BLACKDOWN HILLS AONB
STATE OF NATURE REPORT 2021

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Notice

Summary

This report details an assessment of the State of Nature for the Blackdown Hills Area of Outstanding Beauty. It is part of a suite of projects that together comprise the emerging Nature Recovery Plan for the area, in part fulfilment of the 'Colchester declaration' pledge by each AONB to undertake steps to address the extinction emergency for biodiversity, within the context of a wider response to climate change (NAAONB, 2019).

The strategic context for a Nature Recovery Plan for the Blackdown Hills AONB is described. A desk study collated and mapped evidence from local and national sources, including condition information where available, and the distribution of Champion Species. Key Natural Capital values for the Blackdown Hills AONB are also described. The relationships between Priority Habitats, the distribution of Champion Species for the Blackdown Hills AONB, and Strategic Nature Areas were examined.

Important habitats for the Blackdown Hills AONB include woodland, heathland and meadows and wetlands, as well as special features such as spring-line mire habitats. Hedgerows are important landscape connectivity features for wildlife such as brown hairstreak butterfly and hazel dormouse. The hills are also a hotspot for rare and important bats such as lesser and greater horseshoe, and Bechstein's bat.

Priority habitats and designated sites comprised a relatively small area within the AONB. Overall, the Blackdown Hills AONB comprises 6% priority habitat cover and around 10% of the Blackdown Hills AONB is covered by a combination of statutory and non-statutory designated sites for nature conservation. Of these statutory designated sites, Sites of Special Scientific Interest cover 1.8% of the Blackdown Hills AONB, with 19.1% of the Sites of Special Scientific Interest being in a favourable condition. This offers ample scope for nature recovery throughout the area to contribute to local, regional and national targets, potentially attracting significant funding streams for environmental land management relating to biodiversity and natural capital.

Natural capital benefits of the Blackdown Hills AONB includes the carbon stored in woodland, peaty soils and other natural habitats within the Blackdown Hills AONB, and catchment-scale approaches to fluvial flows and water quality management. There is substantial scope for further catchment-scale work to be incorporated within Nature Recovery Plans, including through the use of the natural 'ecosystem engineers', such as the beavers on the River Otter, and changes to land management to benefit water quality. The value of the Blackdown Hills AONB in terms of recreational, cultural, landscape and heritage benefits is also emphasised, and could be part and parcel of Nature Recovery Plans.

Analysis suggests that the enhancement of Strategic Nature Areas will support important habitats and species within the Blackdown Hills AONB, and that Strategic Nature Areas therefore comprise a reasonable basis for nature recovery planning. In due course, further detailed habitat analysis and mapping being carried out at the Devon and Somerset county scales would be expected to update and further refine target areas for nature recovery actions.

Recommendations include:

- Strategic Nature Areas form a reasonable interim approach to the identification of priority areas for nature recovery work – at least until county-level maps are ready for use.
- Enhancing the data baseline, particularly for areas outside designated sites would be valuable. Refreshing / ground-truthing priority habitat maps in particular would help improve their accuracy and coverage.
- The identification of landscapes of heritage value may also help to identify

areas that are currently wildlife-rich, and/or which may yield swift benefits from targeted enhancement measures.

- Integrated natural capital benefits from nature recovery include carbon budgets, catchment-scale improvements to fluvial management, well-being benefits from access and recreation, and cultural and heritage enhancements.
- The conservation of the characteristic complex 'patchwork' landscapes and point-features for the Blackdown Hills AONB within Nature Recovery Plans would be of value, particularly for spring-line mires.

Acknowledgements

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1. Introduction

1.1 Blackdown Hills AONB State of Nature Report – Part of the Emerging Nature Recovery Plan

Nature Recovery Plans for AONBs

1.1.1 The Nature Recovery Network is a major commitment in the Government's 25 Year Environment Plan (HMSO, 2018). It will comprise a single, improved, joined-up and larger national network of core, restored and new wildlife rich places. This network will help to deliver nature conservation objectives, as well as providing landscapes which are more resilient to climate change, which provide us with vital ecosystem services including improved soil, clean water and clean air, and which help to connect us with nature, benefiting our health and well-being (Defra & Natural England, 2020).

1.1.2 The National Association of Areas of Outstanding Natural Beauty committed in 2019 to developing Nature Recovery Plans (NRPs) to help contribute to this commitment, as set out in the Colchester Declaration (NAAONB, 2019). NRPs for each AONB will be developed with contributions from stakeholders including government and non-governmental organisations, and landowners; they will also be subject to peer review by specialists and will be based on sound data including from Local Record Centres as well as national datasets. A landscape-scale approach to evaluation and targets will link to metrics to demonstrate how NRPs will deliver against regional and national targets, as well as integrating with AONB Management Plans and other local strategies and commitments.

1.1.3 Above all, Nature Recovery Plans for AONBs must inspire, engage and create change on the ground. Nature conservation needs to have greater ambition for 'bigger, better, more and joined', to reverse previous declines (Lawton, 2010). Nature recovery can only ultimately be delivered through action at the site level. Effective work at the AONB and similar scales is therefore of critical importance to achieving the government's targets as set out in the 25 Year Environment Plan (HMSO, 2018) and the 2020 Biodiversity Strategy (Defra, 2011)

Report Scope

1.1.4 Understanding the current condition and extent of wildlife in an area is an important first step in developing any plan for nature conservation, and in helping to evaluate its future success. This report sets out and maps the State of Nature for the Blackdown Hills as at April 2021, collating data from Local Record Centres and other sources, and sets out the strategic context for the Blackdown Hills Nature Recovery Plan. The aim is to help inform discussions and decisions relating to how and where best to target nature conservation actions in the Blackdown Hills AONB. It comprises a suite of documents, data, maps and materials that together will make up the emerging Nature Recovery Plan for the Blackdown Hills AONB.

1.1.5 This report:

- Describes the strategic context for a Blackdown Hills AONB Nature Recovery Plan in terms of biodiversity and natural capital, including how the effectiveness of the Plan can be measured.
- Describes the current biodiversity and natural capital of the Blackdown Hills AONB.

1.2 Conserving and Enhancing Biodiversity in the Blackdown Hills AONB through a Nature Recovery Plan – Strategic Context

1.2.1 Biodiversity in England is conserved and enhanced through a variety of different agents for nature conservation, including legislative and statutory controls, funding regimes and stakeholder groups. The Nature Recovery Plan for the Blackdown Hills AONB will be delivered through effective use of and integration with existing mechanisms. In addition, significant new opportunities from the Environment Bill (currently making its way through parliament) and the Agriculture Bill (HMSO, 2020) (which passed into law in November 2020) will be important to success. These bills form the cornerstone for the government's 25 Year Environment Plan and ambition of being 'the first generation to leave the natural environment in a better state than we found it' (HMSO, 2018). These new bills include landmark measures such as:

- The requirement for farmers and land managers to deliver public goods in return for public money.
- A 10% biodiversity net gain requirement on new development.
- A strengthened biodiversity duty on public authorities.
- Species Conservation Strategies and Protected Sites Strategies.
- Targeted measures to protect existing trees.
- Provision for conservation covenants.
- Mandatory Local Nature Recovery Strategies to cover the whole of England. The Nature Recovery Plan for the Blackdown Hills AONB will be expected to feed into the development of the relevant Local Nature Recovery Strategy or strategies.

1.2.2 Some of the key existing and new mechanisms for the delivery of nature recovery for AONBs are described in more detail below.

Local Nature Recovery Strategies

1.2.3 Local Nature Recovery Strategies (LNRS) will have a statutory basis under the Environment Bill (which is currently going through parliament) and will be a key mechanism for the delivery of the national Nature Recovery Network. Spatial mapping and planning tools to inform nature recovery will be required to be developed.

1.2.4 The Environment Bill sets out the required content for statutory LNRS. They will together cover the whole of England, with each individual LNRS being led by an appropriate 'responsible authority'. They must: include

- A statement of biodiversity priorities for the area.
- A local habitat map that shows the most valuable existing habitat for nature and which maps specific proposals for creating or improving habitat for nature as well as wider environment goals.

1.2.5 LNRS are expected to inform and collective action for nature conservation for a variety of sectors, including development control (*e.g.* through targeting Biodiversity Net Gain, and the National Planning Policy Framework requirement to plan strategically for nature (MHCLG, 2019), agriculture (*e.g.* through the Environmental Land Management Scheme) and climate action (*e.g.* through highlighting the best areas for tree planting and nature-based flood management works).

1.2.6 Within Devon, preliminary work is being carried out by the Devon Local Nature Partnership including the development of a strategy for delivery. A Devon Nature Recovery Network Map will be developed by 2023 that is expected to

contribute to the development of the statutory LNRS. This map will show (DLNP, 2021):

- Core Nature Areas comprising existing areas of wildlife rich habitat or supporting habitat.
- Other Nature Areas, comprising existing habitats which have current or potential wildlife value but which do not meet Core Nature Area criteria.
- Priority areas for habitat creation, based on aspects such as soils and geology, and connectivity to existing areas.
- Nature Recovery Areas. Large areas of countryside with considerable coverage of Core and other Nature Areas where landscape-scale restoration will contribute significantly to nature recovery in Devon.
- Recognition that action for wildlife everywhere is of value, not just works that occur in mapped areas.

1.2.7 Similarly, within Somerset, preliminary work is being carried out by the Somerset Local Nature Partnership that will be expected to feed into the statutory LNRS for Somerset. A different approach is being adopted to the identification of areas of current and potential future importance for wildlife. Ecological network mapping has been carried out for the whole county for four broad habitat types: Broad-leaved Woodland; Priority Grasslands (including calcareous, acid and neutral grassland); Heathland and Acid Grassland; and Fen, Marsh and Swamp. This 'Econet' shows (SWT, 2019):

> "a group of habitat patches that species can move easily between maintaining ecological function and conserving biodiversity".

1.2.8 Mapped areas are derived from the minimum area required to maintain a healthy population and enable dispersal for priority species associated with each habitat (SWT, 2019). Although the maps do not yet highlight areas for habitat creation or restoration in the Blackdown Hills AONB, they can be used to inform the development of national and local nature recovery networks; the maps are available for use now.

1.2.9 The LNRS structure, approach and processes will hopefully learn from previous landscape-scale initiatives. These include the South West Nature Map which selected 'Strategic Nature Areas', comprising core nature areas of existing value for wildlife, as well as identifying priority areas for biodiversity action and climate change adaptation, based on local and national datasets and input from ecologists with local knowledge (BSW, 2007). Another nature recovery mapping initiative has been carried out by Natural England, which comprises National Habitat Network Maps which identify areas for habitat creation and restoration based on the current location of existing priority habitat (Edwards, *et al.*, 2020). However, this map portrays a more 'patchy' future landscape, and is not informed by local knowledge; it also in any case overlaps in large part the SNA maps. This report therefore adopts Strategic Nature Areas as a preferred interim 'proxy' for areas for priority action for wildlife which is coherent across the whole of the Blackdown Hills AONB, whilst the county and national processes are in development; statistical analysis is also carried out to check that SNAs will contribute to the conservation of key habitats and species.

1.2.10 It is expected that current nature recovery initiatives and plans, including AONB Nature Recovery Plans, will lay the foundations for and in time become integrated with the wider statutory LNRS; action will likely be delivered and 'nested' at a variety of spatial scales, according to local circumstances.

1.2.11 The recent 'Planning for the Future' white paper set out how national and local level environmental and other data should be made available to authorities,

communities and applicants in digital form in order to make it easier to re-use and update information and reduce the need for site-specific surveys (MHCLG, 2020). This is as true for the new Local Nature Recovery Strategies as it is for any other aspect of spatial planning, and will require significant investment in the quality data, most likely by public bodies.

1.2.12 The Nature Recovery Plan for the Blackdown Hills AONB will adopt the approach and requirements for the LNRS statutory process, to help inform LNRS emerging for each county. Close working with the Local Nature Partnerships for both Somerset and Devon will be required to align the different methodologies for each county and ensure a coherent approach throughout the AONB. The Blackdown Hills AONB work will also contribute to wider initiatives, including State of Nature Reports for each county. A key objective of the NRP will be to help direct and collate current nature conservation activities to those locations and works that are most likely to have the greatest positive impact, whilst the wider county-level initiatives are in development.

1.2.13 Some areas with good existing or potential biodiversity will straddle the AONB boundary. Integrating the Blackdown Hills NRP with action at the county levels will enable actions to be carried out across the AONB boundary, on bigger sites, and will ensure that enhanced areas are part of a well-connected landscape, at the AONB, county and wider geographical scales, fulfilling the Lawton Report requirement for more, bigger, better, and joined wildlife sites and networks (Lawton, 2010).

Blackdown Hills AONB Management Plan

1.2.14 It is a statutory requirement for every AONB to have a management plan that is reviewed at least every 5 years. Local authorities act jointly to delegate the production and co-ordination of the Management Plan to AONB staff units. The current management plan objective relating to nature conservation for the Blackdown Hills AONB is (BHAONB, 2019):

> "to conserve geodiversity and ensure effective conservation, enhancement, expansion and connectivity of habitats, forming coherent and resilient ecological networks across the Blackdown Hills and beyond, facilitating the movement of priority species across the landscape".

1.2.15 This will be achieved through the following Blackdown Hills AONB policies:

- BG1 Take a strategic landscape-scale based approach to the creation, restoration and maintenance of habitats within the AONB (focussing on designated and undesignated priority sites) in order to ensure resilience to climate change and other pressures
- BG2 Connect habitats at a landscape scale and ensure permeability for species movement within coherent and resilient ecological networks
- BG3 Priority species (including Section 41, Devon Special Species, Protected Species) will be conserved. Targeted action will be taken to support the recovery of priority species
- BG4 Ensure sites of geological and geomorphological importance are appropriately managed to conserve their special features and reduce impacts of development
- BG5 Opportunities will be sought to maximise the benefits for wildlife and people from the positive management of all types of land including farmland, gardens, parks and community green spaces
- BG6 A strategic approach to the control, or eradication where feasible, of invasive non-native species will be taken where they threaten or damage

local habitats and species and where action is practicable

- BG7 Increased recreational pressure will be resisted at locations where unacceptable damage or disturbance to vulnerable habitats or species is likely to arise

1.2.16 A series of indicators have been developed as part of the Blackdown Hills AONB Management Plan process, that track the 'health' of the AONB across all objectives and inform AONB Annual Reviews and the five yearly AONB Management Plan reviews. Natural heritage indicators include percentage of SSSI in favourable condition and area of woodland in active management. These specific measures are used to define the existing 'state of the AONB' relating to biodiversity, as well as including statements relating to the 'desired state' for each target (BHAONB, 2017).

1.2.17 Key performance indicators and targets for the Blackdown Hills AONB NRPs are expected to in time comprise a subset of the AONB statutory management plan targets relating to biodiversity; crucially, these will include a spatial representation of policies and action relating to nature recovery and natural capital actions – mapped actions and targets.

Protected and Important Sites, Species and Habitats

1.2.18 Legislation, such as the Wildlife and Countryside Act 1981 (as amended) (HMSO, 1981)and the Conservation of Natural Habitats and Species Regulations 2017 (as amended) (HMSO, 2017) enable the designation and conservation of statutory sites and species, set out a consent and licensing regime for some activities and ensure consideration of protected sites in the development control regime; as well as enabling financial and other support for positive management, enhancements, and monitoring.

1.2.19 Statutory protected sites represent the very best core areas for wildlife conservation and their conservation and enhancement will be important to the success of the national and local nature networks. The Colchester declaration includes a commitment that at least 200,000ha of Sites of Special Scientific Interest (SSSIs) within AONBs will be in favourable condition by 2030 (NAAONB, 2019).

1.2.20 Species Conservation Strategies are a development control mechanism now included in the Environment Bill which are designed to address 'up-front' the adverse impacts likely to arise from development. The aim is to conserve local populations whilst also reducing the need for reactive, site-based assessments. The initiative builds on the experience of district level licensing for great crested newt *Triturus cristatus* which is now in place in many counties including the Somerset area of the Blackdown Hills AONB ((b) Defra, 2020). Surveys are undertaken and measures developed to mitigate or compensate for any impact on the species in advance and across a wide area. A Nature Recovery Plan for the Blackdown Hills AONB could help to target and focus action carried out under Species Conservation Strategies.

1.2.21 Protected Sites Strategies are also included in the Environment Bill and are expected to operate in a similar way to Species Conservation Strategies. They may, for example, be developed to address multiple impacts on protected sites that arise from off-site impacts and a Nature Recovery Plan may help to focus and direct action and resources. An example of their use could be to resource action for landscape connectivity that will help to ensure favourable condition for bat populations from Special Areas of Conservation across southwest England.

1.2.22 AONBs have each adopted up to 5 Species of Conservation Concern and will prepare and deliver a Species Action Plan, with the objective that at least thirty

threatened species relevant to AONBs will be taken off the list by 2030 (NAAONB, 2019).

Public duty

1.2.23 The existing statutory duty on public bodies to have regard to biodiversity (HMSO, 2006) will be strengthened by the Environment Bill. Public bodies will be required to further a general biodiversity objective relating to the conservation and enhancement of biodiversity. Each body will be required to:

- Consider from time-to-time what action it can take, consistent with the proper exercise of its functions, to further the general biodiversity objective, and;
- determine policies and specific objectives it considers appropriate for taking action to further the general biodiversity objective, and;
- take such action as it considers appropriate, in the light of those policies and objectives, to further the objective.

1.2.24 Nature Recovery Plans will be a helpful contribution to AONB fulfilment of their statutory duty to conservation.

Government Funding for Environmental Land Management

1.2.25 The government provides support for beneficial land management that delivers public benefits, including biodiversity, access and natural capital enhancements. The most significant support, in terms of areas covered and impacts on biodiversity, comprises agri-environmental funding. Three new schemes are in development:

- Sustainable Farming Incentive
- Local Nature Recovery
- Landscape Recovery

1.2.26 These schemes are the latest in a series of agri-environmental support schemes which are moving away from 'profit foregone' to 'payments for public goods', as an ecosystem services approach is embedded within government processes, which places a public benefit value on the wise stewardship of natural capital. The schemes together form a cornerstone of how the government expects to meet its targets for the 25-year Environment Plan (HMSO, 2018), as well as contributing to the commitment to 'net zero' emissions by 2050 (made under an amendment to the Climate Change Act (HMSO, 2008). The schemes mean that farmers and other land managers are likely to be paid for delivering the following public goods:

- clean air
- clean and plentiful water
- thriving plants and wildlife
- protection from environmental hazards
- reduced risk of harm from environmental hazards such as flooding and drought
- enhanced beauty, heritage and engagement with the environment
- mitigating and adapting to climate change.

1.2.27 The Blackdown Hills includes one of the national 'test and trial' projects for Environmental Land Management Schemes (ELMS). This project is trialling a 'peer-to-peer' approach amongst farmers to help improve agri-environment scheme update for high nature value areas. The pilot aims to improve habitat

connectivity between holdings and enable a collective approach to identifying and enhancing natural capital. It is worth noting that ELMS are now being replaced by the Sustainable Farming Incentive (SFI) which will provide support for individual farmers, as a successor to schemes such as Countryside Stewardship. SFI pilots are in development, and the scheme is expected to roll-out in late 2024. Nature Recovery Plans are expected to help target SFI scheme actions and investment.

Other Funding Opportunities

1.2.28 There will be a specific Local Nature Recovery Scheme that will offer government funding for collaborative projects that deliver environmental benefits. Although the details of the scheme are uncertain, there may be opportunities for this fund to support actions recommended by the Blackdown Hills AONB Nature Recovery Plan.

1.2.29 There will be a Landscape Recovery Scheme. This will support large-scale long-term changes in land use that would contribute to biodiversity networks and delivery natural capital enhancements such as contributions to the national carbon net zero target. Projects may include tree-planting over significant areas or peatland conservation projects. The Nature Recovery Plan for the Blackdown Hills AONB may help to identify suitable projects and areas for applications for funding under the scheme.

Direct Management and Ownership

1.2.30 Direct management and ownership of sites for biodiversity by government and non-governmental organisations (nature reserves) remains a crucial element of conservation in England and elsewhere, particularly where these represent 'core nature' areas of high biodiversity value.

1.2.31 Management of sites for other or multi-purposes can also help to deliver biodiversity targets. This includes where management protects a site from pressures relating to agricultural intensification or development. Other or additional site management objectives can include heritage, landscape, recreation and the use of land for military purposes.

Biodiversity Net Gain

1.2.32 Biodiversity Net Gain (BNG) will be mandated by the Environment Bill currently going through parliament. This will place a requirement on local planning authorities to achieve benefits for biodiversity through development control mechanisms. Many local authorities already include BNG policies within their local plan policies. BNG is one of a suite of public benefits, under the umbrella of 'Environmental Net Gain', that are increasingly expected to be delivered through state support and development control (HMSO, 2018).

1.2.33 Biodiversity Net Gain is 'development that leaves biodiversity in a better state than before' (Baker, Hoskin, & Butterworth, 2019). This compares habitat condition, type and area, once a project has completed, as compared to the baseline at the start of the project. A standardised metric is used to calculate the 'net gain' figure (Crosher, *et al.*, 2019). Areas put forward will need to achieve a gain of at least 10%, and be actively managed for biodiversity for a minimum of 30 years (Baker, Hoskin, & Butterworth, 2019).

1.2.34 The 'mitigation hierarchy' still applies, so that developers are required to demonstrate how they first, avoid, second mitigate and finally compensate for adverse effects arising from a proposal. BNG is only applied after all reasonable options under avoidance and mitigation have been explored.

1.2.35 Nature Recovery Plans can help target resources secured from developers for

Biodiversity Net Gain actions to those locations most likely to achieve success.

Conservation Covenants

1.2.36 The security of long-term favourable land management can be crucial to the success of conservation initiatives. The Environment Bill includes provision for 'conservation covenants', enabling obligations for positive management to be passed on to successors or purchasers of land. This will be important for many nature recovery actions and projects within the Blackdown Hills AONB.

Stakeholder Engagement and Support

1.2.37 For all activities for nature conservation, public awareness of the value of and threats to biodiversity is critical to long-term support. A nurturing of public interest in and engagement with nature and biodiversity is important, including engagement with stakeholders at all levels through effective consultation.

1.3 Conserving and Enhancing Natural Capital in the Blackdown Hills AONB through a Nature Recovery Plan – Strategic Context

1.3.1 AONBs across England are committed to embedding an ecosystem services approach into their management plans by 2024 (NAAONB, 2019). Nature Recovery Plans and initiatives for the Blackdown Hills AONB will be expected to deliver natural capital enhancements.

1.3.2 Natural capital is related to, but distinct from biodiversity in terms of how it is evaluated and managed. Natural capital is defined as the stock of living and non-living natural assets, including geology, soils, water and all living organisms. The benefits of natural capital to us can be measured in terms of ecosystem services, which are the vital processes that derive from ecosystems that make our planet habitable to humans, such as clean air and food provision, as well as the aesthetic values and mental wellbeing. A healthy and balanced ecosystem is more resistant to stresses such as climate change and will have an increased ability to provide the ecosystem services and maintain the natural capital that we require to thrive on this planet.

1.3.3 Natural capital tends to be based and/or dependent upon biodiversity, and the need for long term policies and action to assist with increasing and maintaining natural capital is well recognised. Monetary and other values can be assigned to selected ecosystems services so that we can better understand, and monitor the contribution made by those assets from an economic perspective. This anthropocentric approach to valuation can be useful for influencing decision making. Although it is no substitute for the effective articulation of the need to protect biodiversity based on intrinsic values and ethics, natural capital and ecosystem service calculations can convey some key additional benefits derived from biodiversity conservation. Since many decisions are made at least partly based on economic consideration, looking at biodiversity in terms of natural capital enables environmental decisions to also be discussed in financial and asset management terms (*e.g.* Dasgupta, 2021).

1.3.4 Economic techniques for measuring the value individuals and communities place on natural resources are rapidly evolving; however, describing the relationship between biodiversity and natural capital remains complex and challenging. Natural capital can include a wide range of assets, and measuring the benefits associated with public goods can be particularly problematic. Values can be easier to measure for 'tangible and transferable' stocks such as wood, as compared to, for example pollinators, views from a locality or climatic buffering (Dasgupta, 2021).

1.3.5 Natural stocks may be used to derive benefits in a sustainable manner or can be depleted; use can be extractive or non-extractive (Lovell, Depledge, & Maxwell, 2018). Agriculture is one industry that both relies upon and impacts on the natural

environment for production. Conservation grazing can be crucial for the management and maintenance of natural stocks relating to soil conservation and biodiversity. Decline in the condition and resilience of the natural environment (for example, loss of soil or access to water), including biodiversity (pollinators) can pose a risk to agriculture. Sometimes the relationship is complex; for example, wildlife can eat crops – but can also contribute to pest control. In the Blackdown Hills AONB, as for many AONBs, sustainable agriculture can yield substantial public goods as well as food and benefits for biodiversity, although it is not always currently straightforward for landowners to make the most of these opportunities (Silcock, et al., 2011).

1.3.6 AONB Management Plans are expected to include 'meaningful measures around climate change mitigation and adaptation, including clear, measurable targets to support Net Zero' (NAAONB, 2019). Investment in natural capital can improve resilience to climate change alongside biodiversity benefits.

1.3.7 Catchment scale actions and partnerships can be particularly helpful. Nature-based solutions to water flow management can reduce flood risk and enhance biodiversity as well as helping to address water quality issues in an integrated manner (EA, 2017). Catchment-scale projects underway of which the Blackdown Hills AONB are a partner include for the River Axe and the River Culm. A Nature Recovery Plan could help to map and target suitable areas for further action.

1.3.8 Investment in natural capital can also provide means to approach 'net zero' carbon emissions. Tree planting can provide additional woodland habitat and absorb carbon ((a) Defra, 2020). AONB. The 'Woods for Water' project illustrates how woodland enhancement can also potentially help to address water flow issues at the catchment scale (BHAONB, 2017). A Nature Recovery Plan could help to identify both the right place to plant trees, as well as identifying areas where planting trees should be avoided due to the existing nature conservation and other values of the land.

1.3.9 Integration of natural capital targets within Nature Recovery Plans may be helpful to this objective, providing an opportunity to direct climate interventions to the best locations within AONBs to maximise benefits and minimise risks and costs.

1.3.10 As the 'net zero' statutory target approaches then additional resources for climate change adaptation and carbon sequestration may be available as external individuals and organisations seek means to offset their carbon budget. A Nature Recovery Plan could help to identify where these resources could best be targeted.

1.3.11 Well-being benefits from access to wildlife can be considerable and AONBs across the country have committed to enabling opportunities for people to 'make an emotional connection with nature' (NAAONB, 2019).

1.3.12 Areas of Outstanding Natural Beauty comprise high quality environments. made up from a combination of biodiversity, heritage and landscape aspects. Natural capital is not the only stock used by people. There is produced capital (*e.g.* buildings) and human capital (*e.g.* health, education, well-being). Some features of high biodiversity value, such as mature hedgerow networks, also have significant landscape, heritage and culture values and well-being benefits for people from high quality environments can be derived from a complex mix of these, including the interactions between them. Over the last twenty years there has been a rapidly growing body of evidence related to the well-being benefits derived from living in, visiting or otherwise having access to (whether direct or indirect) a high-quality environment, and researchers have increasingly explored the roles and relationships between biodiversity, heritage, ecosystem

services and natural capital in deriving these benefits (*e.g.* Powell, *et al.*, 2019; RPA and LUC, 2019; Fluck & Holyoak, 2017; Youngs & Horner, 2019; Natural England, 2009; Fujiwara, Cornwall, & Dolan, 2014 and Ander, *et al.*, 2013).

1.4 Measuring the Effectiveness of a Blackdown Hills AONB Nature Recovery Plan

1.4.1 The Nature Recovery Plan for the Blackdown Hills AONB will be expected to deliver against existing and new obligations. Detailed objectives and Key Performance Indicators (KPIs) are in development. These will need to line up with the indicator list produced by government relating to the 25-year Environment Plan, as well as being compatible with, and avoiding duplication of, existing and emerging monitoring frameworks, including the AONB Management Plan, Local Nature Recovery Strategies, SFI and other relevant schemes and initiatives. Similarly, some of these schemes will increasingly incorporate measures relating to their delivery against nature recovery targets.

1.4.2 Environmental metrics and Key Performance Indicators for Nature Recovery Plans should include mapped measures relating to areas of habitat, areas under positive management, and, where available, habitat condition. Species data and trends, and measures relating to natural capital would also be important to effective monitoring. However, the process is at an early stage. Considering the strategic context, and existing plans and objectives set out above, initial KPIs for the process may include:

- Writing the NRP and integrating it within the AONB Management Plan.
- Update the NRP on a 3-5 years basis.
- A qualitative tracker for the 5 priority species in each plan.

1.4.3 These will be supplemented with additional detailed targets, including mapped priorities and targets for nature recovery within the Blackdown Hills AONB in due course.

2. Methodology

2.1 Project Team

2.1.1 The Geckoella Project Team includes Kate Jeffreys (Geckoella Director & Project Lead), Samuel Olney (Geckoella Principal Ecologist and Elements 2&3 Lead), Phil Collins (PCA Director and Elements 1&4 Lead), Jamie Foster (Geckoella GIS Lead) and Alex Woolock (Geckoella Statistics Assistant). The Project Manager for Blackdown Hills AONB is Tim Youngs (AONB Manager). A Steering Group for the project included representatives from Quantock Hills AONB, Mendip Hills AONB, East Devon AONB and South Devon AONB.

2.2 Selection of Champion Species

2.2.1 A list of 'indicator' or 'key' species was compiled for Blackdown Hills AONB as a way of developing the Nature Recovery Plan and driving the wider protection and recovery of important habitats within Blackdown Hills AONB; this also comprises part of the Colchester Declaration commitment for AONBs to derive Species Action Plans (NAAONB, 2019). The potential Champion Species were narrowed down using three criteria; species of conservation concern, indicators of healthy habitats, and if they are a charismatic species. The Champion Species are an important way of connecting and engaging with the wider public and so it was crucial that the Champion Species selected were charismatic so as to be used as an engagement tool for stakeholders, landowners and the general public.

2.2.2 Natural England, working with the AONB network in England, created a tool to cross check Section 41, red-listed, 'Back from the Brink' and favourable conservation status species against their national distribution to highlight specific AONB relevance. The list of species was then looked at by Blackdown Hills AONB and reviewed by local partners and stakeholders including various specialists to come up with the final Champion Species list for Blackdown Hills AONB based on the three criteria detailed above.

2.3 Desk Study of Biodiversity and Natural Capital

2.3.1 A desk study was carried out to visualise and analyse the current State of Nature within Blackdown Hills AONB. This study involved the collection of open-source data in addition to data from Local Record Centres (LRC). LRC (and open-source) data has been limited to within or on the boundary of the Blackdown Hills AONB.

2.3.2 Open-source data has been collected from Natural England, Historic England, Ordnance Survey, Devon County Council, Somerset County Council, Environment Agency and the Office for National Statistics: this data was accessed through MAGIC's data portal (Natural England 2021). This open-source data includes designated sites (SSSIs, SACs, LNRs and AONBs), natural capital indicators (*e.g.* quantity of freshwater floodplains), river and catchment records, an ancient woodland inventory and heritage assets (scheduled monuments and parks and gardens). In addition to this, OpenStreetMap Standard has been acquired through QGIS's OSM plugin and used as a base map in all maps excluding those showing river management and modification data, in which case Google Satellite rasters are used.

2.3.3 Data received from Local Records Centres (DBRC and SERC), includes priority habitats, a species inventory, statutory protected sites, non-statutory sites and Strategic Nature Areas. The 10 Champion Species chosen, were extracted from LRC species data sets and filtered by their original survey collection date into two categories: '2009 and older' and '2010 to present'. To ensure enough species data was available, and that the current State of Nature was best

represented, the '2010 to present' Champion Species dataset was therefore used for statistical analyses.

2.3.4 The condition of habitats and status of species populations is an important part of describing the State of Nature of an area. Condition assessment data is available for Sites of Special Scientific Interest, and there are national assessments of the conservation status for some priority habitats and species (Natural England, 2021). However, there is currently sparse accessible and mappable data relating to the condition of, for example, Local Wildlife Sites or priority habitats at the AONB or finer scale.

2.3.5 The data we received has been processed and spatially analysed in QGIS, with a full analysis being carried out within RStudio. Open-source data is typically available at a national scale, however LRC data is limited to county boundaries (the Somerset – Devon county boundary, in this case). Although data from LRCs is showing the same type of information, the format in which it is supplied, displayed and created, differs between each records centre. As a result, datasets such as priority habitats, Champion Species and non-statutory sites have been processed to produce coherent and uniform datasets at a whole-AONB scale, spanning the county boundaries. Spatial and statistical analyses are only undertaken on the datasets that exists within the AONB boundary.

2.3.6 When calculating the 'total' percentage cover (%) and area (Ha) in Tables 2, 3 and 6, the overlap of sites has been taken into account so as to not duplicate the results (*e.g.* where Quants SSSI and Quants SAC overlap, the area is only included in the total once).

Table 1: Data Sources Blackdown Hills AONB

Dataset	Source	Description
DBRC habitats, sites and species	Devon Biodiversity Records Centre	A dataset containing priority habitats (polygons), statutory and non-statutory sites (polygons) and species data (points) containing spatial records of champion species. Data is limited to Devon within the Blackdown Hills AONB.
Strategic Nature Areas (SNA)	Devon Biodiversity Records Centre	A polygon dataset outlining areas of the countryside containing higher than average concentrations of wildlife habitats. Composed of six unique SNA types within the Blackdown Hills AONB: Lowland Heath, Neutral Grassland, Purple Moor Grass and Rush Pasture, Woodland and Rivers.
SERC habitats, sites and species	Somerset Environmental Records Centre	A dataset containing priority habitats (polygons), statutory and non-statutory sites (polygons) and species data (polygon, converted to points) containing spatial records of champion species. Data is limited to Somerset within the Blackdown Hills AONB.
Somerset's ecological network maps (Econet)	Somerset Environmental Records Centre	An ecological network of 4 different broad habitat types (polygons): 'Broadleaf Woodland', 'Fen, Marsh and Swamp', 'Heath and Acid Grassland' and 'Species Rich Grassland'. Each network is composed of Core Areas, smaller Stepping Stones and Dispersal Areas. SERC's Econet shares similarities with DBRC's Strategic Nature Areas.

Dataset	Source	Description
OS Open Rivers	Ordnance Survey	A national dataset containing inland rivers, canals, lakes and tidal rivers line data. Inland rivers line data within or on the boundary of the Blackdown Hills AONB have been isolated, buffered to a diameter of 1.4m and used a proxy to represent rivers as a priority habitat.
National Character Areas (England)	Natural England	A national dataset containing polygons of national scale character areas (defined areas of the landscape with unique/identifiable characteristics).
Habitat Networks (Combined Habitats) (England)	Natural England	This dataset contains habitat networks for 18 priority habitats, in addition to habitat restoration-creation, restorable habitat, plus fragmentation action, and network enhancement and expansion zones (Natural England 2021). This data has been isolated to within Blackdown Hills AONB only.
Areas of Outstanding Natural Beauty (England)	Natural England	A national dataset containing polygons Areas of Outstanding Natural Beauty. This data is used to outline the Blackdown Hills AONB in all maps produced, in addition to sourcing East Devon Area of Outstanding Natural Beauty as a statutory site.
Natural Capital Atlases: Mapping Indicators for County and City Regions	Natural England	A large dataset containing quality, quantity and location of natural capital indicators. The quantity of freshwater floodplains, priority woodland and improved grassland have been displayed in 5km^2 hexagonal tiles and symbolised according to the quantity of the respective natural capital asset. The dataset includes 'WFD 2016 Cycle 2' line data which has been used to symbolise modifications made to rivers, and surface water quality.
Sites of Special Scientific Interest Units (England)	Natural England	A shapefile dataset containing individual units of Sites of Special Scientific Interest (SSSI), which have been isolated to within or on the boundary of the Blackdown Hills AONB. These unit polygons have been displayed to show the condition of the unit/features of interest within (favourable to destroyed).
Ancient Woodland (England)	Natural England	An ancient woodland inventory of sites in England. This data is isolated to within or on the boundary of the Blackdown Hills AONB and shows 'Ancient & Semi-Natural Woodland' and 'Ancient Replanted Woodland' sites.
Special Areas of Conservation (England)	Natural England	A polygon dataset of Special Areas of Conservation (SAC) within England. This data has been isolated to show sites that only lie within or on the boundary of the Blackdown Hills AONB. Available through Natural England via MAGIC.

Dataset	Source	Description
Local Nature Reserves (England)	Natural England	A polygon dataset of Local Nature Reserves (LNR) within England. This data has been isolated to show sites that only lie within or on the boundary of the Blackdown Hills AONB. Available through Natural England via MAGIC.
Sites of Special Scientific Interest (England)	Natural England	A polygon dataset of Sites of Special Scientific Interest (SSSI) within England. This data has been isolated to show sites that only lie within or on the boundary of the Blackdown Hills AONB. This data differs from 'Sites of Special Scientific Interest Units (England)' because it does not contain unit subdivisions describing the site condition. Available through Natural England via MAGIC.
Open Mosaic Habitat (Draft)	Natural England	A dataset containing areas of verified Open Mosaic Habitat. This data has been displayed as a priority habitat alongside data provided by Local Records Centres (DBRC and SERC).
OSM Standard	OpenStreetMap	OpenStreetMap Standard has been used a base map for all maps produced (excluding river condition maps where Google Satellite data is used). Obtained through the OSM plugin through QGIS.
Devon Character Areas	Devon County Council	Devon Character Areas form part of Devon's landscape character assessment (DLCA). This dataset contains polygons of county scale areas which exhibit distinct and unique character within the Blackdown Hills AONB (Devon County Council n.d.).
Landscape Character Areas	Devon County Council	Landscape Character Areas form part of Devon's landscape character assessment (DLCA). This dataset contains polygons of local scale areas which exhibit distinct and unique character within the Blackdown Hills AONB (Devon County Council n.d.).
Scheduled Monuments (polygons)	Historic England	Scheduled monuments are displayed as a heritage feature (in addition to parks and gardens). Due to the small size of these sites, it is not practical to uniquely symbolise individual sites at the scale of the Blackdown Hills AONB.
Parks and Gardens (polygons)	Historic England	A polygons dataset containing parks and gardens (heritage assets) from the Register of Parks and Gardens of Special Historic Interest in England, produced by Historic England. Poundisford Park has been displayed due to its close proximity to the boundary of the AONB.
Counties and Unitary Authorities (December 2019) Boundaries UK BUC	Office for National Statistics	A national polygon dataset containing boundaries of counties and unitary authorities, displayed in all maps to show the county boundary lines between Somerset, Devon and Dorset.

Dataset	Source	Description
WFD River Waterbody Catchments Cycle 2	Environment Agency	A polygon dataset containing river catchments. This dataset has been symbolised to show the boundaries of river catchments and used in conjunction with Natural England's Natural Capital Atlases data, in particular maps referring to quantity of freshwater floodplains, and condition of rivers.
Buglife B-lines	Buglife	A dataset produced by Buglife © 2021, containing a national dataset (UK) of B-Line polygons.
Google Satellite	Google	Google Satellite is accessed through the Google plugin within QGIS. This data is used as background mapping in 'river condition' maps showing natural capital data.

2.4 Statistical Analysis

2.4.1 Champion Species records and, Strategic Nature Areas, statutory and non-statutory sites and priority habitats have been subject to detailed statistical analysis to explore the relationships between Champion Species and, Strategic Nature Areas, biodiversity designations and priority habitats.

2.4.2 An EconullnetR model was carried out to examine these relationships. The null model implies that occurrence of Champion Species records should reflect the relative abundance of resources; resources being the areas of designated sites, priority habitat or Strategic Nature Areas within the AONB. The null model identifies whether Champion Species are positively or negatively associated with designated sites, priority habitat or Strategic Nature Areas.

2.4.3 In order to run the model, the Strategic Nature Area polygon dataset was converted into a point-based dataset, where points were randomised within each Strategic Nature Area. Total point counts within each Strategic Nature Area were based on their total area size. Total number of points were generated for every 100m^2, with no randomised point spaced within 1m of another.

2.4.4 The EconullnetR model was used to ask the following questions:

- What is the coincidence / relationship between Champion Species and statutory and non-statutory designations?
- What is the coincidence / relationship between Champion Species and priority habitat?
- What is the coincidence / relationship between Champion Species and Strategic Nature Areas?
- What is the coincidence / relationship between Strategic Nature Areas and priority habitat?

2.4.5 An example hypothesis comprises: Certain priority habitats, for example woodland, will have a higher frequency of hazel dormice *Muscardinus avellanarius* records.

2.4.6 An example null model comprises: The frequency of hazel dormice records is unrelated to priority habitat type.

2.4.7 The test comprises:

- There are x number hazel dormice distributed across the study area

(Blackdown Hills AONB)

- Priority Habitats – (resources & total availability (m^2)) *e.g.* wet woodland - x m^2, purple moor-grass and rush pasture -x m^2, parkland -x m^2, upland oakwood -x m^2, etc. [other priority habitats], and area not covered by priority habitats -x m^2.
- Interaction relationships between hazel dormice and priority habitats – (EconullnetR model)
- Result: The interaction between the number of hazel dormice records distributed across the 19 different priority habitats and area not covered by priority habitats.
- The Interaction Plot compares the frequency and distribution of hazel dormice records to the 95% confidence intervals of available priority habitat from the null model (bars). Red dots denote an interaction that is stronger than expected, blue dots weaker than expected, and white dots consisted with the null model.
- A stronger than expected interaction shows a positive association, *e.g.* There are proportionally more hazel dormice records in X priority habitat type. A weaker than expected interaction shows a negative association, *e.g.* There are proportionally fewer hazel dormice records in X priority habitat type. An interaction that matches the null model shows there is no significant association, *e.g.* There is the expected amount of hazel dormouse records in X priority habitat type based on the priority habitats total area cover within the study area.

2.5 Study & Data Limitations

2.5.1 Due to SERC's priority habitat classification using their own Integrated Habitat System, the 'lowland fen' priority habitat is not represented in their dataset. In place of this, SERC's 'fen, marsh and swamp' data set has been used. 'Purple moor-grass and rush pasture' priority habitat is displayed alongside 'Fen, marsh and swamp' as a separate priority habitat.

2.5.2 The Priority Habitat Inventory often do not reflect the additional value of a complex matrix of habitats. For example, polygons relating to Blackdown and Sampford Commons SSSI are primarily reflected as 'fen' in Map 2, whilst in reality the site includes substantial areas of heathland and carr woodland, and the boundaries and relationships between these different habitats contribute significantly to their conservation value.

2.5.3 The accuracy of Priority Habitat Inventory at the AONB scale is in question. Anecdotal evidence, and the experience of the authors and others suggests that the primary classification of habitats and the boundaries to polygons may often be inaccurate and/or old (*e.g.* Silcock, *et al.*, 2011). In addition, there are likely to be areas of value for wildlife which are not reflected in the priority habitat maps. However, they are the best standardised approach to habitat mapping currently available that covers the whole of the Blackdown Hills AONB and which extends outside designated sites and they comprise a recognised dataset for planning nature recovery (Crick, *et al.*, 2020, Wildlife Trusts, 2020).

2.5.4 Habitats and areas of value for wildlife do not follow administrative boundaries such as AONB borders. This study focussed on sites and areas within the AONB due to the cost of obtaining data within a buffer area. Although sites which straddle the boundary are illustrated in this report, sites of wildlife value close to the AONB are not depicted. Area calculations and statistical analyses only

include areas within the AONB boundary.

2.5.5 Due to there being no area-based AONB-scale 'rivers' priority habitat;

- The % cover of the area-based SERC river dataset provided within the Somerset side of the AONB was calculated.
- This dataset was then converted to a line dataset, and a buffer of 0.7m was used (assuming a width of 1.4m).
- This new buffered line river dataset has a similar but slightly lower % cover of the Somerset side of the AONB compared to the original SERC river data (as to not falsely strengthen any statistical relationship).
- To allow for an area-based AONB wide river dataset, covering both the Devon and Somerset sites of the AONB, a 1.4m width was applied to the AONB wide line-based data to allow for river priority habitat to be represented in our data/reporting.

2.5.6 The nature of Open Street Maps (an open-source raster) means when we export maps at a resolution of 300 dpi, the scale of place names is not preserved. OS rasters were trialled to mitigate this, however the scale of place names at the AONB scale are still unsuitable and the included road networks displayed in OS maps make the maps visually harder to understand.

2.5.7 Whilst there are a large amount of species records for some of the Champion Species of Blackdown Hills AONB, the varying methods of data collection in terms of quantity and quality makes estimating population sizes and distributions of the champion species difficult. Therefore, some Champion Species are not well represented on the maps. LRC species datasets occasionally contained no records of one or more of the Champion Species therefore could not be displayed or analysed within statistical models.

- Filtering Champion Species data by date of record decreased the data quantity, and in some cased resulted in one or more of the selected Champion Species not being represented in the last 10 years (2010 onwards). 10 years was agreed as a good representation of the 'current State of Nature'.
- Champion Species are displayed as points on the map: where multiple records share the same grid reference, they will be stacked one on top of each other, therefore not visually fully representing the number of records available. However, all records from the last 10 years have been used in the statistical models.
- A single value, *e.g.* a greater horseshoe bat *Rhinolophus ferrumequinum* record, may represent multiple bats forming a roost or a single sighting of an individual bat. However, in both examples it will only be displayed as a single point on the map.
- Statistical models often do not work well when sample sizes are too small. Statistical models with small samples can give unwarranted confidence and select as significant, explanatory variables that are not truly related to the response. Therefore, we choose not to run statistical models on any Champion Species with fewer than 15 records from the last 10 years.

2.5.8 Where data spans multiple counties, the recorded quantity and/or cover of a particular dataset does not necessarily correlate to an actual higher quantity/cover of that dataset. For example, the SERC hazel dormouse dataset has a higher data density than the DBRC dataset. This could be as a result of data collection and /or recording methodologies or it could be that there is a larger population of hazel dormouse within the Somerset side of the AONB. It is not possible within the scope of this report to remove this limitation, and therefore

this report is based on the assumption that datasets provided by differing data centre's is directly comparable to each other.

3. Current State of Nature

3.1 Summary of Blackdown Hills AONB

3.1.1 Blackdown Hills Area of Outstanding Natural Beauty is an isolated, rural landscape on the border of Devon and Somerset, which shares its southern border with East Devon AONB. The area is sparsely developed with small villages surrounded by pockets of enclosed farmland bounded by a network of mature hedgerows.

3.1.2 The majority of the Blackdown Hills AONB is a windswept high, flat plateau resulting from its unique geology, forming, together with the adjoining East Devon AONB, a substantial outcrop of Cretaceous Upper Greensand, overlying Jurassic or Triassic mudstones. Dramatic long escarpments with steeply sided slopes are laced with steep, winding river valleys.

3.1.3 These landscape features support a diverse range of habitats, with the Blackdown Hills AONB known in particular for its wooded ridges and valleys, grasslands, mire and substantial areas of heathland; as well as spring-lines on valley sides at the junction between the Upper Greensand and the mudstones. These habitats found within Blackdown Hills AONB are rich in wildlife and include a wide range of diverse fauna and flora, with numerous areas within the Blackdown Hills AONB having been designated for their biological interest.

3.2 Biodiversity

Priority Habitats

3.2.1 Eighteen priority habitats are found within Blackdown Hills AONB, these are listed in Table 2 below. In addition, coverage of ancient semi-natural woodland and ancient replanted woodland from the Ancient Woodland Inventory has been included. Table 2 also shows the area coverage of each priority habitat, and sets out whether each priority habitat is present within either the Devon or Somerset side of the AONB, or both. Overall priority habitat accounts for just 5.5% of the Blackdown Hills AONB.

3.2.2 Out of the eighteen priority habitats found within the Blackdown Hills AONB several stand out as exemplifying the character of the AONB, these include; lowland heathland, broad-leaved woodlands, hedgerows, lowland calcareous grassland and spring-line habitats.

3.2.3 The Blackdown Hills AONB is characterised, particularly on steeper valley sides, by a complex landscape of habitat patchworks and mosaics. This variety of and connection between habitats of value adds considerably to their nature conservation value, offering a range of micro-habitats and conditions to boost species diversity. Nature Recovery within the Blackdown Hills AONB would be well-served by measures to favour variety and complexity, particularly including point-features such as spring-line mires

3.2.4 **Lowland heathland** is a rare and threated habitat and is characterised by flora that is adapted to the damp, acidic conditions and poor fertility, including western gorse *Ulex gallii*, heathers *Erica spp.*, sundews *Drosera spp.*, and lousewort *Pedicularis sylvatica*. The natural succession of the habitat also leads to scattered scrub and trees such as birch *Betula spp.*. Overall lowland heathland equates to a 0.1% coverage within Blackdown Hills AONB, with no lowland heathland priority habitat being recorded within the Somerset side of the AONB.

3.2.5 **Broad-leaved woodland** is a broad description that encompasses a number of different woodland priority habitats found within the Blackdown Hills AONB, including **wet woodland**, **upland oakwood**, **upland mixed ashwood** and **lowland**

mixed deciduous woodland. Wet woodland is characterised by flora that thrives in poorly drained soils, such as birch and willow *Salix spp.*, whilst the 'upland' canopy of the woodlands on the plateau and scarp includes more oaks *Quercus spp.* and ash *Fraxinus excelsior* trees. Lowland mixed deciduous woodland is a more general categorisation where no one species is dominant, and can be found across a range of soil conditions. Overall priority woodland equates to a 2.4% coverage within Blackdown Hills AONB. No upland oakwood or upland mixed ashwood is recorded within the Devon side of the AONB. Wet woodland and lowland mixed deciduous woodland were recorded in both Somerset and Devon.

3.2.6 Wet woodland is relatively well represented and distributed within the Blackdown Hills AONB, and is likely to be associated with ancient woodland, rivers and streams, and spring-line mire habitats, sometimes developing through lack of management of wet pasture (Silcock, et al., 2011). As well as their nature conservation value they have an important role to play in water flow regulation at the catchment scale.

3.2.7 In addition to the woodland priority habitats with Blackdown Hills AONB, large areas are categorised as ancient woodland, both **semi-natural and replanted ancient woodland**. Some areas of ancient woodland may also be recorded as priority woodland. Overall ancient woodland equates to a 2.3% coverage within the Blackdown Hills AONB.

3.2.8 **Lowland calcareous grassland** is strongly influenced by the alkaline soils found in parts of the Blackdown Hills AONB, often associated with escarpments or dry valley slopes. Lowland calcareous grassland is well recognised for its floral diversity including several orchid species and nationally rare and scarce species/groups. Overall lowland calcareous grassland equates to a 0.02% coverage within the Blackdown Hills AONB, with lowland calcareous grassland being recorded within both the Somerset and Devon side of the AONB.

3.2.9 **'Spring-line mires'** are a key feature of the Blackdown Hills AONB and comprise a matrix of plant communities and wetland features that support a range of specialist plants and animals. They are formed where water percolating through the permeable Upper Greensand meets impermeable mudstones and clays, and emerges from the valley sides. Priority habitats found include **lowland fen** (of which spring-line mire is a sub category), **purple moor grass and rush**, and some of the areas of **wet woodland**. These areas may be characterised by rushes and purple moor grass *Molinia caerulea*, with species-rich communities including meadow thistle *Cirsium dissectum*, marsh St. John's-wort *Hypericum elodes* and insectivorous plants such as oblong-leaved sundew *Drosera intermedia* and pale butterwort *Pinguicula lusitanica*.

3.2.10 Nationally, **purple moor-grass and rush pastures** (also known as 'Rhôs' pasture where enclosed) have declined significantly in area over the last 100 years, although the overall range is stable, and the south-west remains a stronghold. For favourable condition to be achieved for this priority habitat nationally, then an increase to 65,000ha is required from the current extent of 10,500ha, with careful attention paid to the condition of the habitat in terms of floristic and structural diversity as well as hydrological regime. The current extent of purple moor grass and rush in the Blackdown Hills AONB of 234ha comprises 2% of the total cover of this habitat within England (Natural England, 2021).

3.2.11 Due to the variations of the DBRC and SERC datasets the broad habitat categorisation '**fen, marsh and swamp**' has been used to represent **lowland fens**, **reedbeds**, and **upload flushes**, **fens** and **swamps** priority habitats. Within the Devon side fen, marsh and swap can exclusively be read as lowland fen priority habitat, however, within the Somerset side no further sub-division into specific

priority habitat can be achieved with the dataset provided. In addition, although normally categorised as part of the broad habitat fen, marsh and swap, purple moor grass and rush pasture priority habitat has been classified on its own as this data was available from both DBRC and SERC. Overall fen, marsh and swamp priority habitat equates to a 0. 8% coverage within the Blackdown Hills AONB.

3.2.12 **Hedgerows** are an important nature conservation and heritage feature within the Blackdown Hills AONB and nationally (Silcock, *et al.*, 2011, Youngs & Horner, 2019, Natural England, 2021). They are of value as wildlife in their own right and comprise important habitat for a range of notable and protected species including brown hairstreak *Thecla betulae* and hazel dormouse. They have a role in landscape connectivity, particularly in the provision of foraging habitat for mobile species such as bats. Hedgerows are thought to have declined in Devon by at least 1/3rd in legnth since the mid 19th Century (Natural England, 2021). The quality of hedgerows in terms of structural integrity and floristic diversity can have a significant impact on their value for wildlife. They also comprise a substantial carbon store, and contribution to wildlife habitats, landscape value and cultural heritage. For example, a 2 by 2 km survey sample square in the Hemyock area of the AONB contains 78 km of boundaries, 71 km of which are hedged boundaries (Youngs & Horner, 2019). The Blackdown Hills AONB has some areas, generally on the steeper slopes, where medieval strip farming enclosures are well preserved, with irregular fields and massive hedges. These smaller fields are generally more likely to be farmed extensively, and hence to also host relict pockets of species-rich grassland within the farmed landscape, and to link small patches of woodland within the diverse 'High Nature Value Farmland' landscape (Silcock, et al., 2011). Some hedgerow data has been provided by SERC for the Blackdown Hills AONB, which equates to an overall coverage of just 0.003%. However, the SERC data is for a for a single area within the Somerset side of the Blackdown Hills AONB and therefore does not accurately represent the abundance or importance of this priority habitat across the Blackdown Hills AONB.

3.2.13 **Lowland meadows** are a sparsely distributed and threatened habitat at the national scale. Therefore, although the overall identified area of lowland meadows is relatively small (270 ha), this is none the less an important habitat for the Blackdown Hills AONB and an important component of the overall nature conservation value of the area. The mapped area may also be an underestimate, since it is likely to exclude some of the small pockets of species-rich grassland likely to be found in association with other habitats, particularly within some of the more complex features and areas of the Blackdown Hills AONB such as spring-line mires and medieval farmed landscapes.

3.2.14 **Rivers and streams** incise the Greensand plateau and offer valuable habitat for Champion Species such as white-clawed crayfish *Austropotamobius pallipes*. Overall, however, the watercourses are generally modified with poor water quality (Lear *et al.* 2020) (maps 11 and 12), reducing their likely value for wildlife as well as natural capital.

Table 2: Priority Habitat Cover within Blackdown Hills AONB

PRIORITY HABITAT	COVER	LRC	AREA (Ha)
Wet woodland	1.0%	Both	378.8
Purple moor grass and rush pasture	0.6%	Both	233.8
Wood-pasture and parkland	0.3%	DBRC	118.4
Traditional orchard	0.1%	DBRC	49.8
Lowland meadow	0.7%	Both	269.6
Lowland heathland	0.1%	DBRC	45.0
Lowland calcareous grassland	0.02%	Both	8.6
Lowland mixed deciduous woodland	1.4%	Both	499.6
Lowland dry acid grassland	0.1%	Both	19.4
Fen, marsh and swamp	0.8%	Both	297.7
Open mosaic habitat on previously developed land	0.03%	DBRC	11.7
Coastal and floodplain grazing marsh	0.2%	DBRC	65.4
Upland oakwood	0.01%	SERC	3.6
Upland mixed ashwood	0.01%	SERC	3.1
Hedgerow	0.003%	SERC	1.0
Arable field margins	0.01%	SERC	1.8
Dystrophic standing water	0.00001%	SERC	0.004
Rivers (assuming 1.4m wide)	0.08%	Both	29.1
Total priority habitat cover	6%	N/A	2036.3
Ancient & semi-natural woodland	1.2%	Both	426.7
Ancient replanted woodland	1.2%	Both	440.5
Total ancient woodland cover	2%	N/A	867.2
Total priority habitat and ancient woodland cover (combined)	8%	N/A	2903.5
Areas not covered	92%	N/A	34040.4

Statutory and Non-Statutory Designated Sites for Nature Conservation

3.2.15 10% of Blackdown Hills AONB is covered by a combination of statutory and non-statutory designated sites for nature conservation. The designated sites range from being recognised as of international significance, such as the Quants Special Area of Conservation (SAC), which equates to 0.1% coverage of the AONB and was designated for its population of marsh fritillary butterfly (see 3.2.19), to Otterhead Lakes Local Nature Reserve (LNR), which is protected under national legislation and comprises 0.1% coverage of the AONB, and is designated for semi-natural habitats surrounding the two lakes; including, wet woodland priority habitat, and the protected species these habitats support.

3.2.16 In addition to Otterhead Lakes LNR there are seventeen Sites of Special Scientific Interest (SSSI) present within Blackdown Hills AONB that are also protected under

national legislation. The seventeen SSSI equate to a total coverage of 1.7%, with around 19.1% of the SSSI units being in a 'favourable' condition, with around 80.9% of the SSSI units being in an 'unfavourable' condition, with 74.6% being in the sub-category 'unfavourable – recovering'. SSSIs categorised as 'unfavourable – recovering' can still contain good quality habitat, however, the SSSI will often lack certain qualities for example standing deadwood or butterfly indicator species that mean the SSSI cannot be categorised as in a 'favourable' condition. Condition assessments for individual SSSI's although looked at in this State of Nature Report have not been reviewed, with the date of last assessment varying for each individual SSSI unit.

3.2.17 Overall, statutory designated sites for nature conservation account for a total cover of Blackdown Hills AONB of around 1.8%. Non-statutory designated sites, *i.e.* sites designated at a local or county level, account for a total cover of Blackdown Hills AONB of around 8.5%.

3.2.18 Please refer to paragraph 2.3.6 for an explanatory note on the overlap between polygon data sets (designated sites, priority habitats, SNAs) when viewing the 'total' percentage cover and area in Tables 2, 3 and 6.

Table 3: Statutory and Non-Statutory Designated Sites Cover within Blackdown Hills AONB

DESIGNATION	COVER	AREA (Ha)
Special Areas of Conservation (Quants SAC)	0.1%	20.3
Local Nature Reserves	0.1%	21.5
Sites of Special Scientific Interest (incl. SAC)	1.7%	639.3
County Wildlife Sites & Local Wildlife Sites	8.5%	3161.0
Total cover of designated sites	10%	3766.3
Areas not covered	90%	33192.4

Table 4: Sites of Special Scientific Interest Unit Condition within Blackdown Hills AONB

SSSI UNIT CONDITION	COVER	AREA (Ha)
Favourable	19.1%	122.0
Unfavourable - recovering	74.6%	477.1
Unfavourable - no change	6.3%	40.2

Champion Species

3.2.19 Through the consultation and Champion Species selection process described in the methodology section the following Champion Species were chosen for the Blackdown Hills AONB:

- Marsh fritillary butterfly *Euphydryas aurinia*
- Small pearl-bordered fritillary butterfly *Boloria selene*
- Brown hairstreak butterfly *Thecla betulae*
- Double line moth *Mythimna turca*
- White-clawed crayfish *Austropotamobius pallipes*
- Hazel dormouse *Muscardinus avellanarius*

- Eurasian Beaver *Castor fiber*
- Greater horseshoe bat *Rhinolophus ferrumequinum*
- Lesser horseshoe bat *Rhinolophus hipposideros*
- Bechstein's bat *Myotis bechsteinii*

3.2.20 Marsh fritillary *Euphydryas aurinia*, double line moth *Mythimna turca* and small pearl-bordered fritillary *Boloria selene* are together used in this report as indicators for a '**spring-line mire invertebrate assemblage**'. Spring-line mire features are typical of pasture on the scarp slopes of the Blackdown Hills AONB and have high nature conservation value for plants as well as invertebrates (see 3.2.8).

3.2.21 **Marsh fritillary butterflies** are found on damp, tussocky grassland habitats and sometimes within woodland clearings/rides. Their main caterpillar foodplant species is devil's-bit-scabious *Succisa pratensis*, but it will feed on other scabious species when found on calcareous grassland. Quants SAC was originally designated for its population of marsh fritillary butterflies; this has since died out and only 4 records are present for the species since 2010. Conservation efforts over the past 15 years have sought to restore the network of sites and stepping stones for the species, in order to allow its free movement – the marsh fritillary is a good example of a species requiring a metapopulation approach to conservation, where a number of different linked sites are required in order to support a viable population. Butterfly Conservation are undertaking survey work within the Blackdown Hills AONB surveying for devil's-bit-scabious as an indicator for areas that may contain populations of marsh fritillaries or comprise suitable locations for reintroductions.

3.2.22 **Small pearl-bordered fritillary butterflies** are also found in damp grassland habitats, as well as woodland and moorland. Small pearl-bordered fritillary butterflies main caterpillar foodplant species are common dog-violet *Viola riviniana* and marsh violet *Viola palustris*. Only 6 records are present for small pearl-bordered fritillary butterflies since 2010.

3.2.23 **Brown hairstreak butterflies** are woodland specialists, that will also use mature hedgerows to disperse. They can hence be good indicators of the quality of a connected landscape for wildlife. Blackthorn *Prunus spinosa* is the brown hairstreak butterfly's main caterpillar food plant species. 36 records are present for brown hairstreak butterflies since 2010 within Blackdown Hills AONB.

3.2.24 **Double line moths** are another woodland specialist. The double line moth's main caterpillar food plant species are wood-rush *Luzula spp.* and grasses such as cock's-foot *Dactylis glomerata*. 10 records are present for double line moths since 2010 within Blackdown Hills AONB.

3.2.25 **White-clawed crayfish** are a freshwater crustacean and the UK's only native freshwater crayfish. They live in clean, shallow, moderate-fast flowing streams with a strong association to alkaline areas, *i.e.* chalk and limestone water courses; they can help to indicate the quality and state of watercourses. The presence of non-native signal crayfish *Pacifastacus leniusculus* has led to a substantial decline in the range and population numbers for native white-clawed crayfish because they act as vectors for crayfish plague. 60 records are present for white-clawed crayfish since 2010 within Blackdown Hills AONB, with all provided records from the River Culm and its tributaries. Favourable conservation status nationally for white-clawed crayfish would include the re-establishment of viable populations within additional catchments within the Blackdown Hills AONB and elsewhere (Natural England, 2021).

3.2.26 **Hazel dormouse** are another woodland and hedgerow specialist and will spend the majority of the year off the ground where possible, living and feeding

amongst the canopy of the woodland. During the winter they will come to ground level to hibernate creating woven nests amongst ground level foliage or even within root bases of trees. They will eat a range of food from insects to flowers and seeds and are increasingly recognised as utilising a broad range of habitats, including road verges. However, their preferred foodplant is hazel *Corylus avellana*, specifically hazel nuts, and they primarily require a well-connected network of woods and hedgerows suitable vegetative and structural composition; they can hence help to indicate landscape quality for a range of wildlife generally. 284 records are present for hazel dormouse since 2010 within Blackdown Hills AONB. Nationally, hazel dormouse numbers and available habitat are declining, although they are common in Devon (Natural England, 2021).

3.2.27 **Eurasian Beaver** are native to the UK but were hunted to extinction, likely around the 1600s. They are keystone 'ecosystem engineers' and can have a profound impact on catchment water flow, including creating dams that can 'slow the flow' and hence reduce downstream flood events. Beaver *Castor fiber* were found to be present on the River Otter in 2013, and a Devon Wildlife Trust project is researching and monitoring their population and impact on the River Otter and land management of adjacent land, including considering the wetland habitats they establish, to help develop long-term management strategies for beavers in the UK. No records were provided within Blackdown Hills AONB for the beaver population that is known to be within the River Otter.

3.2.28 **Greater and lesser horseshoe bats** are two of the UK's rarest bat species and their roosts and key foraging areas are offered additional protection as compared to other bats under the Conservation of Natural Habitats and Species Regulations (2017) and through development control and other mechanisms. Horseshoe bats are typically associated with livestock grazing, as well as being heavily reliant on woodland fringe habitats for foraging. In addition, along the northern escarpment of the Blackdown Hills AONB there are several caves that are used by greater and lesser horseshoe bats *Rhinolophus hipposideros* for hibernation. 15 records are present for greater horseshoe bats and 51 records are present for lesser horseshoe bats since 2010 within Blackdown Hills AONB.

3.2.29 **Bechstein's bat** are one of the UK's rarest bat species and like the horseshoe bats Bechstein's bat *Myotis bechsteinii* is offered additional protection under the Conservation of Natural Habitats and Species Regulations (2017). Bechstein's bats are almost exclusively found in woodland feeding predominately on moth species, rarely roosting within buildings. Only 3 records are present for Bechstein's bat since 2010 within Blackdown Hills AONB.

3.2.30 Although roost conservation is understandably critical for bats, a high-quality connected landscape of woodlands, hedgerows and meadows is important for foraging, as well as for enabling the movement of bats through areas at different periods in their life cycle. Healthy populations of the rarer bat species in particular can help to indicate the quality of the wildlife network at the landscape scale.

Table 5: Champion Species Records within Blackdown Hills AONB

Common Name	Scientific Name	No. of records 2010 to present
Marsh fritillary butterfly	*Euphydryas aurinia*	4
Small pearl-bordered fritillary butterfly	*Boloria selene*	6
Brown hairstreak butterfly	*Thecla betulae*	36

Common Name	Scientific Name	No. of records 2010 to present
Double line moth	*Mythimna turca*	10
White-clawed crayfish	*Austropotamobius pallipes*	60
Hazel dormouse	*Muscardinus avellanarius*	284
Eurasian beaver	*Castor fiber*	0
Greater horseshoe bat	*Rhinolophus ferrumequinum*	15
Lesser horseshoe bat	*Rhinolophus hipposideros*	51
Bechstein's bat	*Myotis bechsteinii*	3

Strategic Nature Areas

3.2.31 Strategic Nature Areas are defined by DBRC as the following;

> "[SNAs] are areas of Devon's countryside which contain higher than average concentrations of existing wildlife habitats such as native woodlands, flower-rich grasslands, bogs and heathland (many of these habitats will have an international, national or local designation). For simplicity, each SNA is classified on the map according to the dominant habitat type […]. However, the majority of SNAs are a mix of different wildlife habitats and other land uses."

3.2.32 Within Blackdown Hills AONB five SNAs are present and are Lowland Heath, Neutral Grassland, Purple Moor-grass and Rush Pasture, Woodland, and Rivers. It should be noted that as with the 'rivers' priority habitat there is no area-based 'Rivers' SNA data provided, therefore River as an SNA dataset has not been considered.

3.2.33 Table 6 below shows the total area of each SNA type within Blackdown Hills AONB and the corresponding percentage cover. The number of randomised points created for the statistical analyses using this data set has also been provided for reference (see 2.4.3).

Table 6: Strategic Nature Area Cover within Blackdown Hills AONB

Strategic Nature Area Habitat	AREA (Ha)	POINT COUNT	% COVER
Lowland Heath	4702.4	4702	12.7
Neutral Grassland	789.4	789	2.1
Purple Moor Grass and Rush Pasture	3734.7	3735	10.1
Woodland	3309.6	3310	9.0
Total SNA cover	12162.0	12536	32.9%
Area not covered	24796.7	N/A	67.1%

3.3 Results - Relationships between Champion Species, Statutory and Non-Statutory Sites, Priority Habitats and Strategic Nature Areas.

3.3.1 As detailed in the methodology an EconullnetR model was caried out on selected sections of the overall dataset to examine if there was any statistically significance relationship between data sets, for example we know generally that dormice have a strong association with certain habitat types *i.e.* woodland. By using the EconullnetR model we can look to test this association specifically within Blackdown Hills AONB. We ran the EconullnetR model for all Champion Species that had at least 15 records from 2010 onwards and compared their location to priority habitat, designated sites and to Strategic Nature Areas.

3.3.2 The interaction plots found within Appendix 2 compares the frequency and distribution of Champion Species records to the 95% confidence intervals of available priority habitat, designated sites and Strategic Nature Areas from the null model (bars). Red dots denote an interaction that is stronger than expected, blue dots weaker than expected, and white dots consisted with the null model. A stronger than expected interaction shows a positive association, a weaker than expected interaction shows a negative association, and an interaction that matches the null model shows there is no significant association.

Brown Hairstreak

3.3.3 Reviewing the interaction plots found within Appendix 2 we can see that within Blackdown Hills AONB, there is no positive relationship between brown hairstreak and any priority habitat, in fact the records indicate proportionally to the area covered significantly more brown hairstreak have been found in non-priority habitats. However, you are significantly more likely to find brown hairstreak within designated sites (with the exception of Otterhead Lakes LNR) than within areas not covered by statutory or non-statutory designations for nature conservation. In addition to this, the Woodland SNA within Blackdown Hills AONB has a positive association with brown hairstreak, *i.e.* you are more likely to find brown hairstreak in this SNA category than another SNA or area not covered by SNAs.

Hazel Dormouse

3.3.4 Reviewing the interaction plots found within Appendix 2 we can see that within Blackdown Hills AONB, there is a positive relationship between hazel dormouse and ancient replanted woodland and areas not containing priority habitat. Other woodland types you would expect to have a positive relationship with hazel dormouse actually return a negative relationship, including ancient semi-natural woodland. However, similarly to brown hairstreak you are again significantly more likely to find hazel dormouse within designated sites (including Otterhead Lakes LNR) than within areas not covered by statutory or non-statutory designations for nature conservation. In addition to this all SNA with the exception of Neutral Grassland SNA (Woodland SNA, Purple Moor-grass and Rush pasture, Lowland heath) within Blackdown Hills AONB has a positive association with hazel dormouse, *i.e.* you are more likely to find hazel dormouse within these three SNA categories than in areas not covered by these SNAs.

White-clawed Crayfish

3.3.5 Reviewing the interaction plots found within Appendix 2 we can see that within Blackdown Hills AONB, there is a positive relationship between white-clawed crayfish inland river and coastal and floodplain grazing marsh priority habitats. It should be noted that all coastal and floodplain grazing marsh priority habitat within Blackdown Hills AONB is found along the River Culm, so it is expected that white-clawed crayfish records would be picked up within this habitat type. You are also significantly more likely to also find white-clawed crayfish within statutorily designated sites (excluding Otterhead Lakes LNR) than within areas not covered by statutory designations. There is also an interesting relationship

that can be observed between the non-statutorily designated sites where there is a positive relationship with Local Wildlife Sites (Somerset designation), but a negative relationship with County Wildlife Sites (Devon designation). In addition to this Woodland SNA and Lowland heath SNA within Blackdown Hills AONB have a positive association with white-clawed crayfish, *i.e.* you are more likely to find white-clawed crayfish within these two SNA categories than in areas not covered by these two SNAs. This will be due to the River Culm and its tributaries that we know contain 100% of the white-clawed crayfish records since 2010 run through significant proportions of these SNA categories.

Greater Horseshoe Bats

3.3.6 Reviewing the interaction plots found within Appendix 2 we can see that within Blackdown Hills AONB, there is no positive relationship between greater horseshoe bats and any priority habitat, and you are proportionately more likely to have greater horseshoe bats in areas not containing priority habitat. However, you are again significantly more likely to find greater horseshoe bat within statutory designated sites (excluding Otterhead Lakes LNR) than within areas not covered by statutory designation. There is also again an interesting relationship that can be observed between the non-statutorily designated sites where there is a positive relationship with Local Wildlife Sites, but a negative relationship with County Wildlife Sites. Greater horseshoe bats have a positive relationship with Woodland SNA and Purple Moor-grass and Rush Pasture SNA within Blackdown Hills AONB and have a negative relationship with areas not covered by these two SNA.

Lesser Horseshoe Bats

3.3.7 Reviewing the interaction plots found within Appendix 2 we can see that within Blackdown Hills AONB, there is no positive relationship between lesser horseshoe bats and any priority habitat (with the exception of inland rivers), and you are proportionately more likely to have lesser horseshoe bats in areas not containing priority habitat. However, you are again significantly more likely to find lesser horseshoe bat within SSSIs. As with greater horseshoe bats there is again an interesting relationship that can be observed between the non-statutorily designated sites where there is a positive relationship with Local Wildlife Sites, but a negative relationship with County Wildlife Sites. Lesser horseshoe bats have a positive relationship with Woodland SNA, Purple Moor-grass and Rush Pasture SNA, and Lowland Heath SNA within Blackdown Hills AONB and a neutral relationship with Neutral Grassland SNA *i.e.* proportionately the number of records found within Neutral Grassland SNA were expected for the size of the area. There is a negative relationship with areas not covered by SNA and lesser horseshoe bats within Blackdown Hills AONB.

Woodland SNA

3.3.8 Reviewing the interaction plots found within Appendix 2.4 we can see that within Blackdown Hills AONB, there is no positive relationship between Woodland SNA and any priority habitats including woodland priority habitats. Area not covered by SNA was not looked at.

Purple Moor-grass and Rush Pasture SNA

3.3.9 Reviewing the interaction plots found within Appendix 2.4 we can see that within Blackdown Hills AONB, there is a positive relationship between the Purple Moor-grass and Rush Pasture SNA and wood pasture and parkland priority habitat. Area not covered by SNA was not looked at.

Neutral Grassland SNA

3.3.10 Reviewing the interaction plots found within Appendix 2.4 we can see that within Blackdown Hills AONB, there is a positive relationship between Neutral Grassland

SNA and lowland meadow priority habitat. Area not covered by SNA was not looked at.

Lowland Heath SNA

3.3.11 Reviewing the interaction plots found within Appendix 2.4 we can see that within Blackdown Hills AONB, there is no positive relationship between Lowland Heath SNA and any priority habitat with the exception of fen, marsh and swamp priority habitat. Area not covered by SNA was not looked at.

3.4 Conclusions from Statistical Analysis - Relationships between Champion Species, Statutory and Non-Statutory Sites, Priority Habitats and Strategic Nature Areas.

3.4.1 Strategic Nature Areas were originally selected to "*contain higher than average concentrations of existing wildlife habitats*". A positive association was found between Neutral Grassland SNA and lowland meadow priority habitat. However, SNAs often did not have statistically significant positive associations with the relevant priority habitat. This may be because the SNAs extend beyond areas currently rich in wildlife into those areas where habitats can be restored or created. The overall cover of priority habitat is low, with around just 5.5% of the total AONB area. It may also be because although SNAs had an attributed primary habitat, they were also selected to incorporate areas with a diverse and valuable matrix of different habitats – which may explain, for example the positive association between the Lowland Heath SNA and fen, marsh and swamp priority habitat.

3.4.2 Strategic Nature Areas generally had positive associations with those Champion Species likely to indicate and be associated with the relevant habitat type. This suggests that there is already a reasonable distribution and association of indicative species with the areas, and that habitat restoration or creation may be likely to be successful within the SNAs – relict or remnant populations of Champion Species are already present, despite the relatively poor quality of habitat. For example, lesser horseshoe bats have a positive relationship with Woodland SNA, Purple Moor-grass and Rush Pasture SNA and Lowland Heath SNA within Blackdown Hills AONB; and a negative relationship with areas not covered by any SNA.

3.4.3 It is worth emphasising that ground truthing the quality of the priority habitat base data set is recommended before further use of this dataset is made in Nature Recovery Mapping within the Blackdown Hills AONB and elsewhere (see 2.5 – data limitations).

3.4.4 An example of an unexpected statistical finding was that the Purple Moor-grass and Rush Pasture SNA had a negative relationship with purple moor-grass and rush pasture priority habitat; this may be due to the habitat complexity associated with spring-line mire habitats (see 3.2.9).

3.4.5 This analysis does not suggest that protecting, for example, the Woodland SNA habitat would proportionally be protecting woodland priority habitats or ancient woodland across Blackdown Hills AONB. However, it does suggest that you will be protecting the Champion Species that are closely associated with these habitat types.

3.4.6 In summary, the data supports the use of Strategic Nature Areas as a reasonable intermediate proxy for prioritisation of areas for nature recovery, in advance of the more detailed and updated nature recovery targeting approaches that that will emerge in due course from both the Devon and Somerset processes at the county level.

4. Natural Capital

4.1.1 In 2020 the West Country Rivers Trust adopted an ecosystem services approach to mapping environmental assets to support an Environmental Land Management Scheme 'Test and Trial' (WRT, 2020). As well as priority habitats, they also looked at urban natural spaces and the value of cultural and historic natural spaces. They mapped priority areas for action in the Blackdown Hills AONB based on sub-catchments in relation to water quality and resources, fluvial flood risk, biodiversity, farmland, air quality, climate regulation, and cultural and historic value.

4.1.2 Natural England used the national priority habitat dataset as a basis for the evaluation of natural capital assets; example maps for carbon and floodplains are included as maps 11 and 12 of this report (Edwards, et al., 2020).

4.1.3 A recent study also looked at the ecosystem services values provided by different landscape types and found that scores for biomass, flood alleviation, access & recreation, biodiversity and cultural heritage were generally high in areas that were heritage rich (Youngs & Horner, 2019).

4.1.4 Overall, biodiversity was considered a significant natural capital asset for the Blackdown Hills AONB. It also forms the living component of natural capital stock. Additional ecosystem services provided by nature include carbon storage and sequestration (including in and by woodland, peatlands, hedgerows), catchment-scale benefits (including water quality, fluvial flow management) and benefits to communities arising from access, recreation, education and the cultural and heritage qualities of the AONB. These were recurring natural capital priorities and themes for the Blackdown Hills AONB, and may be considered additional benefits to nature recovery actions. It is worth recognising however, that planting trees to sequest carbon is not always compatible with biodiversity conservation – an integrated approach is required to plant the 'right tree in the right place (*e.g.* see Woodland Trust, 2020).

4.1.5 The development of maps and targets relating to Natural Capital is challenging, and techniques are in their relative infancy. None-the-less, progress can be made and there are significant projects in development (*e.g.* the 'SWEEP' initiative (SWEEP, 2021)). Priority and other habitat data may be a suitable proxy for natural capital mapping relating to, for example carbon budgets and soils. Values relating to water budgets and flows, including the targeting of actions relating to nature-based solutions to flood management, may best be considered at the catchment level. Natural capital benefits relating to well-being, heritage and landscape require integration with 'produced capital' and 'human capital' in order to fully capture the range and complexity of benefits that people obtain from an AONB. The mapping and description of natural capital benefits alongside biodiversity can help significantly with effective project design and with securing resources for action – often enabling projects to deliver far more than if biodiversity alone were considered in isolation. Nature Recovery Plans are likely to benefit if also considering natural capital benefits.

5. Recommendations

5.1.1 Nature Recovery Plans form the latest in a series of landscape-scale initiatives for biodiversity enhancement for the Blackdown Hills AONB and other areas. It is crucial that they contribute to and align with the emerging State of Nature Reports and Nature Recovery Network mapping work that is being carried out at the county level in Somerset and Devon, as well as, in due course, the statutory Local Nature Recovery Strategies that will be developed.

5.1.2 AONBs have multiple objectives, including biodiversity and natural capital, expressed and prioritised through the statutory Management Plan. The Blackdown Hills NRP should comprise part of the Management Plan for the AONB, with mapped as well as stated targets for biodiversity enhancement and creation, as well as mapped priority areas for natural capital enhancement.

5.1.3 Existing habitat and species data relating to the Blackdown Hills AONB outside statutory and non-statutory sites is often updated on a piecemeal basis; there are also differences between Devon and Somerset Local Record Centres in the approach to data collation and management. For this report we used national habitat datasets that would benefit significantly from enhancement using up-to-date remote sensing data, ground-truthed to check against the priority habitat and other classifications, before use for field-level prioritisation.

5.1.4 This data could contribute to habitat maps that cover the entire Backdown Hills AONB, and which are reviewed and updated where needed as a coordinated effort. We recommend using the 'UKHabs' classification (Butcher, Carey, Edmonds, Norton, & Treweek, 2020), so that condition data can also be included, and to ensure compatibility with Biodiversity Net Gain and other requirements. This classification is also compatible with adapting survey effort according to likely current or potential value; a broad-brush approach can be adopted for areas of less value with more effort put into searching for valuable point features such as spring-line habitats. A combination of remote sensing and ground-truthing would likely be the most cost-effective technique.

5.1.5 The differing approaches to Nature Recovery Mapping being adopted by the Local Nature Partnerships for Devon and Somerset each have merit. We recommend the Blackdown Hills AONB adopts a single consistent approach across the area which is ecologically coherent, subject to stakeholder engagement and consultation, and which is robust to challenge including through the development control regime. This report uses Strategic Nature Areas as a reasonable intermediate proxy for the more advanced and updated mapped areas for nature recovery that will emerge from both the Devon and the Somerset processes (and which, in time, are expected to form the basis for the statutory Local Nature Recovery Strategies). We recommend that this State of Nature Report for the Blackdown Hills AONB is updated with new information as these processes develop.

5.1.6 Integration of Blackdown Hills AONB actions with county-level State of Nature Reports and nature recovery initiatives must also include data analysis and actions that properly reflect the boundaries and character of natural features rather than administrative boundaries. This means that wildlife features adjacent or near to the boundary of the AONB should also help to identify priority areas for enhancement.

5.1.7 The Blackdown Hills AONB is characterised, particularly on steeper valley sides, by a complex landscape of habitat patchworks and mosaics. Nature recovery within the Blackdown Hills AONB should include measures to favour this ongoing variety and complexity, particularly including point-features such as spring-line

mires.

5.1.8 Identifying heritage-rich landscapes, such as those with medieval field systems, may also help to identify areas of current and potentially future high wildlife and natural capital value, and hence could contribute to the targeting of action for nature recovery (Youngs & Horner, 2019).

5.1.9 Further work to identify key features for champion species, such as important bat roosts, would comprise a valuable contribution to future State of Nature Reports. The statistical analysis presented here sets out that, for the most part, priority habitats and Strategic Nature Areas are more likely to support Champion Species than other areas of the AONB. None the less the available data for these species in the Local Record Centres is often sparse, and targeted surveys to improve the evidence base would be valuable, not least to improve the validity of statistical analysis looking at priority areas for nature recovery.

5.1.10 Linear features, including waterways, and in particular, field boundaries should be included in the development of the Nature Recovery Plan for the Blackdown Hills AONB including mapping and condition assessment; there is a risk that area-based habitat mapping and modelling may underplay their importance. Hedgerows in the Blackdown Hills AONB have significant biodiversity, natural capital and cultural values (Youngs & Horner, 2019 & Devon Hedge Group, 2021).

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7. Glossary and Acronyms

AONB – Area of Outstanding Natural Beauty. An area of statutory protected countryside, designated to conserve and enhance its natural beauty (Natural England, 2017). Areas of Outstanding Natural Beauty are designated by the government and protected through the Countryside and Rights of Way 2000 (CROW Act).
Biodiversity - Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD, 1992).
Champion Species – A selection of individual species chosen by an Area of Outstanding Natural Beauty to be represented within the current state of nature within the respective AONB.
Core Nature Areas – Areas of the countryside which currently contain wildlife rich habitats or support habitats. This includes designated sites, priority habitats, and associated key species (Natural Devon, n.d.).
Countryside Stewardship Scheme – Scheme managed by Defra that provides financial incentives for farmer and other land managers to look after and improve the environment.
CBD - Convention of Biological Diversity. Definition of biodiversity adopted in 1992.
Cultural services – All the non-material, and normally non-rival and non-consumptive, outputs of ecosystems (biotic and abiotic) that affect physical and mental states of people (Dasgupta, 2021).
CWS – County Wildlife Site. Non-statutory sites designated for their nature conservation value and important habitats and/or species within Devon. These sites are selected at a county level and meet local selection criteria. These sites may also be termed as Local Wildlife Sites (LWS) or Sites of Nature Conservation Interest (SNCI).
DBRC – Devon Biodiversity Records Centre. An organisation which collects, collates and manages information on wildlife and the natural environment within Devon, and can supply to local users.
DCMS - Department for Digital, Culture, Media & Sport.
Defra - Department for Environment, Food & Rural Affairs.
Devon Character Areas – The characterisation of the landscape within Devon into areas with distinct character at a county scale. Part of Devon's Landscape Character Assessment (DLCA). [See also DLCA].
DLCA – Devon's Landscape Character Assessment. A method of characterising the landscape of Devon into unique areas with distinct character. The DLCA is divided into National Character Areas, Devon Character Areas and Landscape Character Types. [See also Devon Character Areas].
Econet – Somerset's Ecological Network Map. An ecological network of broad habitat types, visualising the movement of species through the landscape. The ecological network is divided into 'Core Areas', smaller 'Stepping Stones' and 'Dispersal Areas'.

- Core Areas: the 'minimum viable area' able to support important species associated with that particular habitat.
- Stepping Stones: small, discrete areas that are close enough to core areas to be important to the species therein. Can form transport corridors through the landscape.
- Dispersal Areas: areas of permeable landscape allowing movement between Core Areas and Stepping Stones.

EconullnetR – An analytical method for using null models to analyse and detect resource preferences or non-random interactions among networks. Utilised herein for statistical analyses.
Ecosystem services – The contributions that ecosystems make to human well-being. The Review classifies these into provisioning services, regulating and maintenance services,

and cultural services (Dasgupta, 2021).

ELMS Environmental Land Management Scheme - See: SFI Sustainable Farming Incentive

HER - Historic Environment Records comprise datasets providing detailed information about the historic environment of a given area (Historic England, 2019).

Heritage - "Heritage is a broad concept and includes the natural as well as the cultural environment. It encompasses landscapes, historic places, sites and built environments, as well as biodiversity, collections, past and continuing cultural practices, knowledge and living experiences. It records and expresses the long processes of historic development, forming the essence of diverse national, regional, indigenous and local identities and is an integral part of modern life. It is a social dynamic reference point and positive instrument for growth and change. The particular heritage and collective memory of each locality or community is irreplaceable and an important foundation for development, both now and into the future." International Cultural Tourism Charter, ICOMOS, 2002.

NLHF – National Lottery Heritage Fund comprises a share of the money raised through the National Lottery for good causes for the benefit of communities across the UK. Distribution of the fund to heritage across the UK is administered by the National Heritage Memorial Fund (known as the HLF), set up under the National Heritage Act 1980.

Historic environment - All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.

Human capital – the productive wealth embodied in labour, skills and knowledge (Dasgupta, 2021).

Local Development Plan / Local Plan - "A plan for the future development of a local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004." (NPPF, 2019).

LNR – Local Nature Reserve. A statutory designated site, featuring locally important wildlife and/or geological interests. LNRs are managed by local councils and designated under Section 21 of the National Parks and Access to the Countryside Act 1949.

LNRS - Local Nature Recovery Strategies will be required under the Environment Bill currently progressing through parliament. Local authorities will be obliged to develop spatial mapping and planning tools to inform nature recovery through actions and incentives that will drive change on the ground.

LPA - Local Planning Authority. The public authority whose duty it is to carry out specific planning functions for a particular area.

LRC - Local Record Centre. Organisation which collects collates and manages information on wildlife and the natural environment and can supply to local users.

LWS – Local Wildlife Site. Non-statutory sites designated for their nature conservation value and important habitats and/or species within Somerset. These sites are selected at a county level and meet local selection criteria. These sites may also be termed as County Wildlife Sites (CWS) or Sites of Nature Conservation Interest (SNCI) within/by other counties.

MAGIC - Multi Agency Geographic Information for the Countryside. A web-based interactive map to bring together information on key environmental schemes and designations in one place. MAGIC is a partnership project involving six government organisations who have responsibilities for rural policy-making and management (Natural England, 2021).

Natural assets – Naturally occurring living and non-living entities that together comprise ecosystems and deliver ecosystem services that benefit current and future generations (Dasgupta, 2021).

Natural Capital - The stock of renewable and non-renewable natural assets (*e.g.* ecosystems) that yield a flow of benefits to people (*i.e.* ecosystem services). The term 'natural capital' is used to emphasise it is a capital asset, like produced capital (roads

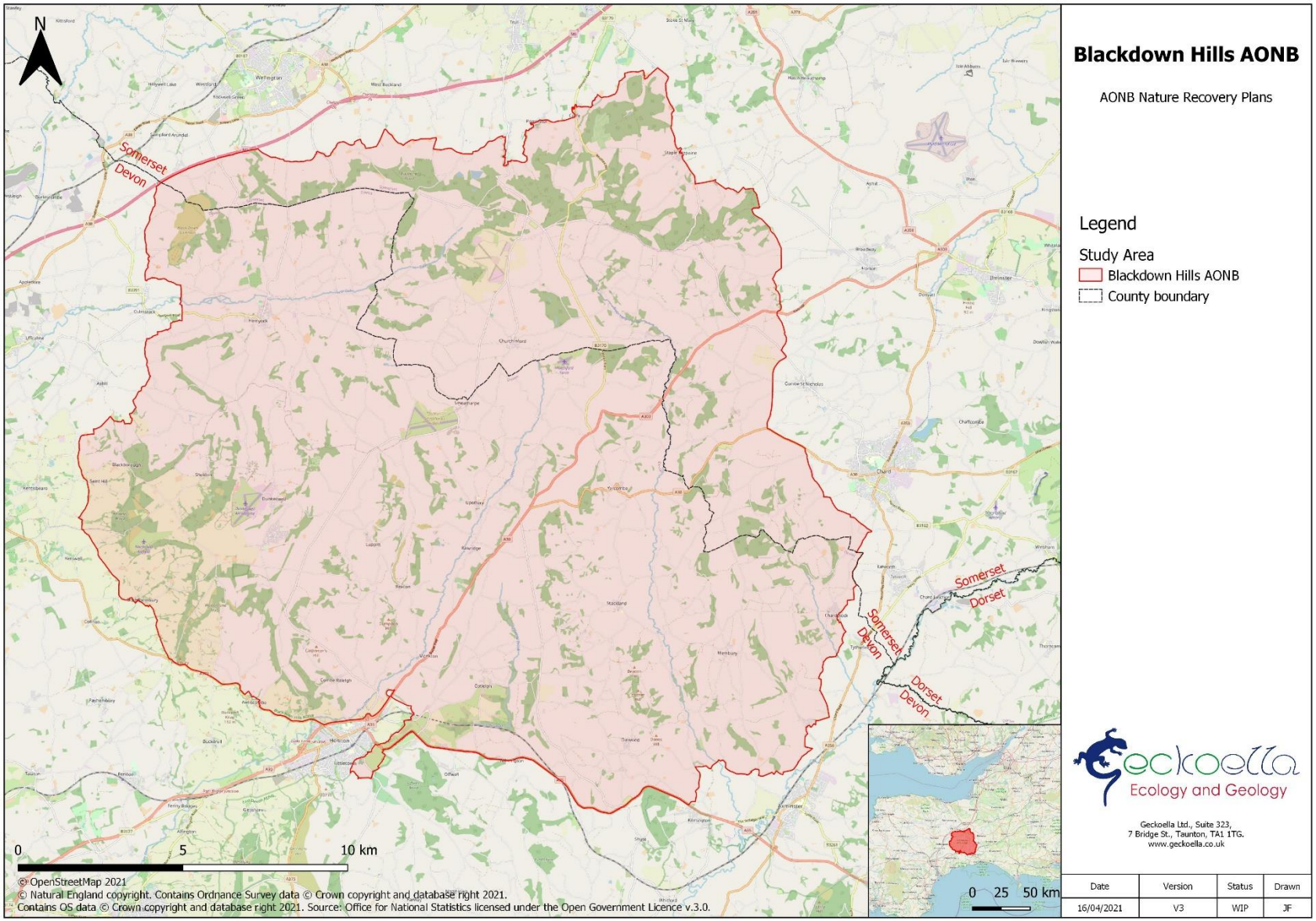
and buildings) and human capital (knowledge and skills) (Dasgupta, 2021).
NCA - National Character Areas. A natural subdivision of England based on landscape characteristics, biodiversity, geodiversity and economics. Each of 159 profiles, produced and revised on a rolling programme by Natural England, includes a description of the natural and cultural features that shape landscapes, how the landscape has changed over time, current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services.
NHLC - National Historic Landscape Characterisation. Data set which presents the historic landscape character of England at a national level in a 250m scale grid. The data is extracted from a dataset of merged sub-regional Historic Landscape Character assessments.
NNR - National Nature Reserve. Designated under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 to protect the UKs habitats, species and geology of particular importance in the terrestrial environment.
Non-statutory site – A defined area of terrestrial or marine environment, designated to protect and enhance important wildlife conservation areas, in addition to geological and geomorphological features of local interest. Non-statutory sites do not receive legal protection through legislation. [See also statutory protected site].
NPPF - National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied (NPPF, 2019).
Physical Modification – In the context of river management. Modification or alteration to a surface water body that has caused significant hydromorphological changes and in turn, significantly changed the water body's character.
Priority habitat – Habitat of principal nature conservation importance as listed under Section 41 of the Natural Environment and Rural Communities Act (2006).
Priority species – Species of principal nature conservation importance as listed under Section 41 of the Natural Environment and Rural Communities Act (2006).
Protected species – Species protected by law. Key legislation for England includes the Wildlife and Countryside Act 1981 (as amended), the Conservation Natural Habitats and Species Regulations 2017, the Protection of Badgers Act 1992 and the Wild Mammals (Protection) Act 1996.
Public goods – Goods or services that are neither rivalrous (access to a public good by any one group of people has no effect on the quantity available to others) nor excludable (no one can be excluded from access to the good). (Dasgupta, 2021).
QGIS – Quantum Geographical Information System.
Ramsar site – A wetland recognised as of international importance under the Ramsar Convention for the conservation and wise use of wetlands and their resources (Ramsar, Iran, 1971).
RIGS – Regionally Important Geological Sites. Non-statutory sites selected at a local level to conserve important geological and geomorphological features of local to regional significance. These sites may also be termed as Local Geological Sites (LGS).
SAC - Special Area of Conservation are high-quality conservation sites that make a significant contribution to conserving the habitats and species listed under of European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive. Can be both terrestrial and marine.
Scheduled Monument – is an historic building or site that is included in the Schedule of Monuments as set out in the Ancient Monuments and Archaeological Areas Act 1979, and maintained by the Secretary of State for Digital, Culture, Media and Sport.
SERC – Somerset Environmental Records Centre. An organisation which collects, collates and manages information on wildlife and the natural environment within Somerset, and can supply to local users.
SFI Sustainable Farming Incentive (previously ELMS – Environmental Land Management Scheme). Farmers and other land managers may be paid for delivering public goods, including clean air, clean and plentiful water, thriving plants and wildlife, protection from environmental hazards, beauty, heritage, and engagement with the environment, and reduction of and adaptation to climate change. A new agri-environment scheme

managed by Defra and planned to be operational by 2024.
SNA – Strategic Nature Areas. An area of Devon's countryside containing higher than average concentrations of wildlife habitats. SNAs are designed to ensure populations of species, characteristic to the habitat, are maintained (DBRC 2019).
Social capital – Mutual trust and associated norms of reciprocity that enable people to engage with one another (Dasgupta, 2021).
SPA - Special Protected Area. Strictly protected site originally protected with Article 4 of the EC Birds Directive (now transposed into UK law) for the conservation of birds.
SSSI - Site of Special Scientific Interest. Site designated by Natural England under the Wildlife and Countryside Act (1981) due to special interest in its flora, fauna, geological and/or geomorphological features.
SSSI Units – A subdivision of Sites of Special Scientific Interest (SSSI), important for maintaining the condition and management of SSSI sites. Condition assessments result in the assignment of 'Favourable' to 'Destroyed', indication the condition of the site, and the features therein. [See also SSSI].
Statutory protected site – A defined area of terrestrial or marine environment, designated to protect and enhance important wildlife conservation areas, in addition to geological and geomorphological features of local interest. Statutory sites receive legal protection through legislation. [See also non-statutory protected site].
Sustainable development – Development that meets the needs of the present without compromising the ability of future generations to meet their own needs, *i.e.* by bequeathing to its successor at least as large a productive base as it had inherited from its predecessor (Dasgupta, 2021).
Well-being – A measure of the extent to which a person's informed desires are realised (Dasgupta, 2021).
WHS – World Heritage Site. An area which is deemed by UNESCO to have outstanding universal value in cultural and natural heritage. (UNESCO World Heritage Convention (1972)).

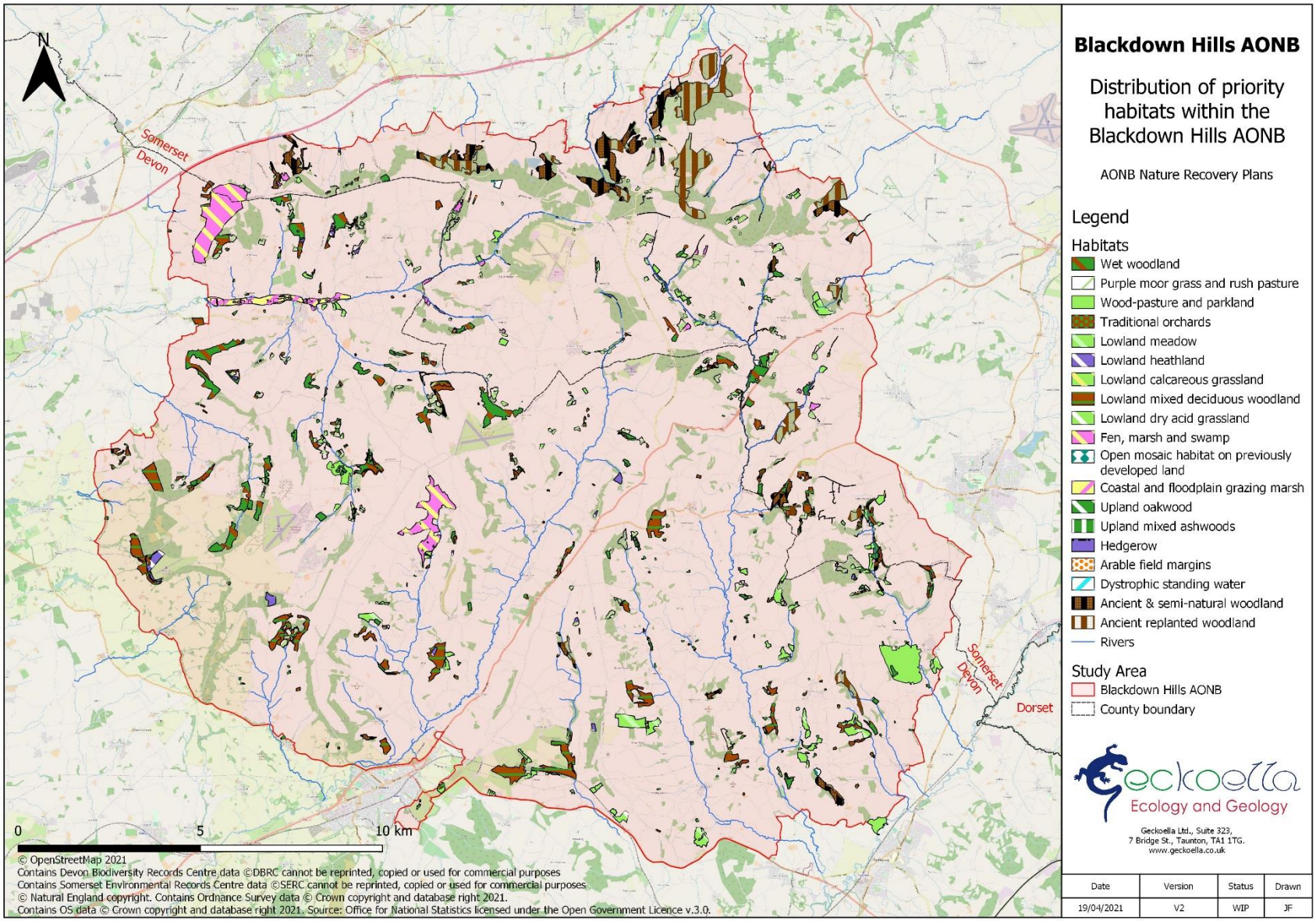
8. State of Nature Mapping and Appendices

Appendix 1: State of Nature Mapping

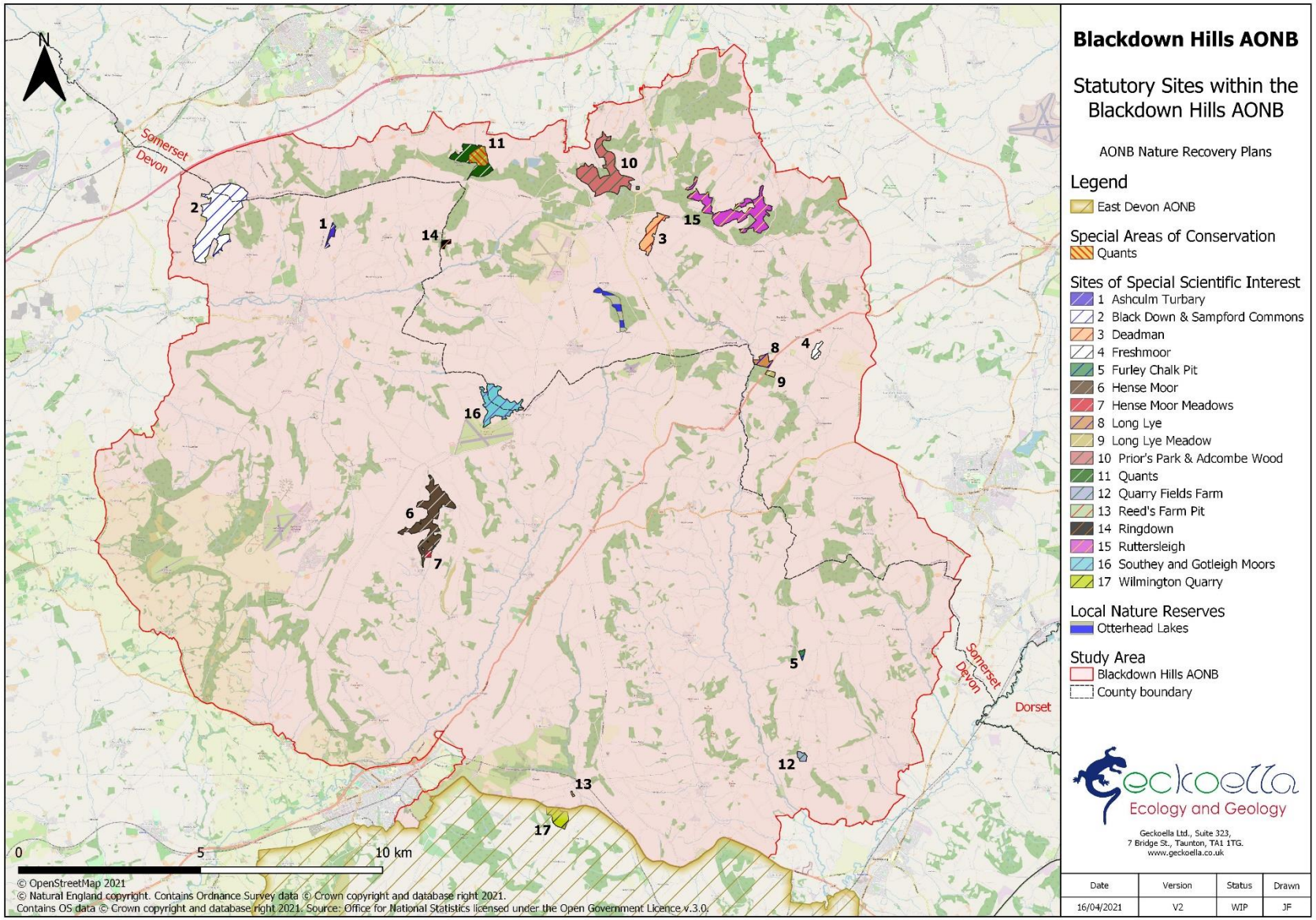
Map 1: Blackdown Hills AONB Study Area



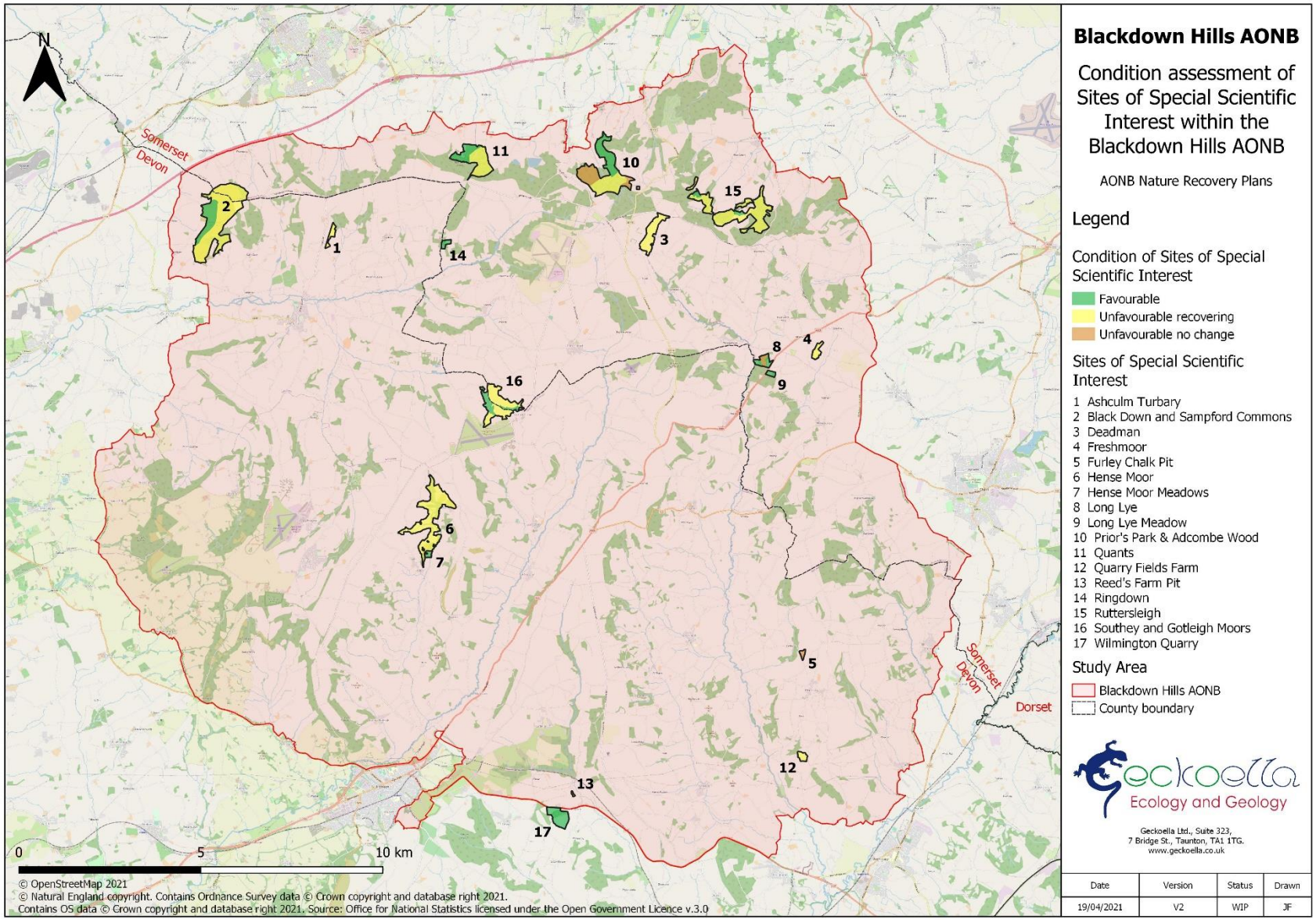
Map 2: Distribution of Priority Habitats within the Blackdown Hills AONB



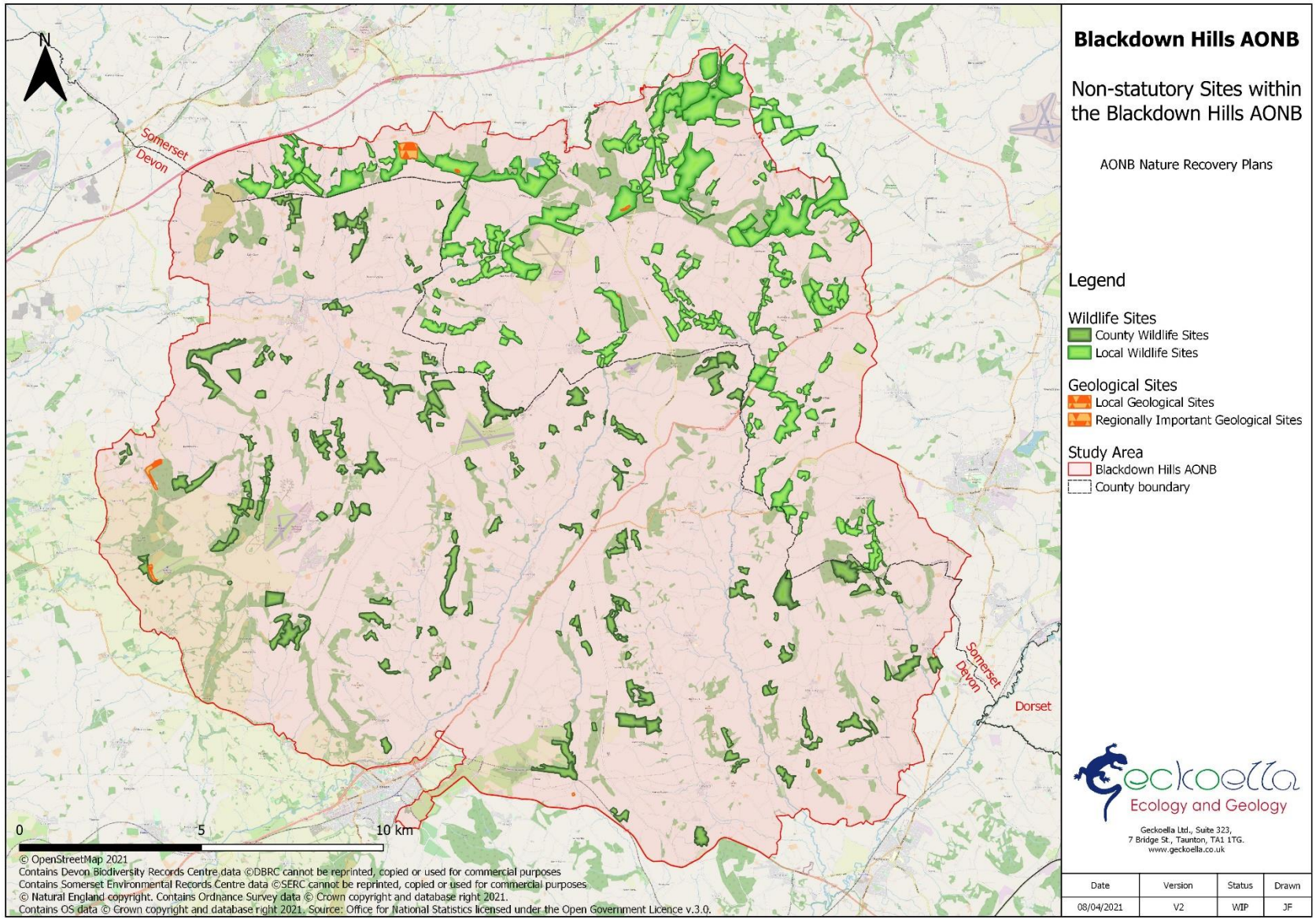
Map 3: Statutory Sites within the Blackdown Hills AONB



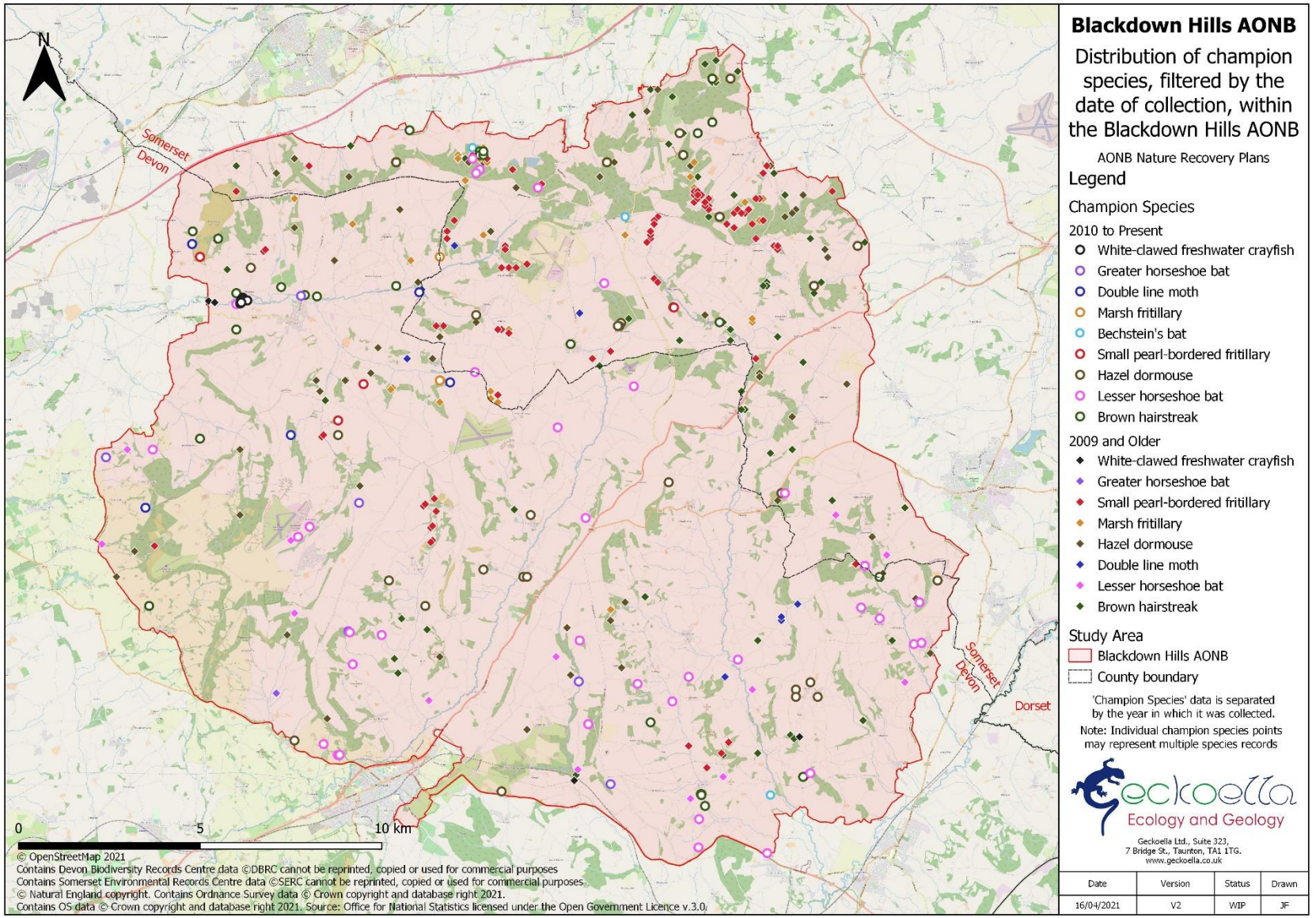
Map 4: Condition Assessment of Sites of Special Scientific Interest within the Blackdown Hills AONB



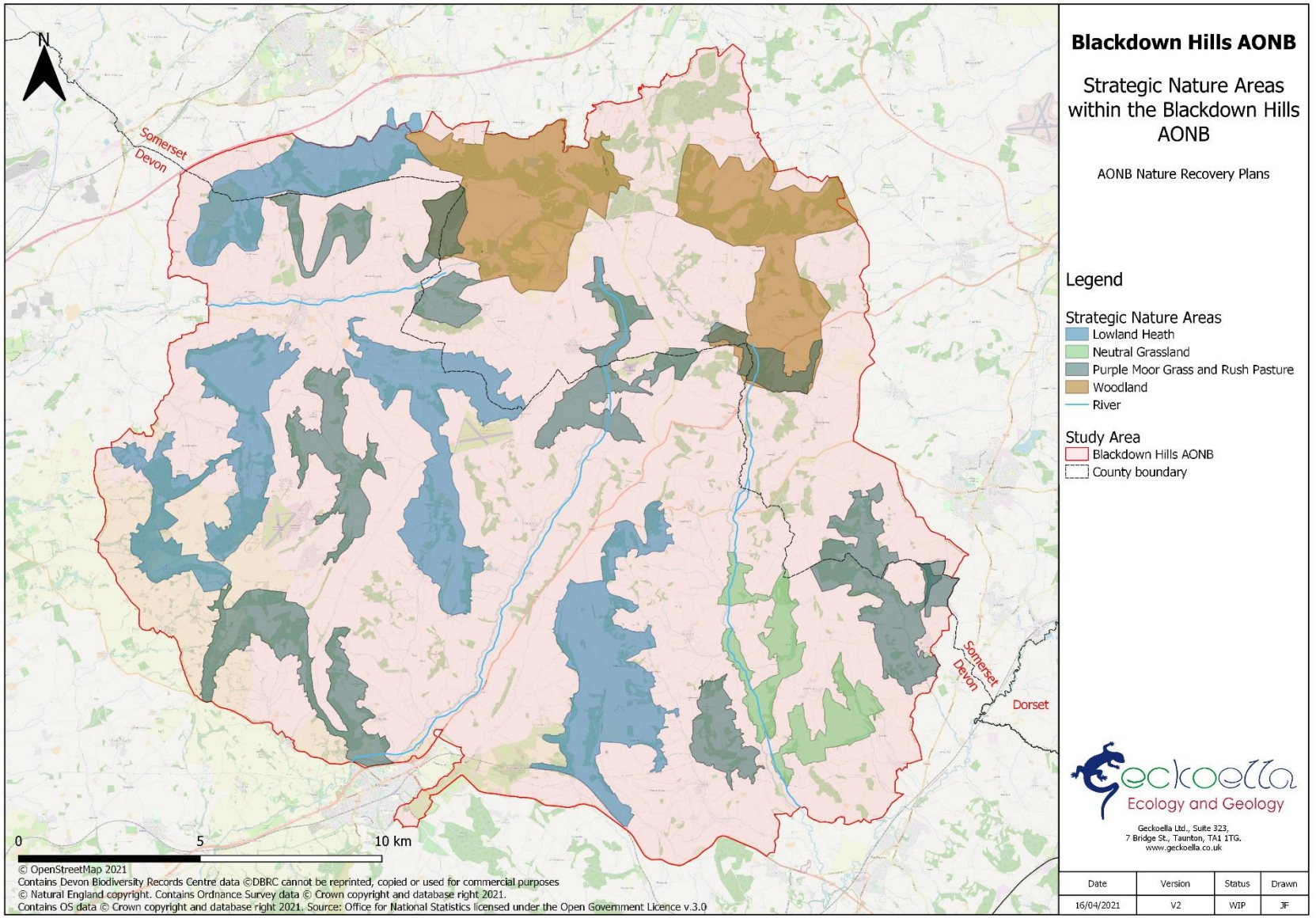
Map 5: Non-statutory Sites within the Blackdown Hills AONB



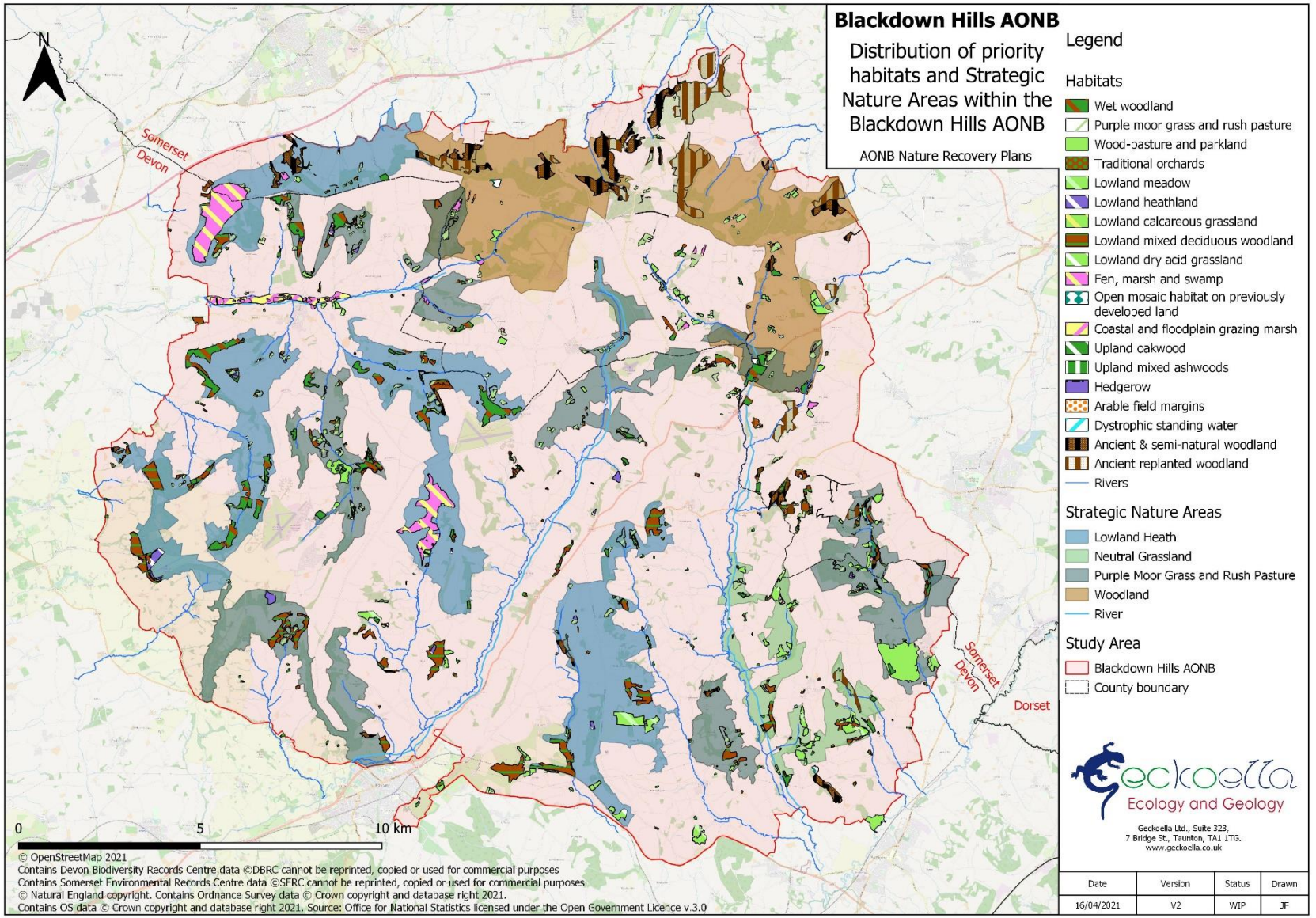
Map 6: Distribution of Champion Species, Filtered by the Date of Collection, within the Blackdown Hills AONB



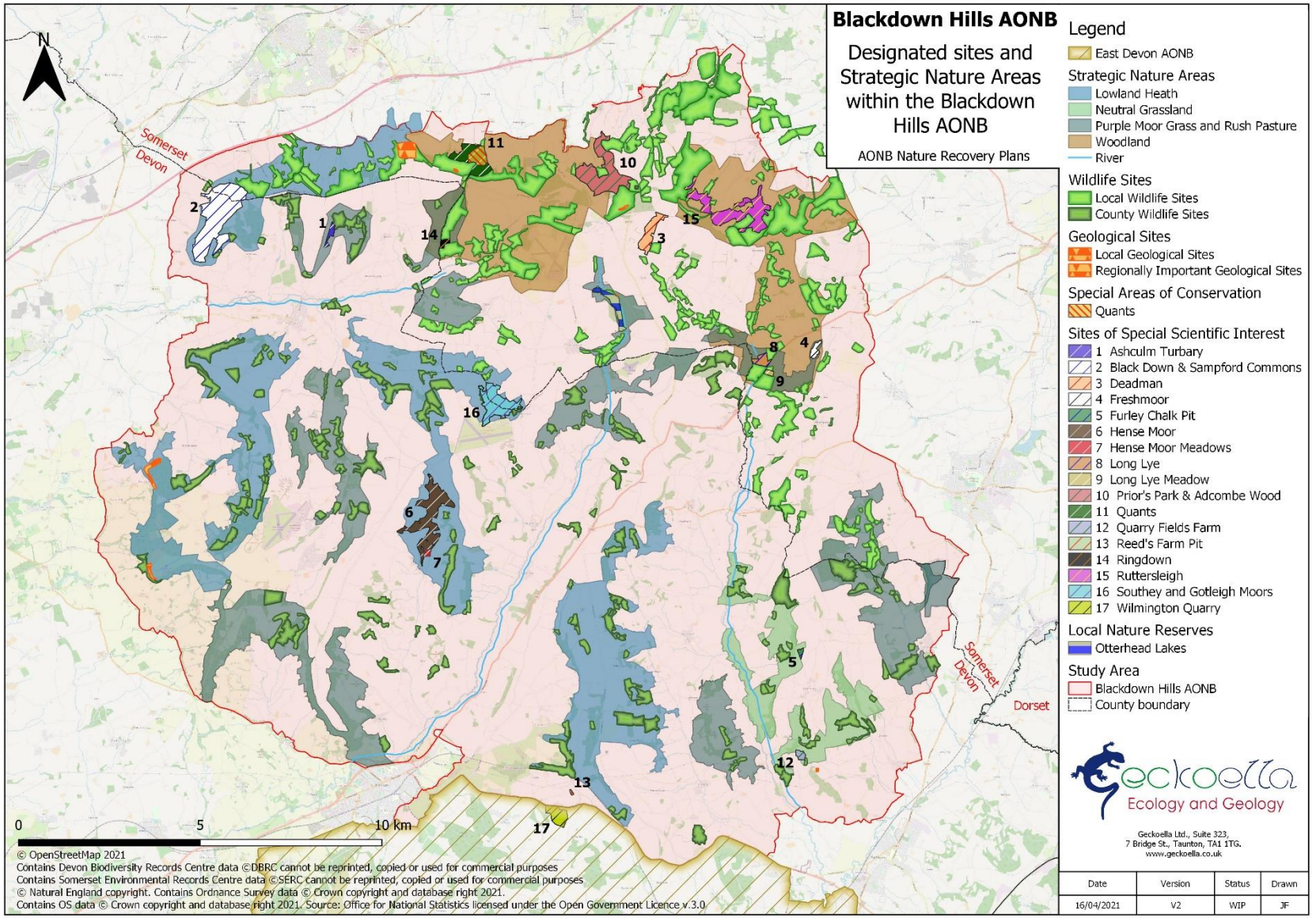
Map 7: Strategic Nature Areas within the Blackdown Hills AONB



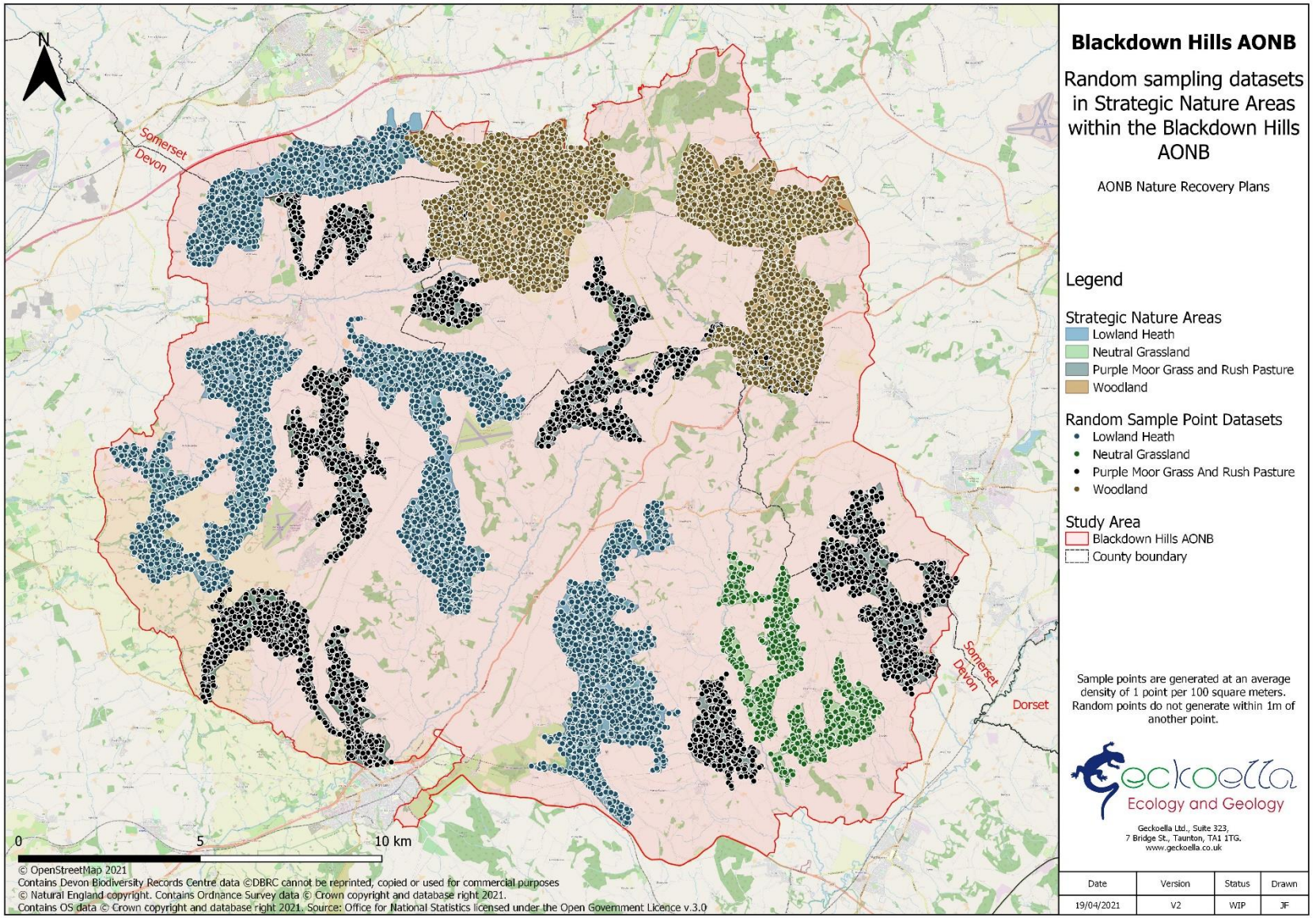
Map 8: Distribution of Priority Habitats and Strategic Nature Areas within the Blackdown Hills AONB



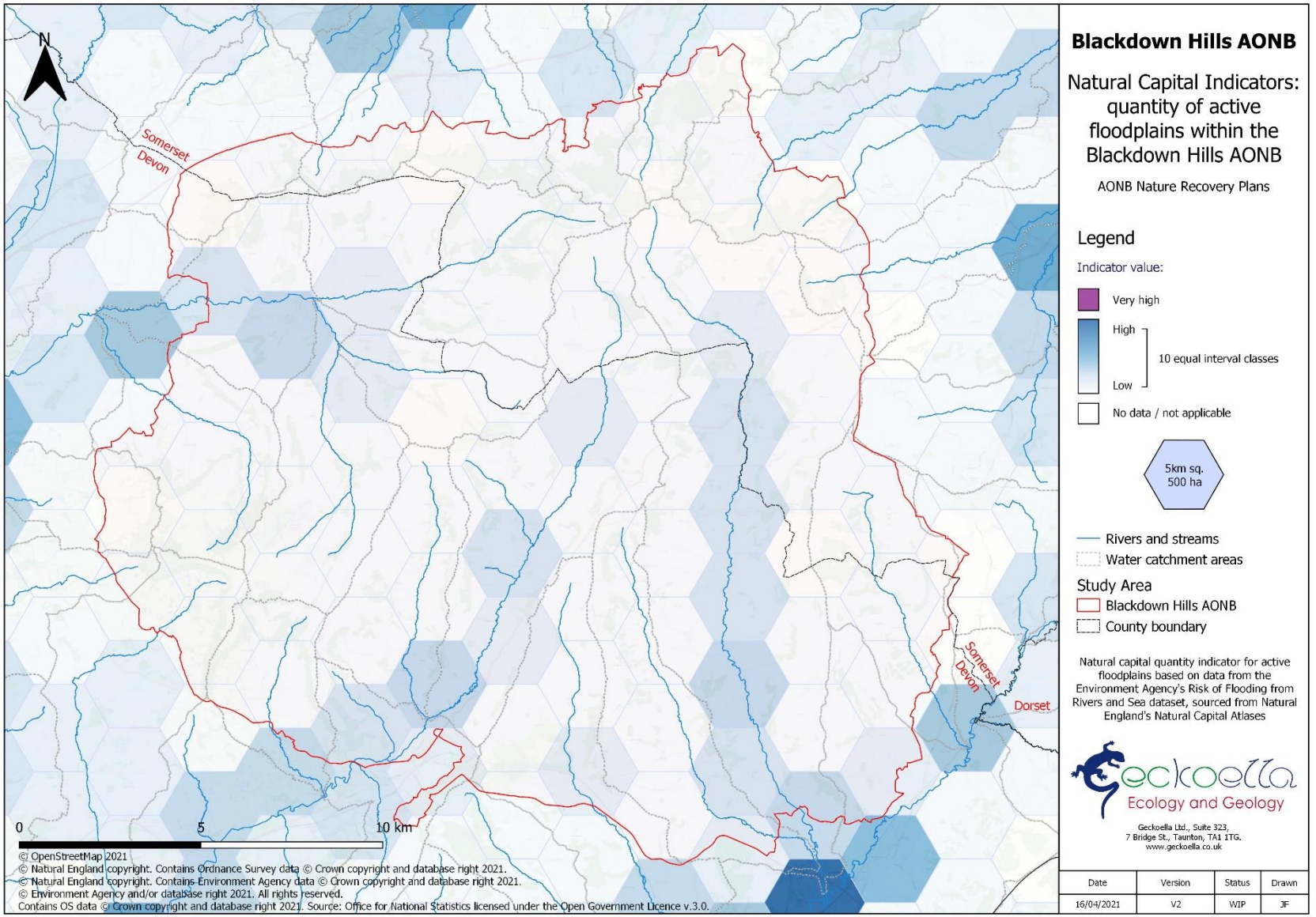
Map 9: Designated Sites and Strategic Nature Areas within the Blackdown Hills AONB



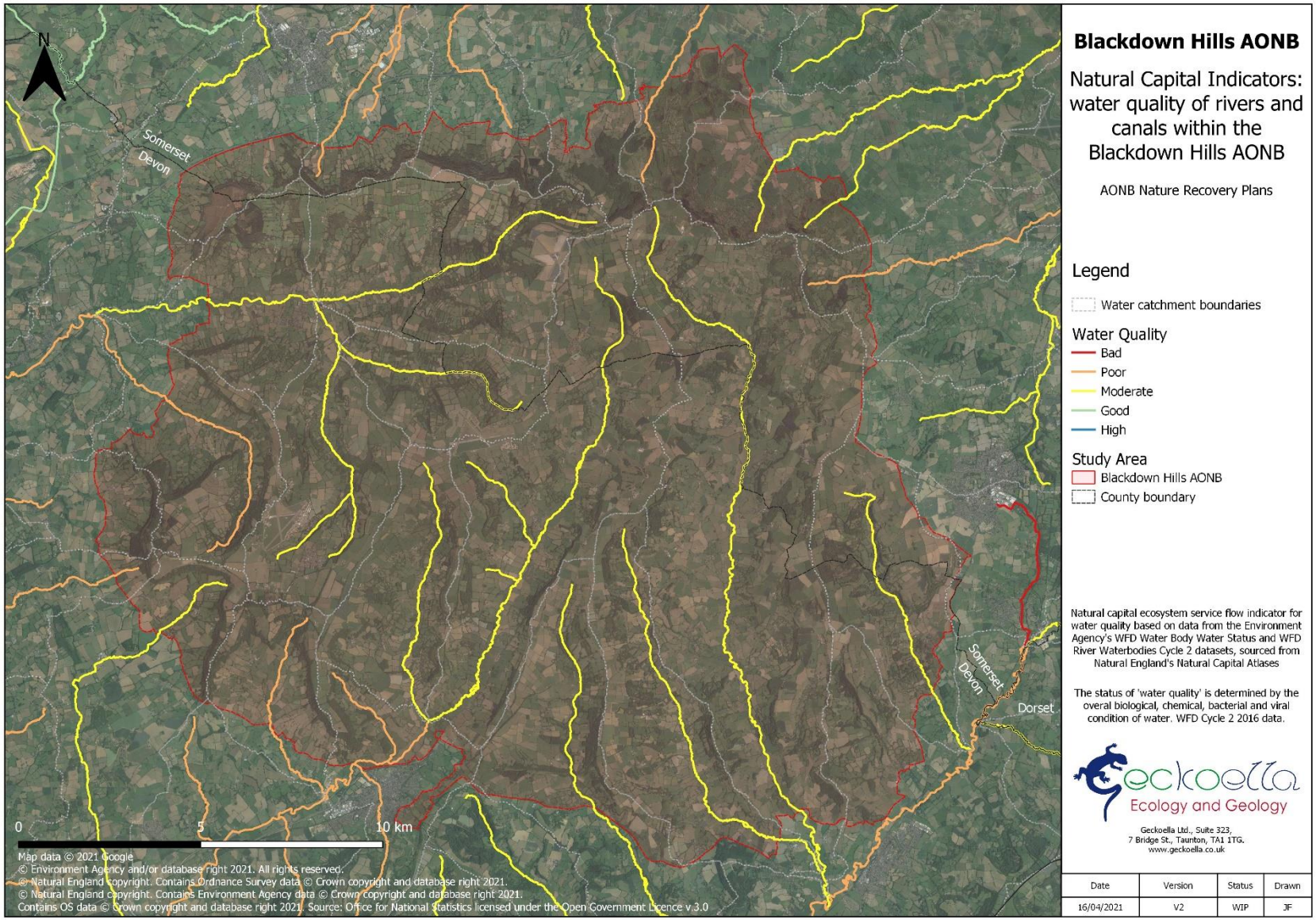
Map 10: Random Sampling Datasets in Strategic Nature Areas within the Blackdown Hills AONB



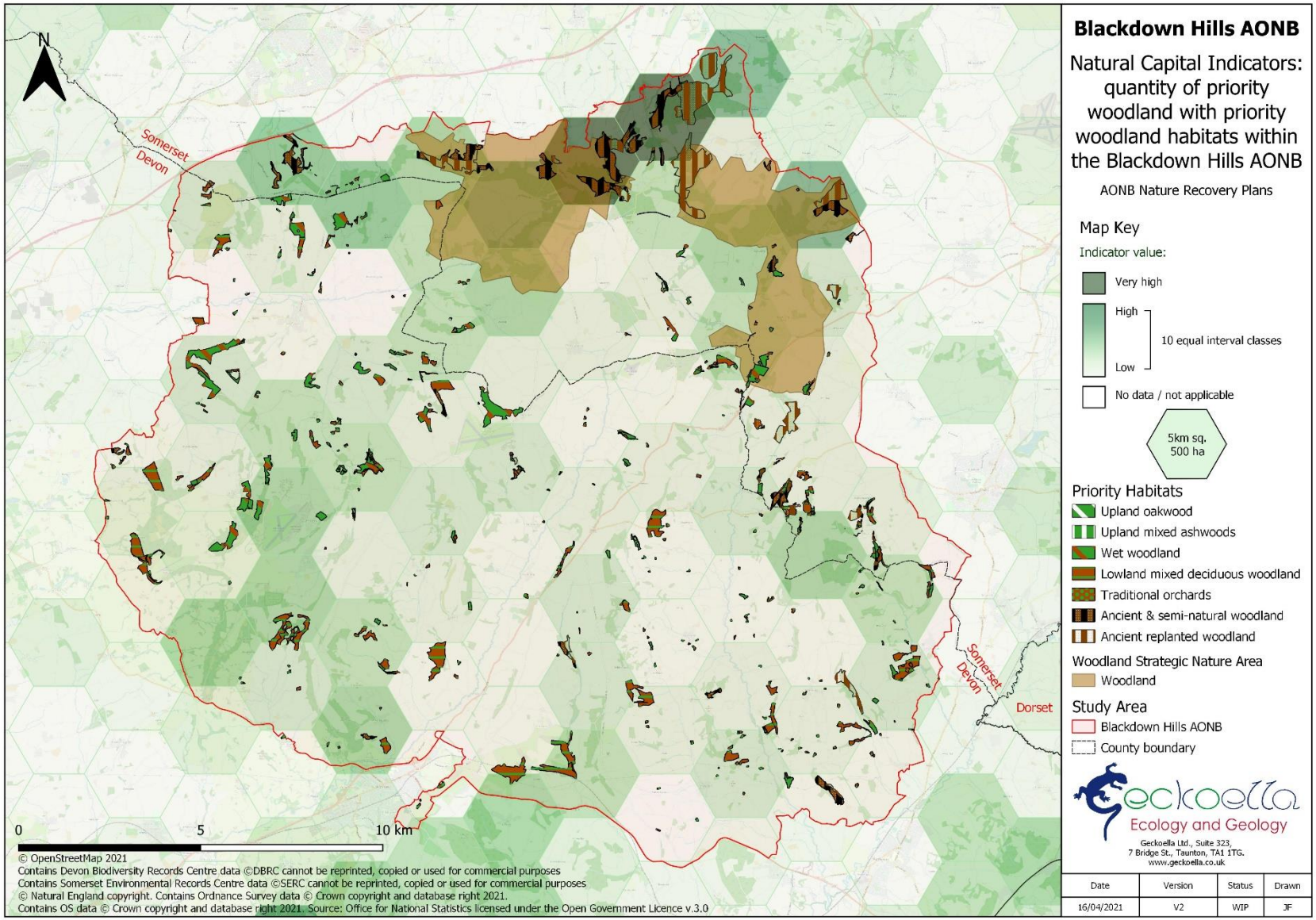
Map 11: Natural Capital Indicators: Quantity of Active Floodplains within the Blackdown Hills AONB



Map 12: Natural Capital Indicators: Water Quality of Rivers and Canals within the Blackdown Hills AONB

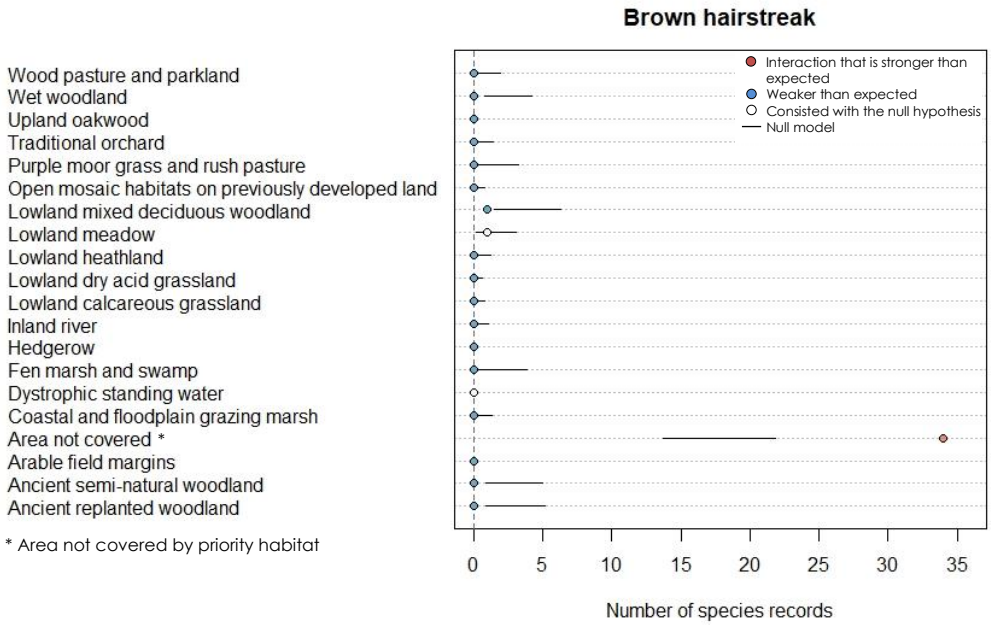


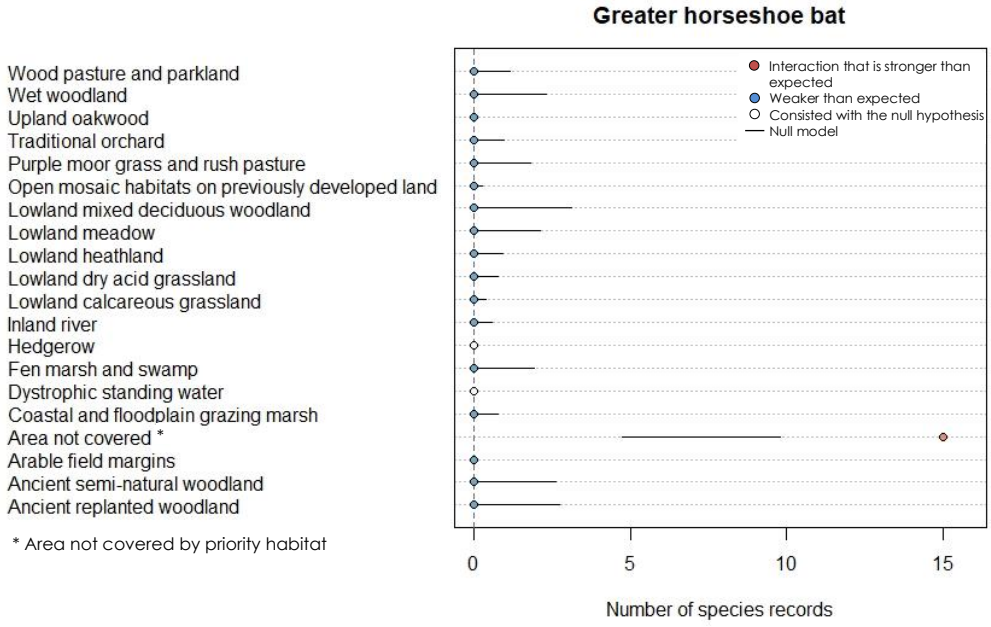
Map 13: Natural Capital Indicators: Quantity of Priority Woodland with Priority Woodland Habitats within the Blackdown Hills AONB

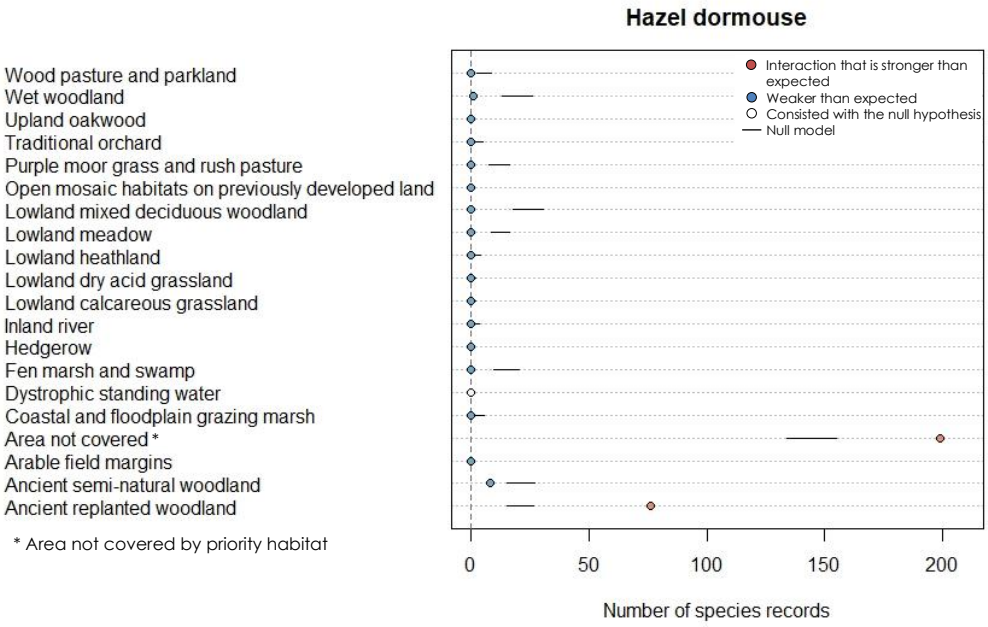


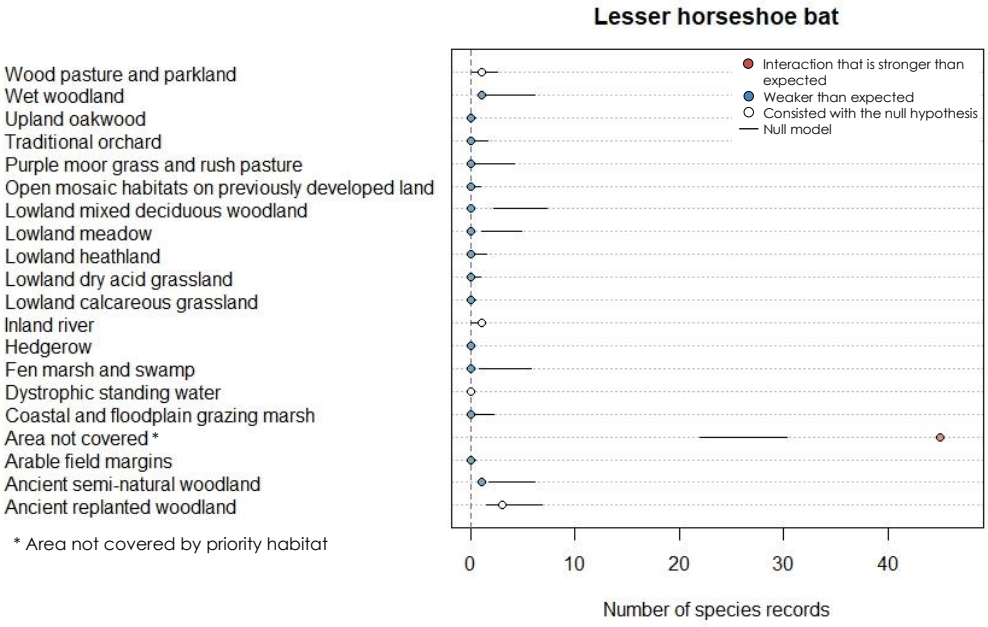
Appendix 2: EconullnetR Models

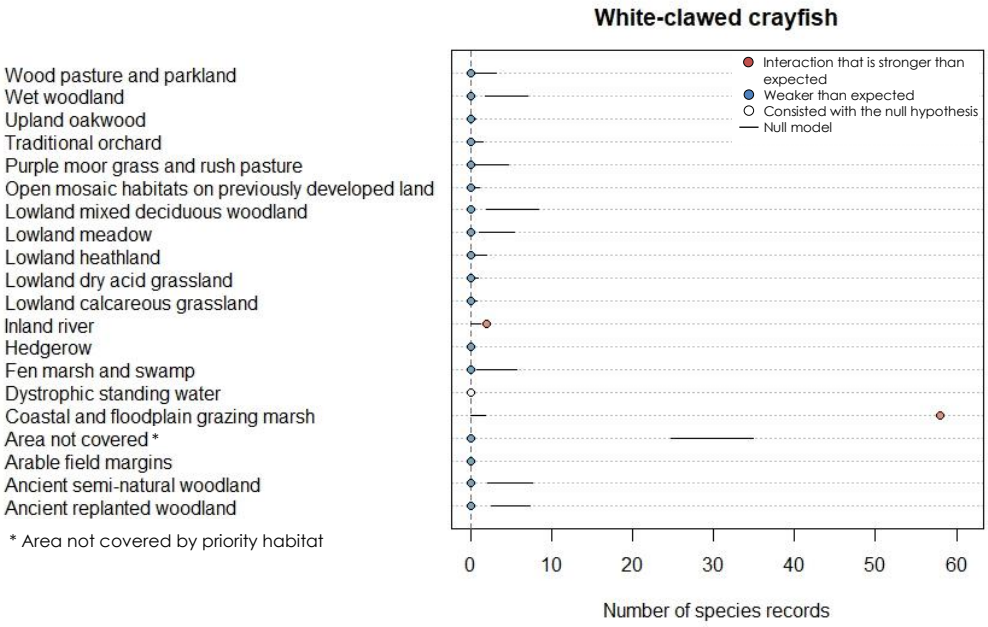
Appendix 2.1: Relationship Between Champion Species and Priority Habitats



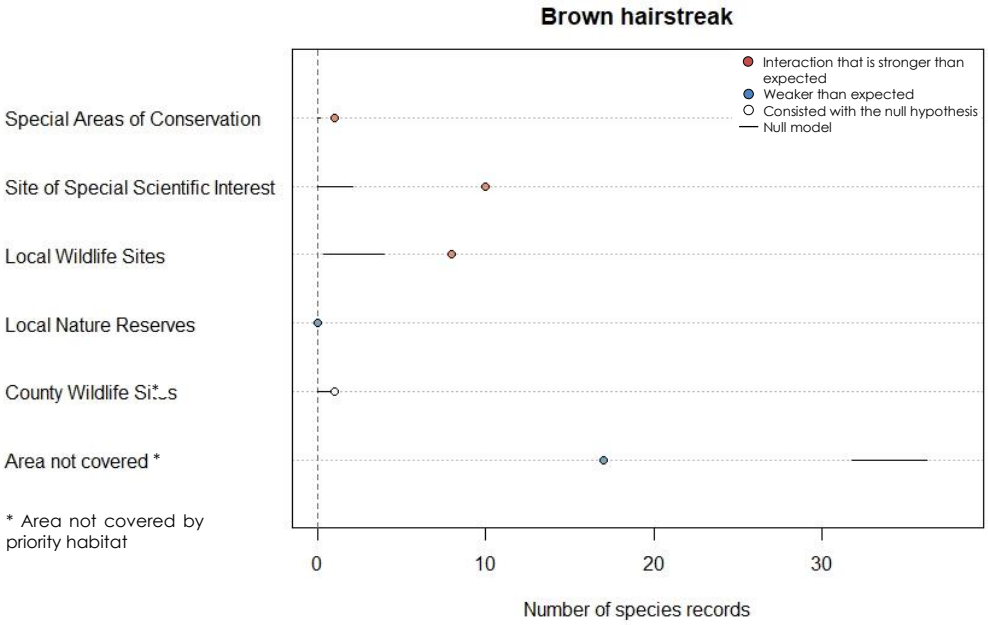


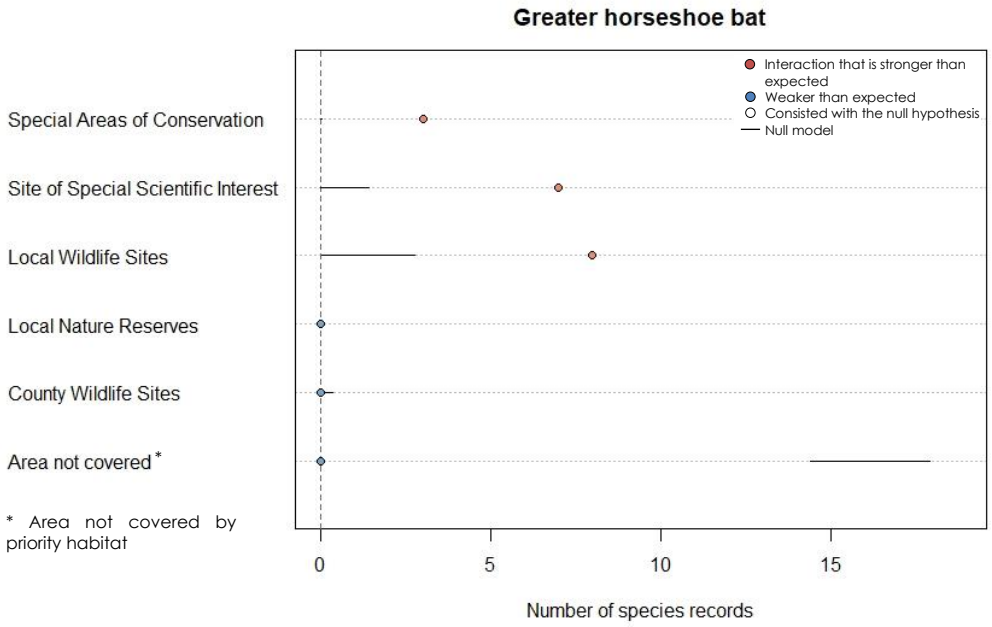

Hazel dormouse
Wood pasture and parkland
Wet woodland
Upland oakwood
Traditional orchard
Purple moor grass and rush pasture
Open mosaic habitats on previously developed land
Lowland mixed deciduous woodland
Lowland meadow
Lowland heathland
Lowland dry acid grassland
Lowland calcareous grassland
Inland river
Hedgerow
Fen marsh and swamp
Dystrophic standing water
Coastal and floodplain grazing marsh
Area not covered *
Arable field margins
Ancient semi-natural woodland
Ancient replanted woodland
* Area not covered by priority habitat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
0
50
100
150
200
Number of species records

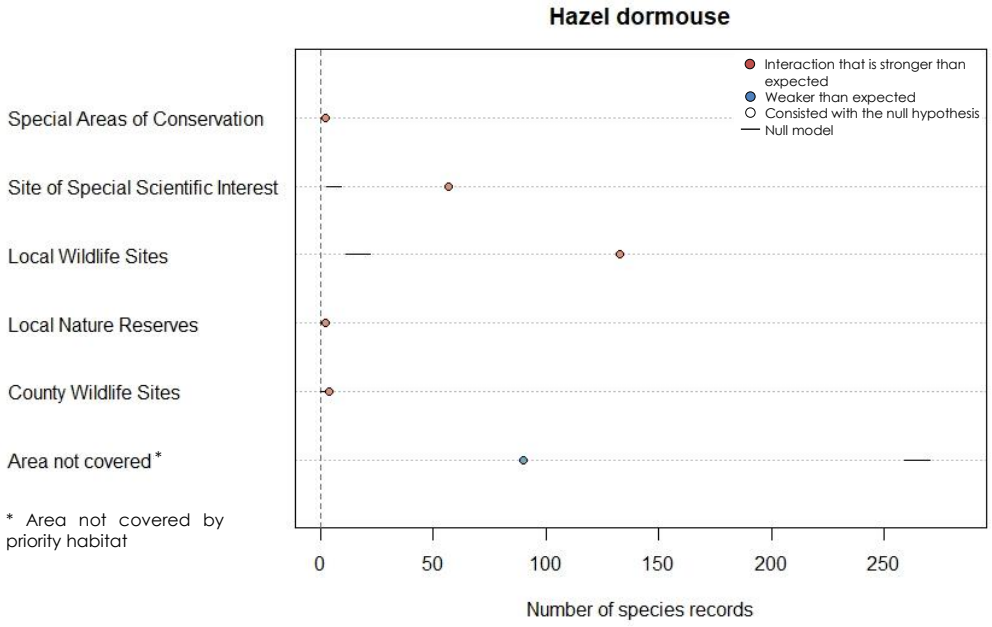

Lesser horseshoe bat
Wood pasture and parkland
Wet woodland
Upland oakwood
Traditional orchard
Purple moor grass and rush pasture
Open mosaic habitats on previously developed land
Lowland mixed deciduous woodland
Lowland meadow
Lowland heathland
Lowland dry acid grassland
Lowland calcareous grassland
Inland river
Hedgerow
Fen marsh and swamp
Dystrophic standing water
Coastal and floodplain grazing marsh
Area not covered *
Arable field margins
Ancient semi-natural woodland
Ancient replanted woodland
* Area not covered by priority habitat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
0
10
20
30
40
Number of species records

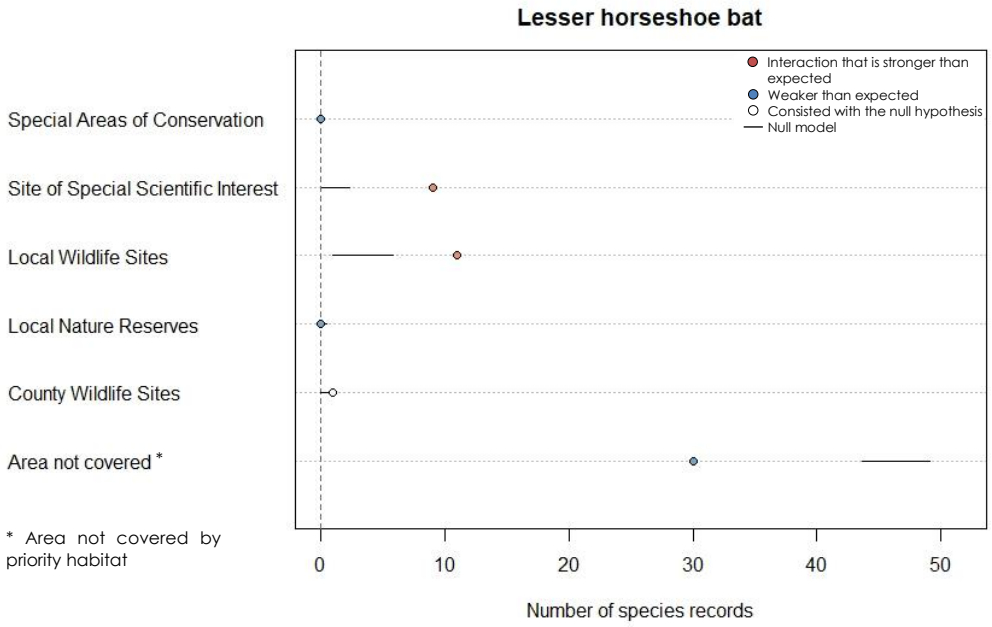


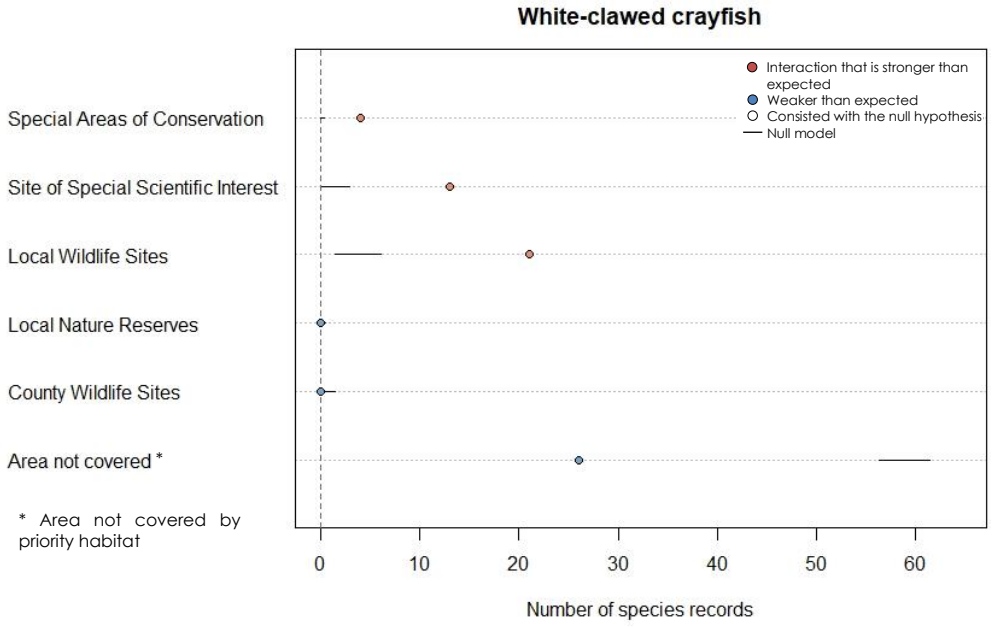
Appendix 2.2: Relationship Between Champion Species and Designated Sites



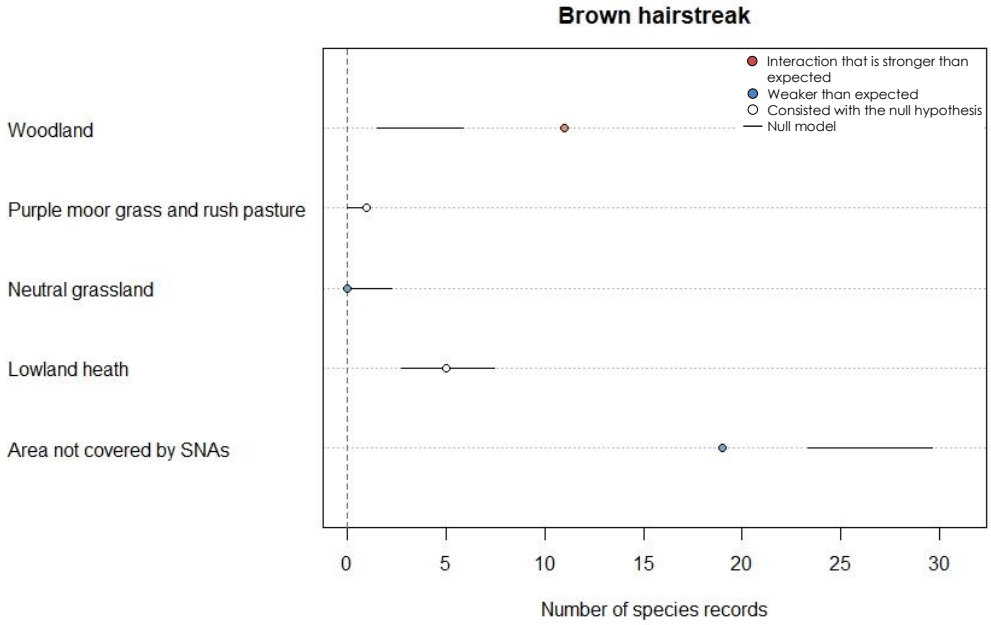

Greater horseshoe bat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Special Areas of Conservation
Site of Special Scientific Interest
Local Wildlife Sites
Local Nature Reserves
County Wildlife Sites
Area not covered *
* Area not covered by priority habitat
0
5
10
15
Number of species records

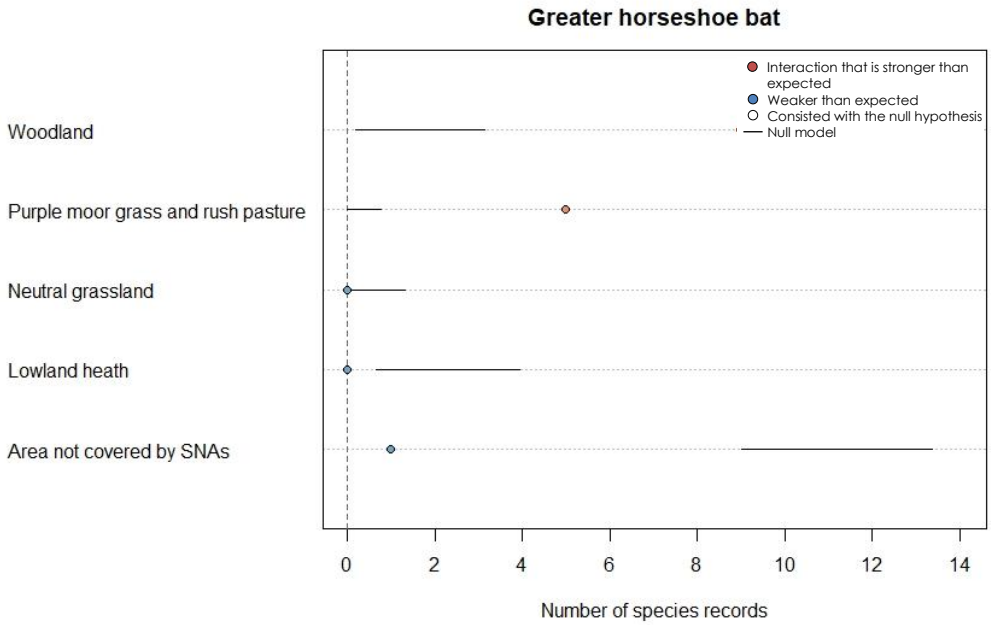

Hazel dormouse
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Special Areas of Conservation
Site of Special Scientific Interest
Local Wildlife Sites
Local Nature Reserves
County Wildlife Sites
Area not covered *
* Area not covered by priority habitat
0
50
100
150
200
250
Number of species records

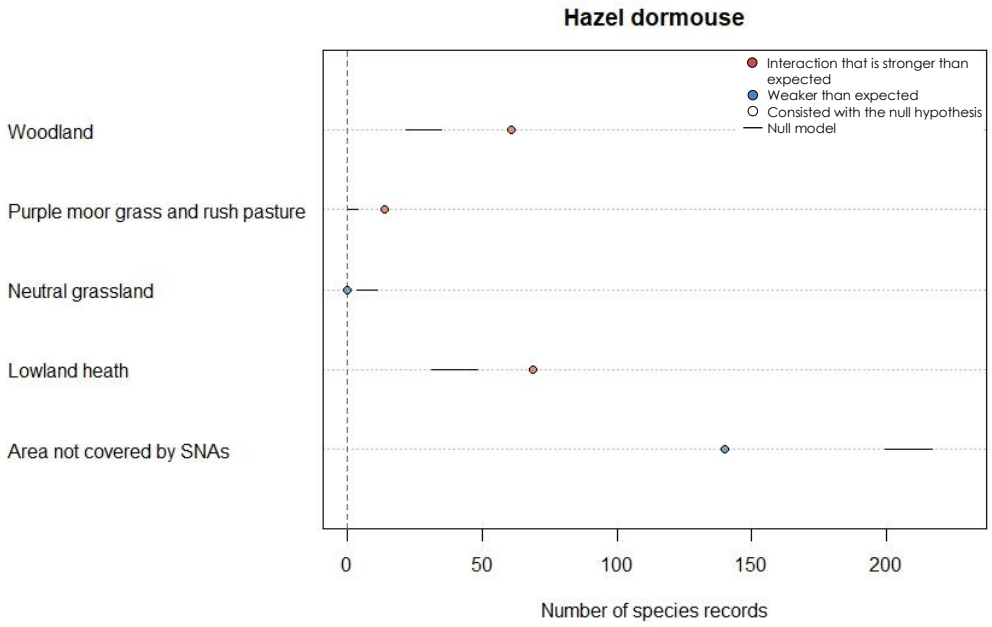

Lesser horseshoe bat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Special Areas of Conservation
Site of Special Scientific Interest
Local Wildlife Sites
Local Nature Reserves
County Wildlife Sites
Area not covered *
* Area not covered by priority habitat
0
10
20
30
40
50
Number of species records

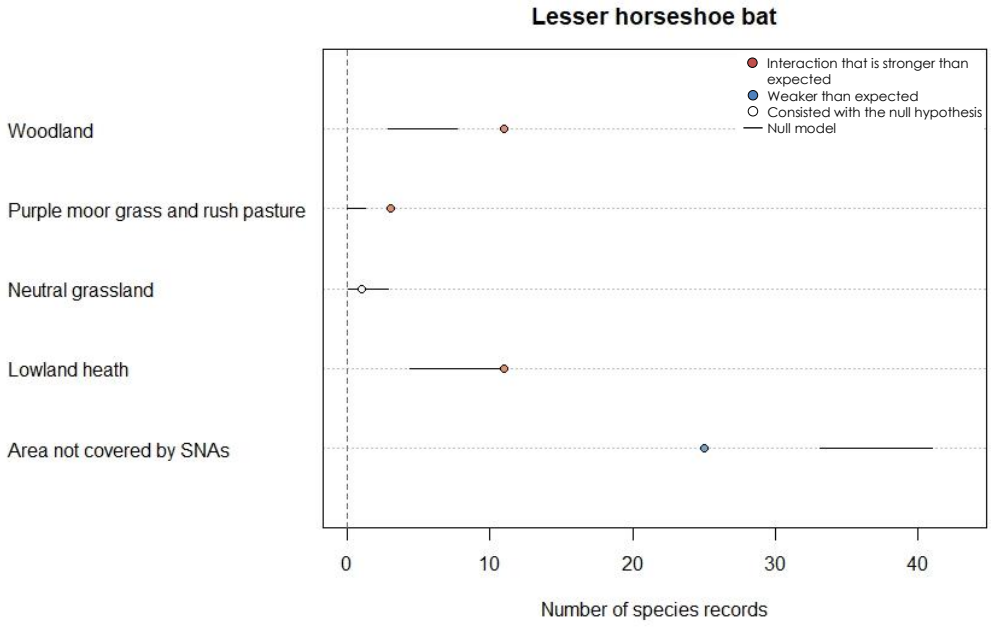

White-clawed crayfish
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Special Areas of Conservation
Site of Special Scientific Interest
Local Wildlife Sites
Local Nature Reserves
County Wildlife Sites
Area not covered *
* Area not covered by priority habitat
0
10
20
30
40
50
60
Number of species records

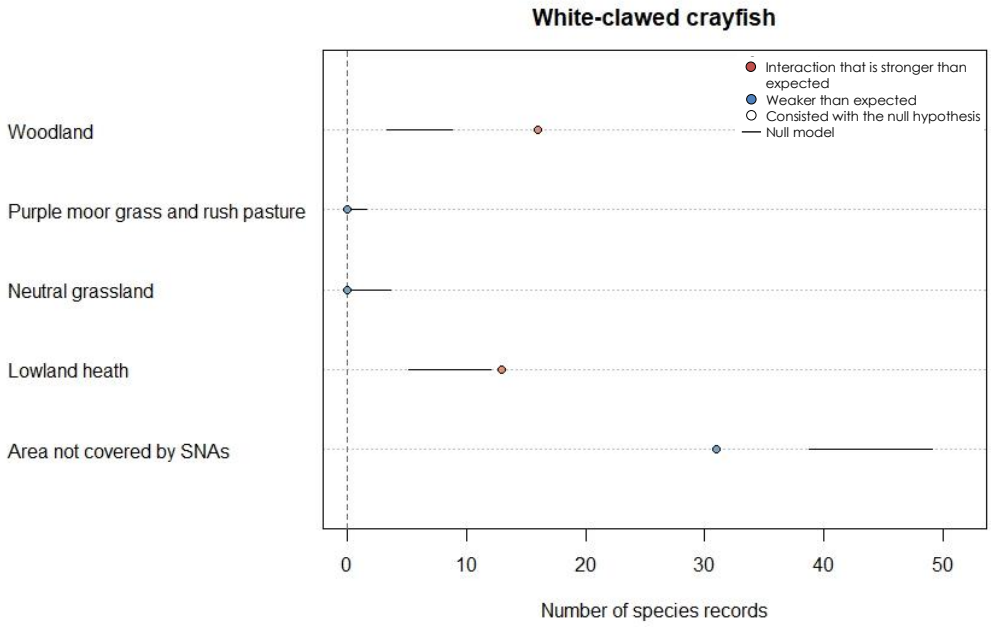
Appendix 2.3: Relationship Between Champion Species and SNAs



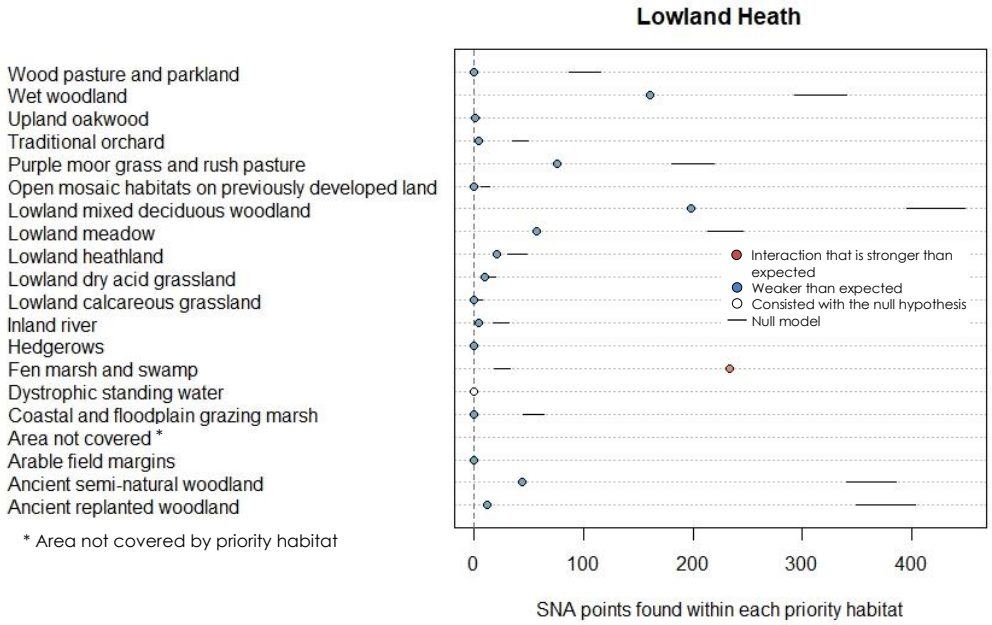


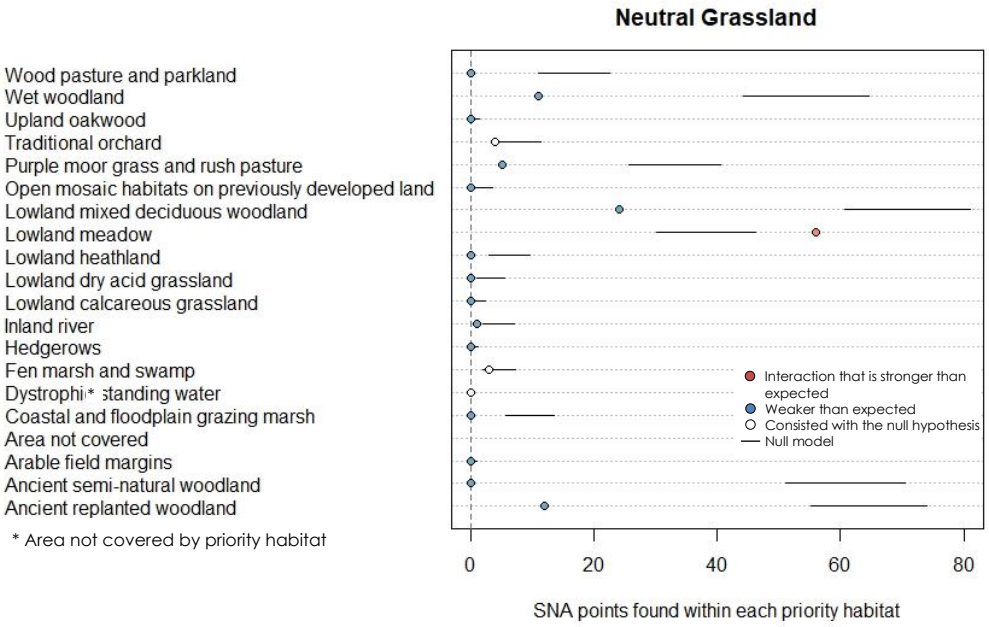

Hazel dormouse
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Woodland
Purple moor grass and rush pasture
Neutral grassland
Lowland heath
Area not covered by SNAs
0
50
100
150
200
Number of species records

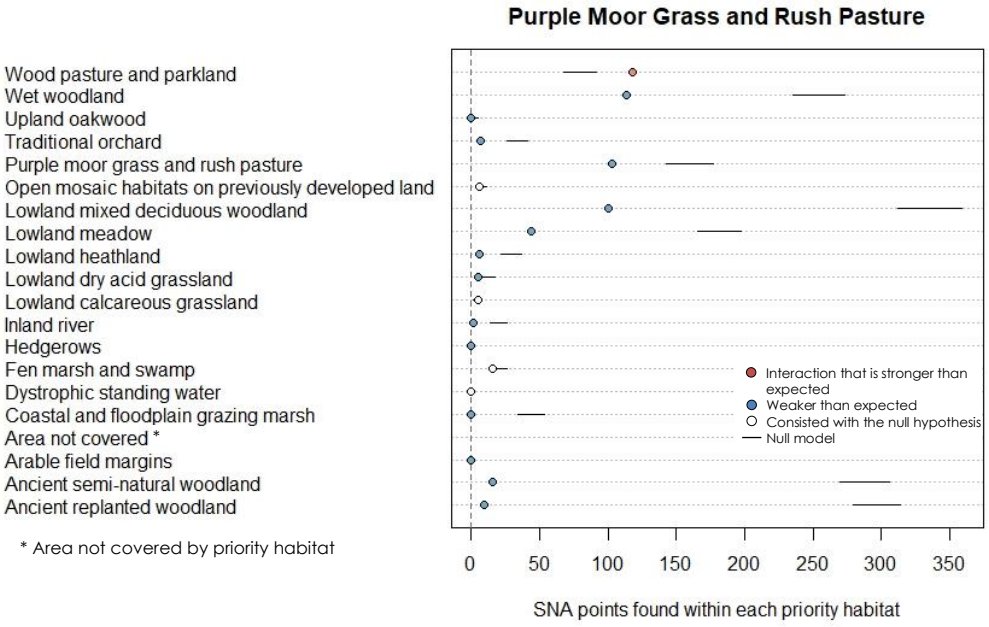

Lesser horseshoe bat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
Woodland
Purple moor grass and rush pasture
Neutral grassland
Lowland heath
Area not covered by SNAs
0
10
20
30
40
Number of species records

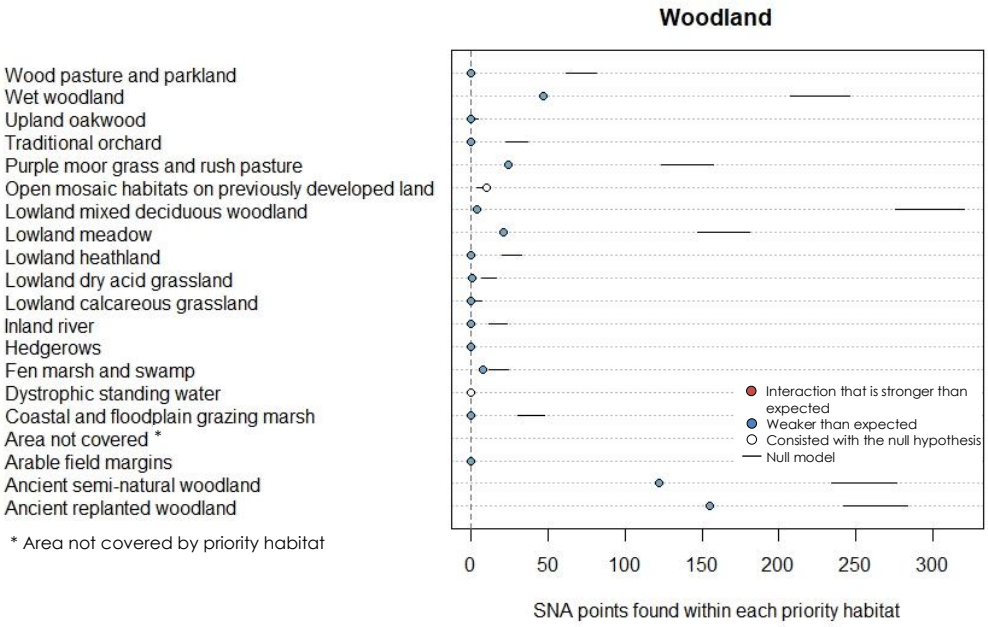


Appendix 2.4: Relationship Between SNAs and Priority Habitats




Neutral Grassland
Wood pasture and parkland
Wet woodland
Upland oakwood
Traditional orchard
Purple moor grass and rush pasture
Open mosaic habitats on previously developed land
Lowland mixed deciduous woodland
Lowland meadow
Lowland heathland
Lowland dry acid grassland
Lowland calcareous grassland
Inland river
Hedgerows
Fen marsh and swamp
Dystrophi* standing water
Coastal and floodplain grazing marsh
Area not covered
Arable field margins
Ancient semi-natural woodland
Ancient replanted woodland
* Area not covered by priority habitat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
0
20
40
60
80
SNA points found within each priority habitat


Purple Moor Grass and Rush Pasture
Wood pasture and parkland
Wet woodland
Upland oakwood
Traditional orchard
Purple moor grass and rush pasture
Open mosaic habitats on previously developed land
Lowland mixed deciduous woodland
Lowland meadow
Lowland heathland
Lowland dry acid grassland
Lowland calcareous grassland
Inland river
Hedgerows
Fen marsh and swamp
Dystrophic standing water
Coastal and floodplain grazing marsh
Area not covered *
Arable field margins
Ancient semi-natural woodland
Ancient replanted woodland
* Area not covered by priority habitat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
0
50
100
150
200
250
300
350
SNA points found within each priority habitat


Woodland
Wood pasture and parkland
Wet woodland
Upland oakwood
Traditional orchard
Purple moor grass and rush pasture
Open mosaic habitats on previously developed land
Lowland mixed deciduous woodland
Lowland meadow
Lowland heathland
Lowland dry acid grassland
Lowland calcareous grassland
Inland river
Hedgerows
Fen marsh and swamp
Dystrophic standing water
Coastal and floodplain grazing marsh
Area not covered *
Arable field margins
Ancient semi-natural woodland
Ancient replanted woodland
* Area not covered by priority habitat
Interaction that is stronger than expected
Weaker than expected
Consisted with the null hypothesis
Null model
0
50
100
150
200
250
300
SNA points found within each priority habitat

Appendix 3: EconullnetR Tables

Appendix 3.1 – Relationship Between Brown Hairstreak and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	0	2.73E+00	8.32E-01	5.13631461	Weaker	-2.2897364
Ancient semi-natural woodland	0	2.76E+00	8.88E-01	4.97940892	Weaker -	-2.436336
Arable field margins	0	2.82E-03	2.01E-128	0.00648848	Weaker	-0.142803
Area not covered	34	1.82E+01	1.37E+01	21.815583	Stronger	7.5458435
Coastal and floodplain grazing marsh	0	4.36E-01	1.27E-03	1.29104636	Weaker	-1.0217074
Dystrophic standing water	0	1.21E-37	0.00E+00	0	ns	-0.1
Fen marsh and swamp	0	1.81E+00	3.39E-01	3.84345636	Weaker	-1.9329018
Hedgerow	0	9.56E-03	9.54E-218	0.03503327	Weaker	-0.121651
Inland river	0	1.73E-01	7.21E-10	1.00419487	Weaker	-0.5626582
Lowland calcareous grassland	0	6.49E-02	4.44E-50	0.76180542	Weaker	-0.3336369
Lowland dry acid grassland	0	7.85E-02	1.00E-12	0.60577644	Weaker	-0.4264086
Lowland heathland	0	2.97E-01	2.19E-06	1.18180249	Weaker	-0.6945493
Lowland meadow	1	1.52E+00	1.84E-01	3.01424241	ns	-0.6719444
Lowland mixed deciduous woodland	1	3.31E+00	1.48E+00	6.3318455	Weaker	-1.7719509
Open mosaic habitats on previously developed land	0	7.07E-02	1.95E-26	0.803908	Weaker	-0.3763584
Purple moor grass and rush pasture	0	1.27E+00	1.22E-01	3.22831149	Weaker	-1.5148893
Traditional orchard	0	3.46E-01	4.51E-05	1.39279385	Weaker	-0.8869591
Upland oakwood	0	2.47E-02	9.74E-97	0.23964231	Weaker	-0.222403
Wet woodland	0	2.22E+00	7.50E-01	4.22624653	Weaker	-2.4857122
Wood pasture and parkland	0	7.28E-01	1.17E-02	1.88048611	Weaker	-1.3658402

Appendix 3.2 – Relationship Between Greater Horseshoe Bat and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	0	1.13E+00	8.54E-02	2.73132524	Weaker	-1.4648792
Ancient semi-natural woodland	0	1.07E+00	1.17E-01	2.63220645	Weaker	-1.4960457
Arable field margins	0	3.82E-03	2.46E-285	0.01434794	Weaker	-0.1197616
Area not covered	15	7.63E+00	4.74E+00	9.78161557	Stronger	5.6545965
Coastal and floodplain grazing marsh	0	1.02E-01	1.14E-11	0.77681594	Weaker	-0.5046468
Dystrophic standing water	0	1.18E-169	0.00E+00	0	ns	NA
Fen marsh and swamp	0	6.90E-01	6.22E-03	1.93810542	Weaker	-1.3015025
Hedgerow	0	9.59E-03	0.00E+00	0.01083196	ns	-0.1097122
Inland river	0	6.70E-02	2.75E-18	0.59373136	Weaker	-0.3652774
Lowland calcareous grassland	0	2.37E-02	7.07E-89	0.40017787	Weaker	-0.2034523
Lowland dry acid grassland	0	7.88E-02	7.98E-27	0.75150593	Weaker	-0.3706704
Lowland heathland	0	8.89E-02	9.16E-14	0.90667303	Weaker	-0.4153389
Lowland meadow	0	7.28E-01	1.61E-03	2.11058969	Weaker	-1.2043654
Lowland mixed deciduous woodland	0	1.28E+00	1.24E-01	3.10314532	Weaker	-1.6929851
Open mosaic habitats on previously developed land	0	2.57E-02	5.97E-49	0.28036681	Weaker	-0.2376263
Purple moor grass and rush pasture	0	6.28E-01	2.73E-03	1.80908646	Weaker	-1.19113
Traditional orchard	0	1.59E-01	7.44E-14	0.96850681	Weaker	-0.5270452
Upland oakwood	0	1.54E-02	1.72E-197	0.086241	Weaker	-0.1676663
Wet woodland	0	9.09E-01	5.49E-02	2.30214024	Weaker	-1.3915079
Wood pasture and parkland	0	3.51E-01	1.39E-06	1.16134626	Weaker	-0.929736

Appendix 3.3 – Relationship Between Hazel Dormouse and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	76	2.10E+01	1.52E+01	2.64E+01	Stronger	19.3397374
Ancient semi-natural woodland	8	2.10E+01	1.51E+01	2.70E+01	Weaker	-4.2532149
Arable field margins	0	1.24E-01	9.01E-15	9.47E-01	Weaker	-0.494038
Area not covered	199	1.43E+02	1.34E+02	1.55E+02	Stronger	9.4646462
Coastal and floodplain grazing marsh	0	3.24E+00	1.03E+00	5.79E+00	Weaker	-2.6073321
Dystrophic standing water	0	3.96E-13	0.00E+00	7.79E-48	ns	-0.1036808
Fen marsh and swamp	0	1.46E+01	9.69E+00	2.05E+01	Weaker	-5.3483634
Hedgerow	0	3.90E-02	7.19E-34	4.77E-01	Weaker	-0.3522636
Inland river	0	1.43E+00	1.75E-01	3.55E+00	Weaker	-1.704129
Lowland calcareous grassland	0	3.25E-01	4.16E-06	1.78E+00	Weaker	-0.6452963
Lowland dry acid grassland	0	8.91E-01	7.30E-02	2.18E+00	Weaker	-1.4571056
Lowland heathland	0	2.14E+00	2.76E-01	4.31E+00	Weaker	-1.9723438
Lowland meadow	0	1.31E+01	8.80E+00	1.65E+01	Weaker	-6.0190723
Lowland mixed deciduous woodland	0	2.44E+01	1.79E+01	3.07E+01	Weaker	-6.5271211
Open mosaic habitats on previously developed land	0	5.85E-01	4.49E-03	1.77E+00	Weaker	-1.1223362
Purple moor grass and rush pasture	0	1.13E+01	7.63E+00	1.66E+01	Weaker	-4.8827876
Traditional orchard	0	2.38E+00	7.91E-01	4.89E+00	Weaker	-2.101098
Upland oakwood	0	1.43E-01	9.67E-09	1.03E+00	Weaker	-0.5120828
Wet woodland	1	1.86E+01	1.34E+01	2.58E+01	Weaker	-5.6912316
Wood pasture and parkland	0	5.81E+00	2.65E+00	8.73E+00	Weaker	-3.3391689

Appendix 3.4 – Relationship Between Lesser Horseshoe Bat and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	3	3.77E+00	1.47E+00	6.82E+00	ns	-0.5868054
Ancient semi-natural woodland	1	3.82E+00	1.79E+00	6.07E+00	Weaker	-2.2676815
Arable field margins	0	3.39E-02	4.81E-102	4.37E-01	Weaker	-0.2451693
Area not covered	45	2.59E+01	2.20E+01	3.03E+01	Stronger	8.20334948
Coastal and floodplain grazing marsh	0	6.14E-01	5.98E-03	2.18E+00	Weaker	-0.9818192
Dystrophic standing water	0	8.87E-85	0.00E+00	2.31E-130	ns	-0.1002757
Fen marsh and swamp	0	2.78E+00	8.06E-01	5.73E+00	Weaker	-2.3184243
Hedgerow	0	1.03E-02	3.17E-193	9.28E-03	Weaker	-0.1290529
Inland river	1	2.29E-01	5.76E-08	1.09E+00	ns	2.47477466
Lowland calcareous grassland	0	3.75E-02	1.33E-34	5.04E-01	Weaker	-0.2964393
Lowland dry acid grassland	0	1.58E-01	4.23E-09	9.05E-01	Weaker	-0.5633807
Lowland heathland	0	3.85E-01	2.71E-04	1.50E+00	Weaker	-0.8127563
Lowland meadow	0	2.43E+00	1.01E+00	4.83E+00	Weaker	-2.2251383
Lowland mixed deciduous woodland	0	4.73E+00	2.20E+00	7.33E+00	Weaker	-3.5485897
Open mosaic habitats on previously developed land	0	1.11E-01	4.03E-15	9.47E-01	Weaker	-0.4565584
Purple moor grass and rush pasture	0	1.97E+00	3.86E-01	4.12E+00	Weaker	-1.9279641
Traditional orchard	0	4.00E-01	8.92E-05	1.60E+00	Weaker	-0.8941323
Upland oakwood	0	3.65E-02	2.77E-52	4.18E-01	Weaker	-0.3079066
Wet woodland	1	3.50E+00	1.55E+00	6.13E+00	Weaker	-2.0118632
Wood pasture and parkland	1	1.06E+00	7.78E-02	2.51E+00	ns	-0.0987031

Appendix 3.5 – Relationship Between White-clawed Crayfish and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	0	4.53E+00	2.48E+00	7.26775031	Weaker	-3.4652484
Ancient semi-natural woodland	0	4.46E+00	2.12E+00	7.62529249	Weaker	-2.9760906
Arable field margins	0	1.80E-02	1.17E-85	0.19026398	Weaker	-0.1986796
Area not covered	0	2.97E+01	2.47E+01	34.9337832	Weaker	-10.628307
Coastal and floodplain grazing marsh	58	6.62E-01	9.88E-03	1.84717108	Stronger	107.114128
Dystrophic standing water	0	6.08E-141	0.00E+00	0	ns	-0.1
Fen marsh and swamp	0	3.14E+00	7.72E-01	5.602362	Weaker	-2.6794705
Hedgerow	0	5.85E-03	1.38E-172	0.08601921	Weaker	-0.2038064
Inland river	2	3.17E-01	1.95E-05	1.21772986	Stronger	4.167464
Lowland calcareous grassland	0	6.56E-02	1.33E-26	0.79529997	Weaker	-0.3022371
Lowland dry acid grassland	0	1.87E-01	1.97E-06	0.93513703	Weaker	-0.6815193
Lowland heathland	0	5.05E-01	2.08E-03	1.91122062	Weaker	-0.968607
Lowland meadow	0	2.85E+00	1.10E+00	5.33625889	Weaker	-2.5649035
Lowland mixed deciduous woodland	0	5.05E+00	1.95E+00	8.39720919	Weaker	-3.0908844
Open mosaic habitats on previously developed land	0	1.45E-01	1.05E-13	0.98760392	Weaker	-0.4965875
Purple moor grass and rush pasture	0	2.55E+00	4.82E-01	4.58336906	Weaker	-2.4528847
Traditional orchard	0	4.75E-01	2.39E-03	1.47934609	Weaker	-1.0759751
Upland oakwood	0	5.33E-02	6.29E-35	0.59099886	Weaker	-0.2945453
Wet woodland	0	4.13E+00	1.84E+00	6.95576129	Weaker	-3.2115853
Wood pasture and parkland	0	1.19E+00	7.14E-02	3.16123183	Weaker	-1.4488756

Appendix 3.6 – Relationship Between Brown Hairstreak and Designated Sites

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered	17	34.1905242	3.18E+01	36.2727024	Weaker	-14.63563
Country Wildlife Sites	1	0.11964867	3.41E-14	1.128641	ns	3.1458697
Local Nature Reserves	0	0.01072892	1.75E-54	0.1636121	Weaker	-0.1926861
Local Wildlife Sites	8	2.03951417	3.95E-01	3.9207517	Stronger	5.7611269
Site of Special Scientific Interest	10	0.62937622	8.56E-03	2.1205162	Stronger	16.2084542
Special Areas of Conservation	1	0.01020786	3.58E-85	0.1389123	Stronger	19.9461299

Appendix 3.7 – Relationship Between Greater Horseshoe Bat and Designated Sites

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered	0	16.6441883	1.44E+01	17.9306056	Weaker	-18.027065
Country Wildlife Sites	0	0.04049606	8.64E-35	0.34369812	Weaker	-0.2525189
Local Nature Reserves	0	0.00886091	3.03E-109	0.05621828	Weaker	-0.1326827
Local Wildlife Sites	8	0.89479139	3.75E-02	2.77443694	Stronger	9.3979069
Site of Special Scientific Interest	7	0.38119833	2.67E-05	1.43232511	Stronger	12.218579
Special Areas of Conservation	3	0.03046501	1.59E-142	0.04863507	Stronger	14.1637497

Appendix 3.8 – Relationship Between Lesser Horseshoe Bat and Designated Sites

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered	30	46.8443366	4.36E+01	49.1270735	Weaker	-11.880152
Country Wildlife Sites	1	0.20226727	3.16E-07	1.0121865	ns	2.2157096
Local Nature Reserves	0	0.03871626	4.24E-47	0.4667527	Weaker	-0.3046802
Local Wildlife Sites	11	2.92959683	9.72E-01	5.8523688	Stronger	6.4619694
Site of Special Scientific Interest	9	0.95615432	7.86E-02	2.3550637	Stronger	12.0969405
Special Areas of Conservation	0	0.02892873	3.39E-66	0.3312991	Weaker	-0.2809146

Appendix 3.9 – Relationship Between Hazel Dormouse and Designated Sites

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered	90	265.13448	2.59E+02	270.53472	Weaker	-52.648068
Country Wildlife Sites	4	1.0005402	4.00E-02	3.0044611	Stronger	3.665978
Local Nature Reserves	2	0.1585963	1.13E-09	0.8708542	Stronger	7.004093
Local Wildlife Sites	133	15.9991838	1.12E+01	22.0086415	Stronger	41.814931
Site of Special Scientific Interest	57	5.5687527	2.64E+00	9.010013	Stronger	28.415142
Special Areas of Conservation	2	0.1384468	8.14E-08	0.92461	Stronger	7.610768

Appendix 3.10 – Relationship Between White-clawed Crayfish and Designated Sites

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered	26	58.9564729	5.63E+01	61.4790349	Weaker	-22.619812
Country Wildlife Sites	0	0.23623271	4.80E-09	1.4948287	Weaker	-0.6075509
Local Nature Reserves	0	0.06104213	7.98E-38	0.5473782	Weaker	-0.2936263
Local Wildlife Sites	21	3.5171549	1.49E+00	6.0516837	Stronger	13.9594149
Site of Special Scientific Interest	13	1.18983513	9.24E-02	2.9465869	Stronger	15.133888
Special Areas of Conservation	4	0.03926225	2.49E-45	0.4158788	Stronger	29.3512524

Appendix 3.11 – Relationship Between Brown Hairstreak and SNAs

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered by SNAs	19	26.4290364	2.33E+01	29.649452	Weaker	-4.1467581
Lowland Heath	5	4.8568525	2.75E+00	7.450081	ns	0.1111862
Neutral Grassland	0	0.8739405	8.62E-02	2.244465	Weaker	-1.4110985
Purple Moor Grass and Rush Pasture	1	0.2405292	6.45E-06	1.103593	ns	2.3836809
Woodland	11	3.5996414	1.52E+00	5.834314	Stronger	6.255726

Appendix 3.12 – Relationship Between Greater Horseshoe Bat and SNAs

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered by SNAs	1	11.1472591	9.02E+00	13.3781949	Weaker	-8.5542619
Lowland Heath	0	1.9464641	6.62E-01	3.9430886	Weaker	-2.4932714
Neutral Grassland	0	0.3030802	7.79E-05	1.3167434	Weaker	-0.8530077
Purple Moor Grass and Rush Pasture	5	0.1417442	3.48E-15	0.7721072	Stronger	20.7350967
Woodland	9	1.4614525	1.89E-01	3.141055	Stronger	8.8811527

Appendix 3.13 – Relationship Between Lesser Horseshoe Bat and SNAs

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered by SNAs	25	37.2637039	3.31E+01	41.011279	Weaker	-5.7669183
Lowland Heath	11	7.1602254	4.42E+00	10.818154	Stronger	2.2070554
Neutral Grassland	1	1.1900328	8.47E-02	2.873964	ns	-0.2486062
Purple Moor Grass and Rush Pasture	3	0.3811307	2.35E-04	1.283878	Stronger	6.5345281
Woodland	11	5.0049072	2.83E+00	7.659269	Stronger	4.6403715

Appendix 3.14 – Relationship Between Hazel Dormouse and SNAs

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered by SNAs	140	207.211927	199.6737328	217.028396	Weaker	-14.192778
Lowland Heath	69	40.015179	31.3676739	48.109407	Stronger	6.895638
Neutral Grassland	0	0.705598	3.3658542	11.235721	Weaker	-3.308269
Purple Moor Grass and Rush Pasture	14	2.157488	2.157488	0.5496834	Stronger	12.602984
Woodland	61	27.909808	21.8460072	34.920528	Stronger	9.523829

Appendix 3.15 – Relationship Between White-clawed Crayfish and SNAs

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Area not covered by SNAs	31	43.6989565	3.87E+01	49.143704	Weaker	-4.8602898
Lowland Heath	13	8.2780311	5.15E+00	12.035499	Stronger	2.6399041
Neutral Grassland	0	1.4300807	1.54E-01	3.667846	Weaker	-1.6145637
Purple Moor Grass and Rush Pasture	0	0.4634918	1.13E-04	1.59386	Weaker	-0.9090661
Woodland	16	6.1294399	3.38E+00	8.844679	Stronger	5.9031571

Appendix 3.16 – Relationship Between Purple Moor-grass and Rush Pasture SNA and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	10	2.97E+02	2.79E+02	3.14E+02	Weaker	-29.5865305
Ancient semi-natural woodland	16	2.87E+02	2.69E+02	3.05E+02	Weaker	-24.775228
Arable field margins	0	1.18E+00	9.97E-02	2.62E+00	Weaker	-1.5997903
Area not covered	3186	1.97E+03	1.92E+03	2.00E+03	Stronger	58.9385574
Coastal and floodplain grazing marsh	0	4.45E+01	3.47E+01	5.34E+01	Weaker	-9.2111069
Dystrophic standing water	0	5.92E-04	0.00E+00	2.20E-05	ns	-0.1005189
Fen marsh and swamp	16	1.96E+01	1.35E+01	2.64E+01	ns	-1.0424792
Hedges or line of trees	0	7.22E-01	8.66E-03	1.96E+00	Weaker	-1.2489968
Inland river	2	1.94E+01	1.41E+01	2.60E+01	Weaker	-5.450894
Lowland calcareous grassland	5	4.35E+00	1.80E+00	7.86E+00	ns	0.4323691
Lowland dry acid grassland	5	1.28E+01	7.17E+00	1.77E+01	Weaker	-2.906985
Lowland heathland	6	2.96E+01	2.24E+01	3.73E+01	Weaker	-5.7297885
Lowland meadow	44	1.81E+02	1.65E+02	1.98E+02	Weaker	-16.8366687
Lowland mixed deciduous woodland	100	3.37E+02	3.12E+02	3.59E+02	Weaker	-18.795488
Open mosaic habitats on previously developed land	6	7.74E+00	3.81E+00	1.17E+01	ns	-0.8132184
Purple moor grass and rush pasture	103	1.58E+02	1.42E+02	1.77E+02	Weaker	-6.0903021
Traditional orchard	7	3.41E+01	2.60E+01	4.12E+01	Weaker	-6.6220036
Upland oakwood	0	2.52E+00	6.38E-01	5.02E+00	Weaker	-2.1408298
Wet woodland	114	2.55E+02	2.35E+02	2.73E+02	Weaker	-13.1328939
Wood pasture and parkland	118	7.95E+01	6.76E+01	9.16E+01	Stronger	5.6891662

Appendix 3.17 – Relationship Between Lowland Heath SNA and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	12	3.74E+02	3.49E+02	4.03E+02	Weaker	-27.1046541
Ancient semi-natural woodland	44	3.63E+02	3.40E+02	3.86E+02	Weaker	-26.1601579
Arable field margins	0	1.38E+00	1.49E-01	3.21E+00	Weaker	-1.6212855
Area not covered	3881	2.47E+03	2.43E+03	2.52E+03	Stronger	61.368462
Coastal and floodplain grazing marsh	0	5.50E+01	4.52E+01	6.39E+01	Weaker	-10.9847898
Dystrophic standing water	0	1.53E-03	0.00E+00	2.84E-07	ns	-0.1029256
Fen marsh and swamp	233	2.55E+01	1.86E+01	3.31E+01	Stronger	51.6836572
Hedges or line of trees	0	7.46E-01	7.95E-03	1.78E+00	Weaker	-1.4423029
Inland river	4	2.47E+01	1.80E+01	3.16E+01	Weaker	-5.8884336
Lowland calcareous grassland	0	5.42E+00	2.21E+00	7.98E+00	Weaker	-3.5027962
Lowland dry acid grassland	10	1.62E+01	1.12E+01	1.99E+01	Weaker	-2.4726901
Lowland heathland	21	3.84E+01	3.13E+01	4.86E+01	Weaker	-3.7482658
Lowland meadow	57	2.29E+02	2.13E+02	2.46E+02	Weaker	-18.6991086
Lowland mixed deciduous woodland	198	4.25E+02	3.95E+02	4.49E+02	Weaker	-16.444262
Open mosaic habitats on previously developed land	0	1.00E+01	6.65E+00	1.44E+01	Weaker	-4.4806578
Purple moor grass and rush pasture	76	1.98E+02	1.81E+02	2.19E+02	Weaker	-12.5536085
Traditional orchard	4	4.19E+01	3.47E+01	4.97E+01	Weaker	-8.7523203
Upland oakwood	1	2.88E+00	1.21E+00	5.32E+00	Weaker	-1.5956281
Wet woodland	161	3.19E+02	2.93E+02	3.41E+02	Weaker	-12.6937759
Wood pasture and parkland	0	9.95E+01	8.68E+01	1.16E+02	Weaker	-13.0873288

Appendix 3.18 – Relationship Between Natural Grassland SNA and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	12	6.37E+01	5.53E+01	7.40E+01	Weaker	-10.7361753
Ancient semi-natural woodland	0	6.14E+01	5.12E+01	7.05E+01	Weaker	-13.5219786
Arable field margins	0	2.52E-01	8.33E-10	9.59E-01	Weaker	-0.6834039
Area not covered	673	4.15E+02	3.93E+02	4.36E+02	Stronger	24.8660358
Coastal and floodplain grazing marsh	0	9.13E+00	5.66E+00	1.34E+01	Weaker	-4.7296153
Dystrophic standing water	0	2.24E-03	0.00E+00	1.61E-14	ns	-0.1
Fen marsh and swamp	3	4.46E+00	2.00E+00	7.16E+00	ns	-0.9982987
Hedges or line of trees	0	2.09E-01	6.35E-11	1.14E+00	Weaker	-0.5720208
Inland river	1	4.17E+00	2.03E+00	7.01E+00	Weaker	-2.4033129
Lowland calcareous grassland	0	7.97E-01	2.12E-02	2.26E+00	Weaker	-1.3330918
Lowland dry acid grassland	0	2.77E+00	9.24E-01	5.48E+00	Weaker	-2.4188111
Lowland heathland	0	6.25E+00	3.02E+00	9.50E+00	Weaker	-3.8861445
Lowland meadow	56	3.81E+01	3.01E+01	4.63E+01	Stronger	4.1468183
Lowland mixed deciduous woodland	24	7.03E+01	6.08E+01	8.10E+01	Weaker	-8.3336693
Open mosaic habitats on previously developed land	0	1.58E+00	2.34E-01	3.61E+00	Weaker	-1.7063094
Purple moor grass and rush pasture	5	3.30E+01	2.56E+01	4.05E+01	Weaker	-6.6413838
Traditional orchard	4	6.71E+00	3.49E+00	1.13E+01	ns	-1.3326311
Upland oakwood	0	4.78E-01	1.93E-04	1.31E+00	Weaker	-1.1500092
Wet woodland	11	5.34E+01	4.42E+01	6.47E+01	Weaker	-8.1553109
Wood pasture and parkland	0	1.71E+01	1.09E+01	2.25E+01	Weaker	-5.7796372

Appendix 3.19 – Relationship Between Woodland SNA and Priority Habitats

Resource Observed	Observed	Null	Lower. 95.CL	Upper.95.CL	Test	SES
Ancient replanted woodland	155	2.62E+02	2.42E+02	2.83E+02	Weaker	-9.7267566
Ancient semi-natural woodland	122	2.56E+02	2.34E+02	2.76E+02	Weaker	-11.1830836
Arable field margins	0	1.03E+00	3.31E-02	2.37E+00	Weaker	-1.5600927
Area not covered	2927	1.75E+03	1.71E+03	1.78E+03	Stronger	56.8943537
Coastal and floodplain grazing marsh	0	3.91E+01	3.01E+01	4.76E+01	Weaker	-8.9211195
Dystrophic standing water	0	2.32E-05	0.00E+00	2.50E-04	ns	-0.1592804
Fen marsh and swamp	8	1.75E+01	1.18E+01	2.42E+01	Weaker	-3.0023161
Hedges or line of trees	0	5.74E-01	2.97E-03	1.98E+00	Weaker	-0.9999639
Inland river	0	1.73E+01	1.16E+01	2.37E+01	Weaker	-5.6979534
Lowland calcareous grassland	0	3.88E+00	1.63E+00	6.99E+00	Weaker	-2.6989002
Lowland dry acid grassland	1	1.18E+01	6.99E+00	1.66E+01	Weaker	-4.3294748
Lowland heathland	0	2.66E+01	2.00E+01	3.33E+01	Weaker	-7.5230596
Lowland meadow	21	1.61E+02	1.47E+02	1.81E+02	Weaker	-15.5973705
Lowland mixed deciduous woodland	4	2.99E+02	2.76E+02	3.20E+02	Weaker	-25.3913901
Open mosaic habitats on previously developed land	10	6.82E+00	3.73E+00	1.05E+01	ns	1.697847
Purple moor grass and rush pasture	24	1.41E+02	1.24E+02	1.57E+02	Weaker	-13.3719361
Traditional orchard	0	2.98E+01	2.30E+01	3.71E+01	Weaker	-7.7628944
Upland oakwood	0	2.24E+00	4.27E-01	4.48E+00	Weaker	-2.0511821
Wet woodland	47	2.26E+02	2.07E+02	2.46E+02	Weaker	-17.1540517
Wood pasture and parkland	0	7.11E+01	6.17E+01	8.15E+01	Weaker	-13.2765208