Gain

The Cornwall and West Devon Mining Landscape World Heritage Site

Ecological Audit Project – Final Report

April 2026

Contents

List of appendices

List of maps, figures and tables

1. The Nature Value of the World Heritage Site (WHS)

The Cornwall and West Devon Mining Landscape World Heritage Site is a Serial Property comprising 10 separate Areas, each with distinctive characteristics. However, these Areas have much in common, designated for their characteristics and features resulting from past hard rock mining. These landscape features are described as 'Attributes' and individually and collectively express the Outstanding Universal Value, or international importance, of the World Heritage Site (WHS). There are seven Attribute types within the WHS, as set out below, all of which can support nature in one form or another.

Table 1. Attributes of Outstanding Universal Value (OUV) within the World Heritage Site

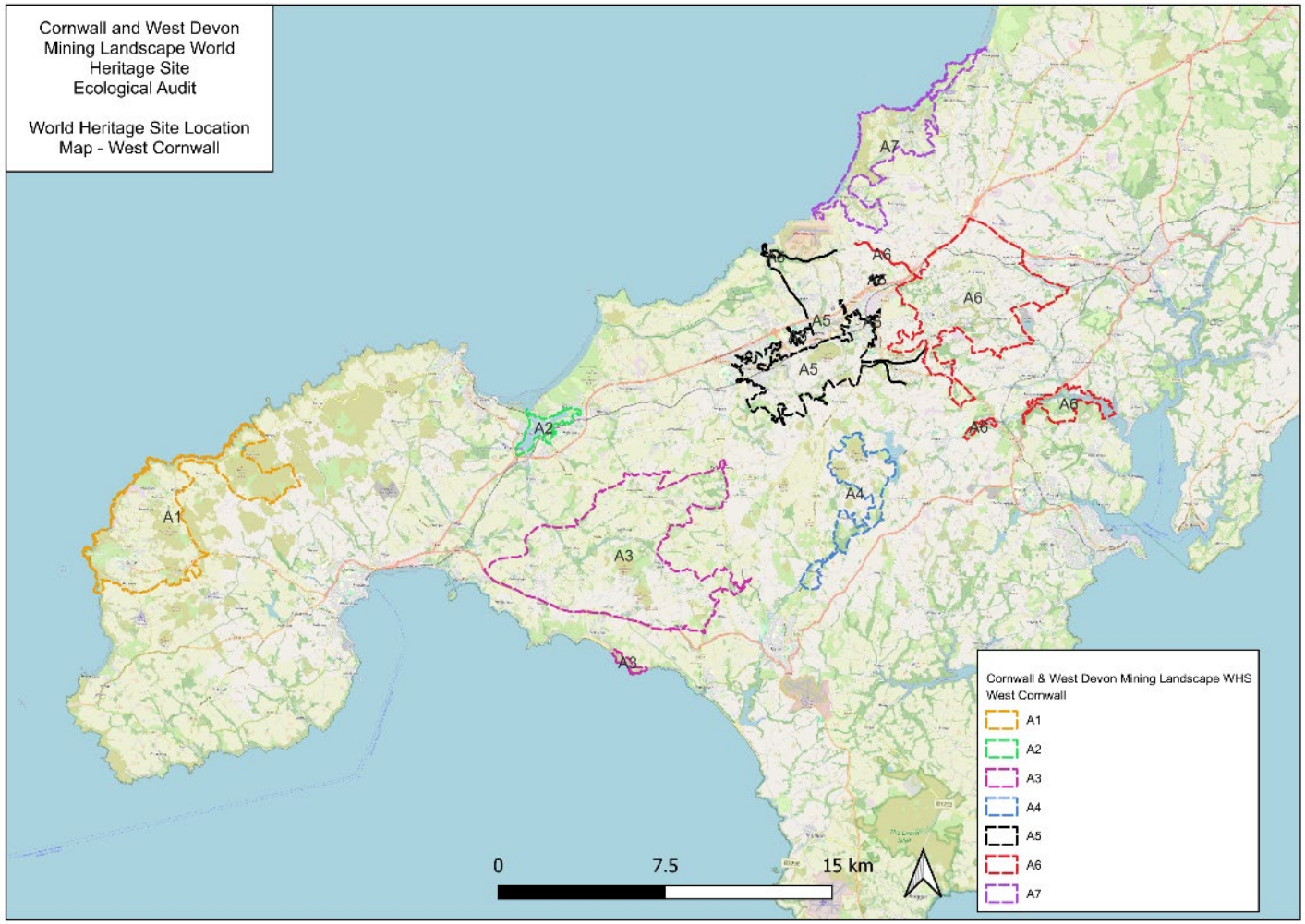
•	Mine sites, including ore dressing sites
•	Mine transport
•	Ancillary industries
•	Mining settlements and social infrastructure
•	Mineworkers' smallholdings
•	Great houses, estates and gardens
•	Mineralogical and other related sites of scientific importance

In addition, the WHS Attributes can themselves contain a range of components or features which together comprise the Attribute type - such as mine shafts and spoil heaps comprising parts of the *Mine sites and ore dressing sites* Attribute. These Attribute component features were created or shaped by their mining associations and can be important in supporting nature.

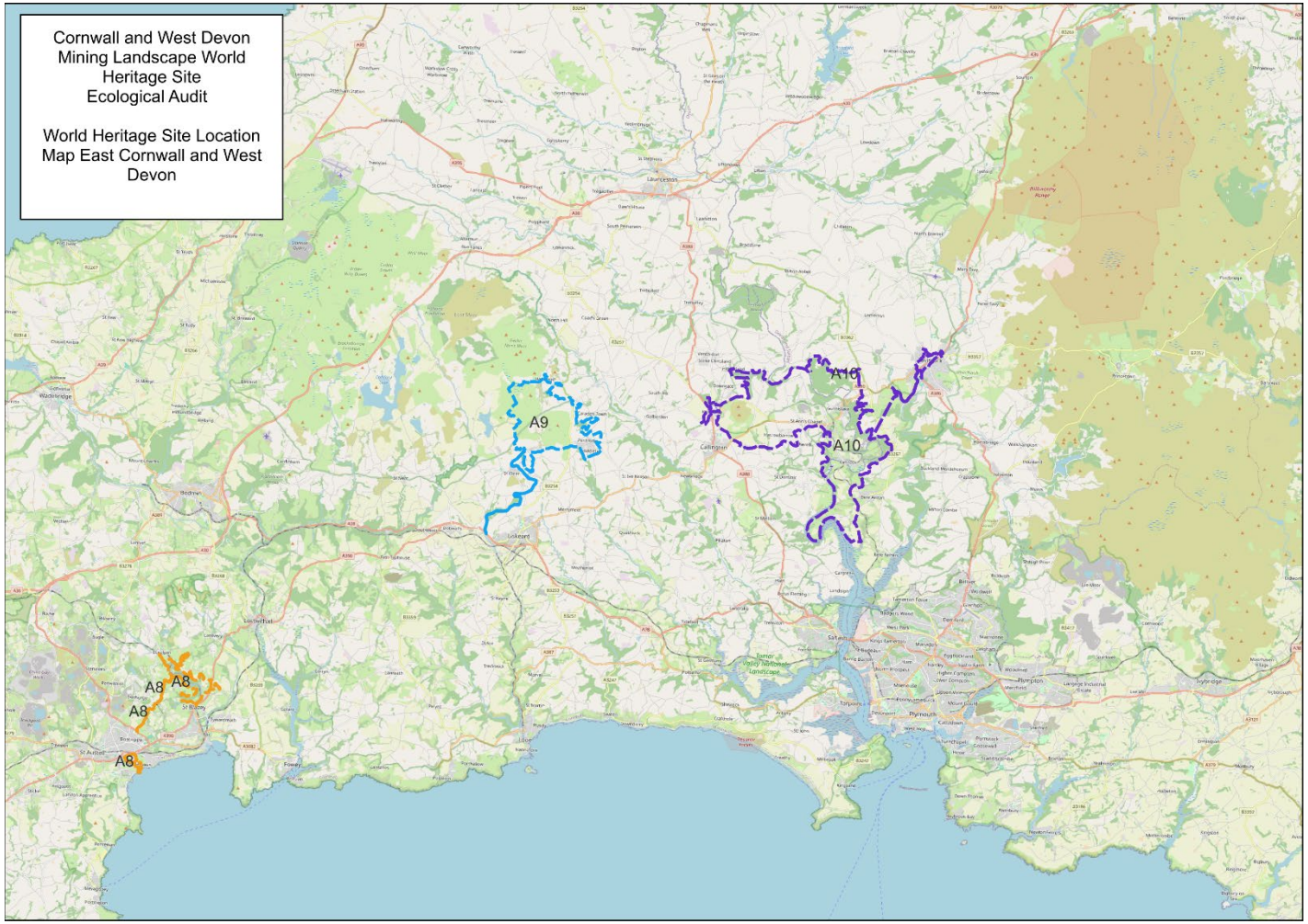
The following section describes the potential role of both the Attributes of OUV and the inherent landscape character of the WHS Areas. It summarises the main features that support biodiversity and describes some of the likely habitats and species that utilise these ecosystems.

Appendix 1 lists, for each of the 10 WHS Areas, the main individual features of each OUV type/ landscape Attribute considered to have the potential to support nature.

Map 1. The Cornwall and West Devon Mining Landscape World Heritage Site (West Cornwall) (Copyright Google 2026)



Map 2. The Cornwall and West Devon Mining Landscape World Heritage Site (East Cornwall and West Devon) (Copyright Google 2026)



1.1. Mine sites, including ore dressing sites

The key habitats which distinguish mine sites from other wildlife areas are heathland, contaminated ground, disused buildings, adits, and shafts.

1.1.1. Spoil heaps, dressing floors, streamworks and processing sites

Key habitats – Open and bare ground habitats on contaminated land, Leats and Reservoir Ponds/ Silt Traps

Key species – Wildflowers; Bryophytes, Insects such as predatory spiders; Mining bees; Lepidoptera (butterflies and moths); Aquatic invertebrates, Herpetofauna (amphibians and reptiles).

Open and bare ground habitats that are found extensively within the WHS around contaminated ore processing and dressing sites. Contamination is in the form of primary waste (residual unworked minerals on waste dumps) or processing waste (arsenic and other metal sulphides, found near the dressing floors, and concentrations of arsenic, cadmium and other minerals in the calciner flues, where ores were roasted to remove impurities.[1]

Sites high in metals such as arsenic, cadmium, chromium, zinc, lead, mercury, selenium, copper and nickel often result in extensive areas of bare ground, providing hunting grounds for predatory and foraging insects such as spiders and basking locations for reptiles. The presence of copper, zinc, lead, and arsenic has, in particular, led to the formation of communities in which plants occur in unusual associations.[2]

Although there appear to be no absolute metallophytes amongst the vascular plants in Cornwall, several lichens and bryophytes are in this category. Detailed surveys on the bryophytes, carried out by David Holyoak on 107 areas of former metal mining in Cornwall, highlighted the importance of these sites for mosses and liverworts; 13 nationally rare taxa were recorded, including the Cornish Path Moss (*Ditrichum cornubicum*), which is unique to Cornwall and found on only two former mine sites. The key areas for bryophytes include the unshaded, highly calcareous old mortar on old mine walls, but the rarest species are found on unshaded, poorly vegetated copper-contaminated soils; the liverworts *Cephaloziella nicholsonii* and *C. massalongi*, and the mosses *Scopelophila cataractae* and Cornish

[1] The value of abandoned mined sites for wildlife – the triumph of nature over our industrial past, Adrian Spalding (based on a talk to the Royal Geological Society of Cornwall, 2010)
[2] The value of abandoned mined sites for wildlife – the triumph of nature over our industrial past, Adrian Spalding (based on a talk to the Royal Geological Society of Cornwall, 2010)

Path Moss are restricted to these copper-contaminated substrates. The designation of the West Cornwall Bryophytes Sites of Special Scientific Interest (SSSI) was a direct result of these surveys. Mine sites are also recognised as being nationally important for lichens (Purvis 1993). In Cornwall, in detailed surveys carried out on 56 former mine sites, Giavarini recorded 338 taxa, including ten nationally rare and 39 nationally scarce taxa, and he considers that Cornish mine sites support about 40% of all British metallophyte lichens (Giavarini 2002). The key habitats for lichens include: unshaded, sparsely vegetated mine wastes, especially where copper contamination is present: habitat for the nationally scarce metallophytes *Cladonia cariosa, Lecanora handelii, L. subaurea, Stereocaulon leucophaeopsis* and S. *nanodes;* and vertical shaded walls constructed from mine waste: habitat for the metallophytes *Acarospora impressula, Lecanora epanora* and *Rhizocarpon furfurosum*. [3]

Butterfly and moth species such as Silver-studded Blue (*Plebejus argus*), Dingy Skipper (*Erynnis tages*), Grayling (*Hipparchia semele*), Wall (*Lasiommata megera*) and Small Heath (*Coenonympha pamphilus*) are all supported by the flower-rich open mine sites. Silver-studded blue's primary larval food plants are Ling (*Calluna vulgaris*) and Common Bird's Foot Trefoil (*Lotus corniculatus*), with larvae also found feeding on Gorse (*Ulex europaeus*) and English Stonecrop (*Sedum anglicum*). Bell Heather (*Erica cinerea*), Crossed-leaved Heath (*Erica tetralix*) and Greater Bird's-foot Trefoil (*Lotus pedunculatus*) may also be used; this is not confirmed at these sites. Larvae are always found in the presence of ants, with Black Ant (*Lasius niger*) appearing to be the sole mutualistic species on these mine sites. Breeding habitat consists of pioneer-stage heathland, where Ling, Bird's-foot Trefoil and Gorse are colonising areas of bare ground. [4]

Some former mine sites contain the remains of leats and reservoir ponds, many of which are now silted up but still provide wet habitat suitable for amphibians, reptiles and aquatic invertebrates (see also Section 1.3.1 below). Open areas will also provide basking sites for reptiles.

[3] The value of abandoned mined sites for wildlife – the triumph of nature over our industrial past, Adrian Spalding (based on a talk to the Royal Geological Society of Cornwall 2010)

[4] A conservation plan for Cornish mine sites in the Carnon Valley and Camborne-Redruth Mining District 2024 Marcus Rhodes

1.1.2. Disused buildings

Key habitats – Roofspaces, masonry crevices, tall structures

Key species – Nesting birds e.g. Corvids, Swallows and Owls, Hunting perches for raptors e.g. Buzzard, Roosting spaces for Bats, Bryophytes

Disused buildings and structures in the WHS, such as engine houses, calciners, dressing floors, and stamping mills, can provide many ecological niches for nature. Tall chimneys are used as hunting perches and nesting sites for birds, such as Kestrel and Buzzard. More enclosed buildings may provide nesting niches for species such as Barn Owl and Swallow. Several bryophyte species thrive on the lime-rich mortar[5], holding the stones together. Bats such as Pipistrelle (*Pipistrellus pipistrellus*), Noctule (*Nyctalus noctula*) and Brown Long-eared (*Plecotus auritus*) may use cracks and crevices within the stonework or under and between ivy covering the structures.

1.1.3. Mine shafts and adits

Key habitats – Underground, dark, rocky niches with sheltered microclimates

Key species - Bats

Shafts and adits on mine sites provide safe, undisturbed environments in which bats can hibernate, with little variation in temperature and humidity throughout the year (McAney, 1999). Some bats may also use these underground areas in the summer as night roosts and feeding areas. Bats prefer some airflow through the shaft or adit, although they will use single shafts with little airflow for temporary roosts. The structure of the shaft or adit is important, as it creates pockets of cooler or warmer air. Several species of bat in Cornwall hibernate underground, mainly in mine sites or caves, including Brandt's (*Myotis brandtii*), Brown Long-eared (*Nyctalus noctula*), Daubenton's (*M. daubentonii*), Greater Horseshoe (*Rhinolophus ferrumequinum*), Lesser Horseshoe (*R. hipposideros*), Natterer's (*M. nattereri*) and Whiskered (*M. mystacinus*) (Tompsett 1997).[6]

[5] The value of abandoned mined sites for wildlife – the triumph of nature over our industrial past, Adrian Spalding (based on a talk to the Royal Geological Society of Cornwall 2010)

[6] The value of abandoned mined sites for wildlife – the triumph of nature over our industrial past, Adrian Spalding (based on a talk to the Royal Geological Society of Cornwall 2010)

1.2. Mine transport

1.2.1. Harbours, wharfs and quays

Key habitats – Tidal and subtidal rock and masonry niches in harbour and quay walls

Key species – Shellfish e.g. Barnacles; Limpets and Mussels; Sea Snails e.g. Littorina sp. ; Seaweeds e.g. Bladderwracks; Bryozoans; Crabs; Starfish; Rock dwelling fish e.g. Blenny and Shanny.

Maritime-built heritage (e.g., historic seawalls) is an important component of coastal infrastructure worldwide. Despite this, the ecological communities supported by these tidal and subtidal structures are poorly understood. A 2023 study investigated seven locations across the UK, comparing the biodiversity and physical habitat characteristics of (1) historic (pre-1900s) masonry walls, (2) concrete walls, and (3) natural rocky cliffs.

Historic masonry walls were found to support significantly more species than concrete walls, and in some locations, more diverse communities than nearby rocky cliffs. Nevertheless, community composition remained distinct between the three habitat types at each location. Historic masonry walls provided substantially more cryptic space (i.e., crevices) than both concrete walls and rocky cliffs, and this is positively associated with the ecological value of these structures. Overall, the study suggests that the unique physical properties of historic masonry walls make them an important component of habitat diversity along developed coastlines.[7]

[7] Intertidal biodiversity and physical habitat complexity on historic masonry walls: A comparison with modern concrete infrastructure and natural rocky cliffs, Timothy Baxter Martin Coombes and Heather Viles 2923 Marine Pollution Bulletin

1.2.2. Mine tramways, railways, and trails

Key habitats – Various – A mosaic of open and bare ground, wetland, streams, species-rich grasslands, heathland, scrub, wet woodland and woodland – Green corridors

Key species- Various – Wildflowers, e.g. Depford Pink, and grasses, Invertebrates, Birds, e.g. Dipper and Wagtail, Mammals e.g., Bats, Hedgehog, Fox and Badger, Herpetofauna (Amphibians and Reptiles), Aquatic invertebrates.

There are a significant number of linear features within the WHS along the long-abandoned routes of former tramways, railways and cart tracks. These routeways have often been repurposed into off-road multi-use trails, many of which are long-distance, such as the coast-to-coast Bissoe Trail, which runs north to south between Portreath and Devoran. The corridors around the trails contain a myriad of habitats, often in complex mosaics, from bare ground to acid grasslands, flower-rich successional habitats, wetlands, scrub, and woodland, supporting a myriad of insects, birds, and mammals.

As well as being habitats in themselves, the corridors of long-distance routes play an important role in connectivity, linking habitats, often over large areas, and providing opportunities for species to move through the landscape, linking populations, assisting with species resilience, and facilitating the colonisation of new areas.

1.2.3. Canals

Key habitats – Woodland, Canalised watercourses, Wetland, Ponds, Wet woodland and Grasslands

Key species- Wildflowers and grasses, Herpetofauna (Amphibians and reptiles); Mammals such as Otter, Badger and Bats (E.g. Daubentons feeding over water); Aquatic invertebrates, Birds .e.g Kingfisher, Dipper and Wagtail, Invertebrates such as Lepidoptera (butterflies and moths); Fish e.g. Roach. Potential for reintroductions of Water Vole.

Canals associated with mining occur close to Tavistock and in a short section of the Luxulyan Valley. The Tavistock Canal, lined by mature trees, lies above the valley floor south of Tavistock and provides an important wildlife corridor.[8] The Par Canal and the modified watercourses in the Luxulyan Valley have significant nature value. It is known for its rich biodiversity, including a wide range of protected and notable flora and fauna, as well as diverse habitats such as ancient woodland and watercourses. The canal itself provides important aquatic and riparian habitats.

[8] South Hams and West Devon Landscape Character Assessment 2018

1.3. Ancillary industries

1.3.1. Foundries, factories and engineering works

Key habitats – Canalised watercourses (leats); Woodland, Bryophytes; Grassland, Scrub, Open and Bare Ground, Streams and Wetlands; Masonry niches in old walls and structures.

Key species – Trees and Wildflowers, Mammals including Bats, Birds e.g. Dipper and Wagtail; Aquatic invertebrates; Amphibians.

The WHS contains the remains of many of the foundries, factories and works that facilitated the processing and smelting of ores and the mining activities themselves. The former gunpowder works at Kennall Vale is a good example with remnant stone structures, a quarry, well preserved mills and a well-preserved leat system. The site is designated as a Scheduled Monument and a Cornwall Wildlife Trust Nature Reserve. The stone structures host populations of Pipistrelle bats (*Pipistrellus pipistrellus*). Many of the trees in the valley were planted as part of the gunpowder operation. In the event of an explosion, they were to help absorb shockwaves and to provide a barrier to protect the nearby village from flying debris. Trees were also used for timber and charcoal production. The main trees today are beech, ash, oak and sycamore. Mosses thrive at Kennall Vale. The buildings long abandoned by people have been colonised by wildlife. Ferns, mosses and liverworts cling to the old walls, thriving in the shady, damp conditions. Ivy creeps up the buildings, forming a dense thatch for nesting birds, and providing a valuable food source with its berries. The paths through the valley were cut so that horses and carts could bring in the raw ingredients of gunpowder and take out the finished product. They now form sunny glades where wildflowers grow, and butterflies and bees feed on nectar. At dusk, you might see bats hunting for insects, including the rare Brown long-eared (*Nyctalus noctula*), Lesser horseshoe (*R hinolophus hipposideros*) and Greater horseshoe (*R. ferrumequinum*) bat. The stones in the river provide ideal perches for birds such as the Dipper (*Cinclus cinclus*) and Grey Wagtail (*Motacilla cinerea*), which feed on water insects and worms.[9]

[9] https://www.cornishmining.org.uk/media/pdfs/Audio/Kennall_Vale_Audio_Trail_Delve_Deeper.pdf

1.3.2. Quarries

Key habitats – Rock faces and crevices; Quarry lakes; Open habitats; Species-rich grasslands

Key species – Bryophytes; Bats, e.g., Daubentons; Aquatic Invertebrates; Herpetofauna (Amphibians and Reptiles); Birds, e.g. Raptors; Invertebrates, e.g. Beetles, Lepidoptera, and Mining Bees.

Derelict pits and quarries are a largely unrecognised resource for nature conservation in Cornwall. Natural colonisation by plants and animals has followed the abandonment of these sites, often leading to the presence of rare or locally important species (Coppin & Bradshaw, 1982).

Stone quarries generally are not part of the OUV of the WHS, but the exceptions to this are those granite quarry sites associated with the mining entrepreneur J T Treffry within the Luxulyan Valley (Area A8) and also those quarries that were established on or near mine sites to supply building stone specifically for the use of mines or related operations. An example is that at Wheal Prosper at Rinsey Head (Area A3), where a small quarry site is extant a short distance to the southeast of the pumping engine house.

Other quarry sites outside of the WHS Areas (e.g. Newmill Quarry and Sheffield Quarry in West Penwith) have been well surveyed for wildlife, and others, such as Rosemanowes Quarry near Penryn, are known to be important for wildlife despite still being used for a variety of industrial purposes, and are included here for that reason. There are also a large number of quarries and pits (many on private land) for which the wildlife is yet to be documented, but which may be important because they contain one or more of the following:

- refuges of habitats formerly common in the surrounding agricultural landscape
- open exposures with early successional stage plants and animals
- standing water buffered from the surrounding landscape
- key species such as birds, bats, mosses, liverworts and dragonflies

Many quarry sites of wildlife value in Cornwall have been designated either as Sites of Special Scientific Interest or as County Wildlife Sites. Many quarries have been designated as SSSIs for their geological interest, although some (e.g., Stepper Point and De Lank), beyond the World Heritage Site, are also important for wildlife. County Wildlife Sites are also important in this context, and it has been estimated by the Environmental Records Centre for Cornwall and the Isles of Scilly that about 29% (179) of the County Wildlife Sites in Cornwall contain at least one (often more) disused quarry, ranging from 10 metres to over 300 metres wide. In addition to these sites, many non-

designated quarries serve as havens for nature. These have often been too difficult or hazardous to reclaim for agricultural land. A review for English Nature of the importance of the mineral extraction industries for biodiversity in different Natural Areas in Britain (English Nature Research Report 279) omits the Natural Areas which occur in Cornwall (Bodmin Moor, Cornish Killas and Granite, The Lizard, West Penwith, The Culm and the coastal fringes). This illustrates that the importance of quarries to wildlife may be largely overlooked because many are very small and widely scattered throughout the region. [10]

1.4. Mining settlements and social infrastructure

Key habitats – Remnant historic open and green spaces within settlements, Roofspaces and Mansory Crevices in churches and other historic buildings

Key Species – Reptiles, Invertebrates e.g. Lepidoptera and Bumblebees; Bats; Birds e.g. Barn Owl, House Sparrow, House Martins.

Mining settlements such as Portreath, Camborne, Pool, Redruth, Lanner, St Agnes and Tavistock comprise a historic core of older buildings, usually constructed of stone, and include public buildings, Methodist chapels, preaching pits, and new Church of England churches. Often, the historic core is surrounded by different eras of subsequent development.

Several studies have demonstrated that historic urban areas have greater value for biodiversity due to the presence of historic green and open spaces, which often preserve fragments of relic habitats and greater time depth. In addition, older buildings such as churches and houses can support populations of species associated with buildings, including Barn Owls (*Tyto alba*), Swallows (*Hirundo rustica*), Swifts (*Apus apus*), House Martins (*Delichon urbicum*), House Sparrows (*Passer domesticus*), and a range of bat species. Old routes and trackways move through urban areas within former mining settlements, often preserved while adjacent land is developed, maintaining vital green corridors and linear survivals of semi-natural habitats.

[10] the conservation value of abandoned pits and quarries in Cornwall Spalding et al 2002

1.5. Mineworkers' smallholdings

Key habitats – Species-rich grassland; Semi-natural grassland; Cornish hedges, particularly with stone facing, and Stone Walls

Key Species – Reptiles, Invertebrates e.g. Lepidoptera and Bumblebees; Mammals e.g. Bats, Weasels, Voles, Shrews and Mice; Birds e.g. Owls, Swallows, Swifts, Kestrels and Buzzards.

Around the periphery of settlements and extending into what was formerly downland (unenclosed land) are mineworkers' smallholdings - Mineworkers' subsistence farms - comprising narrow strips or rectilinear fields with Cornish hedge field boundaries in the relevant local geology. The rural hinterland contains scattered, stone-built individual Mineworkers' cottages and related outbuildings.

Mineworkers' smallholdings are recognisable for their small, rectilinear enclosures, bounded by Cornish hedges and sometimes dry-stone walls. Now largely agricultural, they are mainly pasture. Nature value will be found within more species-rich grasslands, which will support a range of pollinators and other invertebrates. More tussocky swards will support small mammals and provide nesting sites for bumblebees.

The Cornish hedges that surround the fields have significant nature value. Cornish hedges form Cornwall's largest semi-natural habitat, with a long and continuous history and relic species linked to the original pre-farming landscape. They also have a vital seed bank of local provenance that reflects former land cover.

Their rich vegetation diversity creates a wide range of habitats and microhabitats for birds, insects, reptiles and mammals, beyond those supported by a traditional planted 'hedgerow'.

Their high wildlife value stems from the importance of their individual and collective habitats. More than 500 native plant species can be found living in a wide range of diverse hedge habitats. The physical structure of a Cornish hedge, especially one with a grassy margin or ditch, provides a variety of conditions suitable for the flora and fauna of grassland, woodland, moorland, cliff and wetland species to thrive. Typically, the fill within the hedge is less fertile than the surrounding land. The bottom of the hedge is the dampest and most fertile area. The hedge sides are the most variable, with wildlife varying within the physical hedge structure. This depends on its aspect, the number of niches between the stones, its age, and its management.

- Hedges with a south or south-west facing aspect are especially valuable for invertebrates and reptiles
- Oak (*Quercus* sp.), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), and Bramble (*Rubus fruticosus*) are beneficial to wildlife species.

- Ivy gives vital autumn and winter food and shelter to many beneficial insects and birds.
- Standing dead wood gradually benefits invertebrates and fungi.
- The thicker and higher the hedge, the more food and safety it provides for nesting birds.
- A good mix of native locally occurring hedge plants yields berries and seeds throughout the winter.
- Bushy hedges make corridors between isolated habitats, encouraging biodiversity.
- Trees, shrubs, and summer wildflowers along hedges encourage insect-eating birds and bats.
- Exposed stone hedges are valuable for lichens, ferns, mosses, and lizards.
- Untrimmed growth is needed for the whole life cycle of many moths and butterflies.
- Overzealous flailing and trimming can have an adverse effect on the robustness of these important habitats.

1.6. Great houses, estates and gardens

Key Habitats – Ornamental gardens, Horticulture, Broadleaved and Conifer Woodland and Trees; Grassland; Ponds, Roofspaces and Masonry structures

Key species – Various - Woodland birds, e.g. Wood Pigeon, Woodpeckers, Treecreepers and Nuthatch; Conifer specialist birds e.g. Crossbill and Firecrest; Mammals, e.g. Fox, Badger, Hedgehog, Deer, Mice, Voles and Bats; Bumblebees, Solitary bees and other invertebrates; Reptiles, Amphibians; and Aquatic Invertebrates, Saproxylic invertebrates; Fungi.

This aspect of the WHS comprises great houses and other substantial residences, lodge houses and other related buildings, estates, parkland and gardens, villas and embellished townhouses. Many great houses and estates were built with money from the mining industry. Several outstanding houses and gardens in Cornwall, which once belonged to the mineral lords, or the industrial 'nouveau riche', still survive today.

While upward social mobility meant that people with new money could move to more attractive areas of towns and villages, the landed classes – many of whom made huge fortunes from the mining industry – were keen to reflect their success and status.

These elegant mansions, boasting well-stocked libraries, music rooms and conservatories crammed with plants, were shielded from the source of their wealth – acres of mine tips and industrial buildings that 'scarred' the landscape – by lavish ornamental gardens.

Horticulture became increasingly popular amongst the wealthy during the 19th and early 20th centuries. Several families involved in the mining industry became notable horticulturists. Many sponsored plant-hunting expeditions were conducted all over the world to find new

species to bring back to Cornwall. It is also thought that plants were introduced by Miners returning from abroad, such as the ubiquitous Mexican Fleabane (*Erigeron karvinskianus*).

Due to Cornwall's mild climate, many of the plants and shrubs brought back from more tropical regions flourished here, particularly in the more sheltered, south-facing gardens. Rhododendrons, brought back from India and the surrounding areas, and tree ferns, which originate from New Zealand and Australia, have flourished in Cornish gardens. As a result, many of the gardens that developed during this period have become internationally renowned. Great Houses and estates within the World Heritage Site include Carclew House, Trengwainton House, Tehidy House, Scorrier House, Trevarno House, Clowance Estate, Burncoose, Trevince and Tregullow House.

Trevarno House, formerly the home of the Wallis mining family, later became the home of the Bickford-Smiths (safety-fuse manufacturers). It's famous for its magnificent gardens. Trengwainton House was bought by the Bolitho family, one of the great Cornish mining families, in 1867. When Lt. Col. Edward Bolitho inherited the garden in 1925, he set about transforming the garden with exotic species. He sponsored a plant-hunting expedition to Assam and the Mishmi Hills in Burma. Many of the specimens brought back from that venture had never been grown in the UK before. [11]

The Williamses of Cornwall are renowned for their gardens. Scorrier House garden once employed William Lobb, one of the great Victorian nurserymen, botanists and plant hunters who ventured around the world bringing back exotic species to decorate Scorrier's garden. Lobb's own fame came from importing the *Araucaria araucana*, the Monkey Puzzle. The garden remains an evolving timepiece, with winding paths, old walled gardens, and wild meadows. A path lined with Camellias was described in 1881 as 'one of the finest and best managed Camellia Walks in Britain'. [12] Close to Scorrier is Tregullow House, a grade II listed building with a woodland garden and two substantial walled gardens.

Much of the charm of Burncoose Gardens (also in the ownership of the Williams' family) is the carpets of Bluebells (*Hyacinthoides non-scripta*), Daffodills (*Narcissus* sp.), Primroses (*Primula vulgaris*), Snowdrops (*Galanthus nivalis*) and Wild Violets (*Viola* sp.)which grow in abundance in the late winter and spring. The woodland gardens are kept as informal as possible. [13]

[11] https://www.cornishmining.org.uk/about/mining-in-cornwall-and-west-devon/mining-characters-and-society/great-houses-and-gardens

[12] https://www.scorrierhouse.co.uk/scorrier-house-gardens/gardens/

[13] https://www.burncoose.co.uk/site/static.cfm?content=our_gardens

Regarding the Trevince Estate, nothing remains of the medieval or Tudor buildings, but the back of the house (now the wing) dates from the late 17th century. In 1863 Edmund Beauchamp Tucker (EBT) inherited the estate and rebuilt the front part of the house to a design by James Piers St Aubyn, a prolific Cornish architect. The gardens include a walled garden of probable 18th century origin and parkland of similar date. In the 19th century, Rhododendrons, Azaleas and Camellias provided a mainstay, with subtropical plants around the lawns and drives, highlighting the mild climate. Avenues of Irish yews were planted, and specimen trees complemented the native broad leaves. The kitchen garden provided cut flowers, fruit, and vegetables, and there was a heated vineyard, an orchid house, and greenhouses. Beyond is a Wilderness Walk and then woodland, planted on the industrial waste of tin and copper workings as the Trevince and Beauchamp families were mine and mineral owners from at least the Tudor period. The house and garden sit at the centre of a thriving rural estate.

Carclew House was destroyed by fire in 1934, but the terraced gardens, complete with their water fountains and cascades, remain and are privately owned and not open to the public, although the ruins of the old house are being conserved and opened to pre-arranged groups. A notable feature of the garden is the large lily pond with swans. [14]

The large estates all contain a complex mosaic of ornamental and semi-natural habitats, some planned and some unplanned. Mature woodland and trees will provide hunting perches and nesting sites for raptors and roosting and nesting sites for a whole host of other birds such as Woodpecker (e.g. *Dendrocopos major, Dryobates minor, Picus viridis*), Treecreeper (*Certhia familiaris*), Nuthatch (*Sitta euroaea*), Blackbird (*Turdus merula*) and Wood Pigeon (*Columba palumbus*). Large conifers will benefit conifer-specialist birds such as Firecrest (*Regulus ignicapilla*) and Crossbill (*Loxia curvirostra*). In addition, woodland cover will support a range of mammals, including Wood Mice (*Apodemus sylvaticus*), Hedgehogs (E*rinaceus europaeus*), Badgers (*Meles meles*), Deer (e.g. *Capreolus capreolus*), and Foxes (*Vulpes vulpes*). Some older woodland with standing and fallen deadwood will support saproxylic invertebrates and a range of fungi.

More open habitats, such as semi-natural grasslands, may provide nesting sites for bumblebees and foraging habitat for a range of bees and other pollinators. Tussocky grassland may also provide habitat for Mice and Voles.

[14] https://en.wikipedia.org/wiki/Carclew_House#cite_note-11

Several water features and ponds provide important aquatic habitats and standing open water that will host a range of aquatic invertebrates, including Water Slaters, Mayflies, Hoverflies, Stoneflies, Dragonflies, and Damselflies. They may provide habitat for Frogs and Toads, and be utilised by the Grass Snake (*Natrix natrix*).

The historic houses and structures are likely to host Bat populations and, potentially, House Sparrows (Passer domesticus) and House Martins (*Delichon urbicum*). Structures such as the walls of wall gardens will support solitary bees and other invertebrates.

Many of the great houses and estates have, over time, become surrounded by suburban development, providing important island refuges and stepping-stone corridors between more rural areas and patches of semi-natural habitat.

1.7. Mineralogical and other related sites of scientific importance

Key habitats – Heathland and Coastal heath, Open and bare ground habitats on contaminated land, Nature-rich grasslands, Masonry walls

Key species – Wildflowers and ferns; Bryophytes, Insects such as predatory spiders; Mining bees; lepidoptera (butterflies and moths); aquatic invertebrates and reptiles).

The WHS comprises internationally and nationally important type sites for minerals and important mining-related ecological sites. As outlined in 'Mine Sites' above, many of the most important mine sites from an ecological perspective are designated as Sites of Special Scientific Interest, particularly for bryophytes.

In addition, the mine sites are particularly important for several reasons. They have post-industrial habitats of great importance to bees and other insects, in particular bare ground and early successional grassland or heathland on the disturbed spoil of the workings. Other features include south-facing structures, such as banks and walls, that serve as nest sites. Many mine sites have also been excluded from intensive agricultural practices and have retained semi-natural, flower-rich habitats, now rare in intensive farmland. The other highly important feature of the mine sites within the WHS is their habitat connectivity, i.e. the coastal mine sites are likely to be close to a long

strip of connected coastal flower-rich habitats of high significance for their pollinator fauna. Alternatively, mines on Penwith and Bodmin may be connected to valuable moorland habitats. [15]

[15] Bees on AONB mine sites A project scoping Patrick Saunders. 2016

2. Summary of the primary habitats associated with the OUV of the WHS

Table 2. Primary habitats associated with the Outstanding Universal Value of the World Heritage Site

• Contaminated land, mineralogical sites, bare ground and open habitats
• Masonry crevices
• Roofspaces
• Tall structures for perching/ nesting
• Leats, sluice ponds/ reservoir ponds and silt traps
• Underground spaces (shafts and adits)
• Tidal and subtidal stone and masonry crevices
• Green corridors along routeways and canals with a mosaic of habitats
• Remnant historic public open/ green spaces within settlements
• Woodland along routeways, canals and around foundry sites
• Remnant historic public open/ green spaces within settlements
• Linear water features (mine leats and the Tavistock and Par Canals)
• Parkland and ornamental gardens
• Cornish hedges (associated with Mineworkers' Smallholdings)

3. Summary of the main species groups likely to utilise the OUV of the WHS

Table 3. Primary species associated with the Outstanding Universal Value of the World Heritage Site

• Bryophytes and lichens
• Early colonisers of bare ground such as Creeping Bent Grass (*Agrostis stolonifera*) and Birds-foot Trefoil (*Lotus corniculatus*)
• Predatory insects e.g. beetles and spiders
• Bumblebees and solitary bees (mining bees)
• Aquatic invertebrates
• Butterflies and moths
• Bats
• Small mammals
• Higher mammals such as Badger (*Meles meles*), Fox (*Vulpes vulpes*), Hedgehog (E*rinaceus europaeus*) and Deer (e.g. *Capreolus capreolus*) Amphibians e.g frogs and toads
• Reptiles e.g. Adder (*Vipera berus*), Grass Snake (*Natrix natrix*) and Slow Worm (*Anguis fragilis*)
• Fungi
• Saproxylic invertebrates
• Birds
• Fish (Tavistock Canal)

4. Summary of habitats associated with landscape character

The above sections highlight the biodiversity within the World Heritage Site that is most closely aligned with its OUV (Outstanding Universal Value). However, the WHS Attributes sit within wider landscapes that have characteristics that support nature, but which are not necessarily present because of direct or indirect mining activity. These habitats form a secondary list of elements of nature value contained within the ten WHS Area boundaries and are described clearly within the Cornwall and Isles of Scilly Local Nature Recovery Strategy.[16] Table 5 below highlights in green the areas of the WHS where the habitats are strongly characteristic.

Table 4. Primary habitats associated with landscape character within the WHS

• Heathland
• Coastal habitats (including dunes)
• Woodland
• Nature-rich grassland
• Wetland/ Fen/ Marsh
• Rivers and Streams
• Ponds
• Intertidal habitats (mudflats/ Littoral)
• Cornish hedges (outside Mineworkers' smallholdings)*
*includes bare stone hedges and dry stone walls

[16] https://letstalk.cornwall.gov.uk/cornwall-and-isles-of-scilly-nature-recovery-strategy

Table 5. Habitats which make a strong contribution to the landscape character within the World Heritage Site Areas

	World Heritage Site Area									
Habitat	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Heathland	■		■	■		■	■		■	■
Coastal habitats (including dunes)	■	■	■				■			
Trees and Woodland	■	■	■				■			
Nature-rich grassland	■	■	■	■	■	■	■	■	■	■
Wetlands and ponds		■				■		■		■
Rivers and Streams		■				■		■		■
Intertidal (littoral & mudflats)	■	■	■			■	■			■
Cornish hedges and Devon hedgebanks (stone field boundaries)	■		■	■	■	■	■	■	■	■

5. Summary of the ecological audit gazetteer of information

The ecological audit is based on the core tenet of a gazetteer: an index of ecological information held for the World Heritage Site Area. The work to gather information involved contacting 48 Cornwall- and Devon-based local environmental organisations and groups to ascertain what records and survey data they hold on nature within the ten Areas of the WHS. The requests for information were followed up on between September 2025 and January 2026 and were supplemented by internet searches to gather information on nature-based projects. In addition, data requests were made to the Devon Biological Records Centre, the Cornish Biological Network ERICA database and the National Biodiversity Network and national spatial datasets were gathered on habitats.

The gazetteer is set out in **Appendix 2**. It is a searchable Excel spreadsheet that extracts information relevant to each sub-Area of the designation, broken down by data type, habitat, and species. In total, the gazetteer contains 412 items of survey, mapped data or species records covering the WHS and is thought to be the first time such an audit has been attempted locally.

The most significant data provider was the combined data from Cornwall Wildlife Trust, its consulting arm, Cornwall Environmental Consultants, the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS), closely followed by Natural England, with Sites of Special Scientific Interest and Special Area of Conservation surveys, conservation objectives, and citations. The ERCCIS species dataset was not acquired as part of the audit due to relatively high data charges; it is more cost-effective to acquire this data as and when required for specific ecology projects within the WHS.

The gazetteer is likely to be incomplete. The slightly patchy nature of returns on requests for information and the disparate nature of survey information mean that not every piece of information will have been identified. In addition, there was insufficient time to gather all data from more difficult-to-access sources, such as those undertaken for individual planning applications. The gazetteer can be updated over time as new information becomes available. Similarly, the gap analysis summarised in section 7 may not be completely accurate, since it is based on the gazetteer. However, the gazetteer contains sufficient information for the audit and gap analysis to provide a broad picture of data availability and survey information across different habitats and species.

6. Summary of the gaps in ecological information

The information sourced for the gazetteer was mapped to the key habitats and species of the World Heritage Site. This Gap Analysis is provided in **Appendix 3** in Excel format and is summarised in Table 6 below. The Gap Analysis spreadsheet includes a detailed matrix of information for the WHS Areas and a summary sheet. The GAP Analysis also examines the ERICA and NBN Atlas species records by species group to ascertain which groups are better recorded across the ten WHS Areas.

All data points in the Gazetteer were profiled by OUV habitat, OUV species, and landscape character habitat for each WHS area. This enabled the level of information for each nature element and each WHS Area to be ascertained, and for critical information gaps to be identified. The spreadsheet has been colour-coded to highlight where little, moderate, or good amounts of data/surveys have been identified. The colour coding is relative and highlights areas with more studies/data points than others. However, there is a critical lack of information on both the habitats and the species found in the World Heritage Site.

There are significant gaps in knowledge and understanding of habitats, particularly those specific to the WHS's Outstanding Universal Value. While some habitats are mapped, little information is known about their condition, particularly outside of SSSI sites.

While there is a paucity of research and survey information across the board, critical gaps, where there is no, or not significant information is highlighted in Table 6 below. However, it is worth noting that none of the habitats identified as related to OUV received a rating above 'poor' for information level. Species fared slightly better than habitats with Vascular plants, Bryophytes, General Invertebrates, Butterflies and Moths, Bees and Bats performing moderately compared with other groups. Birds were the best-performing species group.

Table 6. Habitats and species with no significant level of information

Habitats related to OUV
Roofspaces
Tall structures for perching/ nesting
Leats, sluice ponds/ reservoir ponds and silt traps

Stone harbours and quays (Tidal and subtidal stone and masonry crevices)
Species related to OUV
Predatory insects, e.g. beetles and spiders
Marine species, e.g. shellfish, seaweeds, crab, small fish, starfish (associated with harbours and quays)
Small mammals*
Higher mammals such as Badger, Fox, Hedgehog and Deer*
Amphibians, e.g. frogs and toads
Reptiles, e.g. Adder, Grass Snake and Slow Worm
Fungi
Saproxylic invertebrates
Habitats related to landscape character
Ponds (particularly those smaller ponds which may not be picked up on land cover mapping)

**NB. Mammals' records may be better represented in the ERCCIS dataset, which was not acquired to inform the study*

Table 7. Summary of the gap analysis

No significant information
Poor level of information
Moderate level of information
Good level of information

Habitat/ Species	World Heritage Site Areas 1	2	3	4	5	6	7	8	9	10	Overall level of information and comments
Habitats related to OUV											
Contaminated land, mineralogical sites, bare ground and open habitats											A small amount of information from Spalding, National Trust, and CWT; Extent of habitats spatially mapped.
Old walls and buildings (Masonry crevices)											Limited information on bridges and retaining walls from CWT/ CEC
Roofspaces											No significant information
Tall structures for perching/ nesting											No significant information
Leats, sluice ponds/ reservoir ponds and silt traps											No significant information
Underground spaces (shafts and adits)											Some limited information from CEC areas 3-6
Stone harbours and quays (Tidal and subtidal stone and masonry crevices)											No significant information
Green corridors along routeways and canals with a mosaic of habitats											Extent of habitats spatially mapped; CEC Mineral tramways information
Remnant historic public open/ green spaces within settlements											Extent of habitats spatially mapped,

Linear water features (leats and canals)											Extent of larger linear features spatially mapped,
Parkland and ornamental gardens											Spalding document; Extent of habitats spatially mapped,
Cornish hedges (Mineworkers' smallholdings)											Extent mapped via CEH and ERCCIS layers
Habitat/ Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Overall level of information and comments**
Species related to OUV											
All species general											Limited general biological survey information from the National Trust and CWT
Wildflowers, ferns and grasses											Reasonable numbers of species records and a limited number of other surveys
Bryophytes, liverworts, lichens											SSSI and SAC surveys and NBN species; County atlas; reasonable number of records in NBN and ERICA. Natural England and Plantlife Information, National Trust survey, CWT surveys
Invertebrates general											Well recorded in ERICA and NBN, but few site-specific surveys. Nature conservation surveys from The National Trust and CWT
Lepidoptera (Butterflies and moths)											Reasonably well recorded in ERICA (Via Cornwall Butterfly Conservation) and NBN, Some National Trust surveys. Buglife B-lines
Predatory insects e.g. beetles and spiders											Low numbers and density of records

Bumblebees and solitary (mining bees)											Low numbers and low record density, but some local studies and county Atlases for bumblebees. Bumblebees are better recorded than solitary mining bees; BugLife Bee Lines
Marine species, e.g. shellfish, seaweeds, crab, small fish, starfish (associated with harbours and quays)											Low numbers and density of records, although likely not recorded for WHS harbours/ quays
Aquatic invertebrates											Riverfly data also feeds into NBN Atlas - Low numbers and density of records
Bats											Low numbers and density of records, some records from the Cornwall Bat Group, feed into ERCCIS and NBN via the National Bat Monitoring Programme, some National Trust counts. Devon Bat Project (feeding into DBRC)
Small mammals											Low numbers and density of records, Cornwall County Atlas, may be better records in ERCCIS, although possible duplicates with NBN. Surveys from CEC and CWT provide further information
Higher mammals such as Badger, Fox, Hedgehog and Deer											Low numbers and density of records, Cornwall County Atlas, may be better records in ERCCIS, although possible duplicates with NBN
Amphibians e.g. frogs and toads											Low numbers and density of records. Limited other surveys vis CEC and CWT. May be better represented in the ERCCIS dataset.
Reptiles e.g. Adder, Grass Snake and Slow Worm											Low numbers and density of records
Fungi											Low numbers and density of records. A small number of surveys for planning from CEC

Saproxylic invertebrates											Low numbers and density of records
Birds											High number of records, National Trust birds surveys, and annual Chough Count. RSPB data on seabirds
Fish											Low numbers and density of records
Habitat/ Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Overall level of information and comments**
Habitats related to landscape character											
All habitats - general											Extensive surveys for Areas A1 and A7, due to a large extent of designations (SSSIs and SACs). Many site-based general ecological assessments from CEC and CWT
Heathland											Extent mapped and some localised surveys e.g. National Trust around St Agnes. Good survey information from Air Point to Carrick Du, Godrevey Point to St Agnes and Cligga Head SSSIs.
Coastal habitats (including dunes)											Extent mapped. Some SSSIT citations and studies by the National Trust, and projects like Dynamic Dunescapes and Making Space for Sand
Woodland											Extent mapped and some localised surveys e.g. The National Trust and for CWT reserves
Nature-rich grassland											Extent mapped. Limited surveys by the National Trust and CWT

Wetland/ Fen/ Marsh											Extent mapped, Wetlands surveyed for Area A1 as part of Penwith Moors SSSI designation.
Rivers and Streams											Extent mapped, Some EA work on Tamar River
Ponds											Extent possibly mapped for larger features
Intertidal habitats (mudflats/ Littoral)											Extent mapped. Some information is available for SSSI and SAC for area 10
Cornish hedges (outside Mineworker's smallholdings)											Extent mapped via CEH and ERCCIS layers
Quarries/ quarry lakes											Extent of habitats spatially mapped,
Other											

6.1. Summary of species records

Species records were found to be quite inconsistent and patchy across the World Heritage Site, with a distinct focus on some habitats over others. For example, the available species data showed a strong focus on heathland, but less on open habitats, despite the potential for bare ground and open habitats to host rare species. In terms of species records, recorder effort was a major factor, and the number of records, therefore, does not reflect species population density. There is a significantly higher density of species records in some WHS Areas than in others, and certain more popular species groups, such as vascular plants and birds, are much better recorded than others. Two of the main species datasets, ERICA and the National Biodiversity Network (NBN), were analysed as part of the study. Records were also obtained from the Devon Biological Records Centre for Area A10. ERCCIS data was not obtained because of data charges (See section 5). As a result, bats and mammals may be underrepresented in the species records.

6.1.1. NBN data

Birds, vascular plants and lepidoptera (butterflies and moths) are the major groups most recorded in the WHS. All other species appear relatively under-recorded. Major species groups with fewer than 1000 records in the WHS, where recording efforts may require the greatest increase, are bats, fish, amphibians, and reptiles. Amphibians and reptiles seem particularly under-recorded, with fewer than 200 records each. The data analysis examined all species groups and also looked specifically at species protected under the Natural Environment and Rural Communities Act (NERC Act) 2006 (Section 41 Species of Principal Importance). [17]

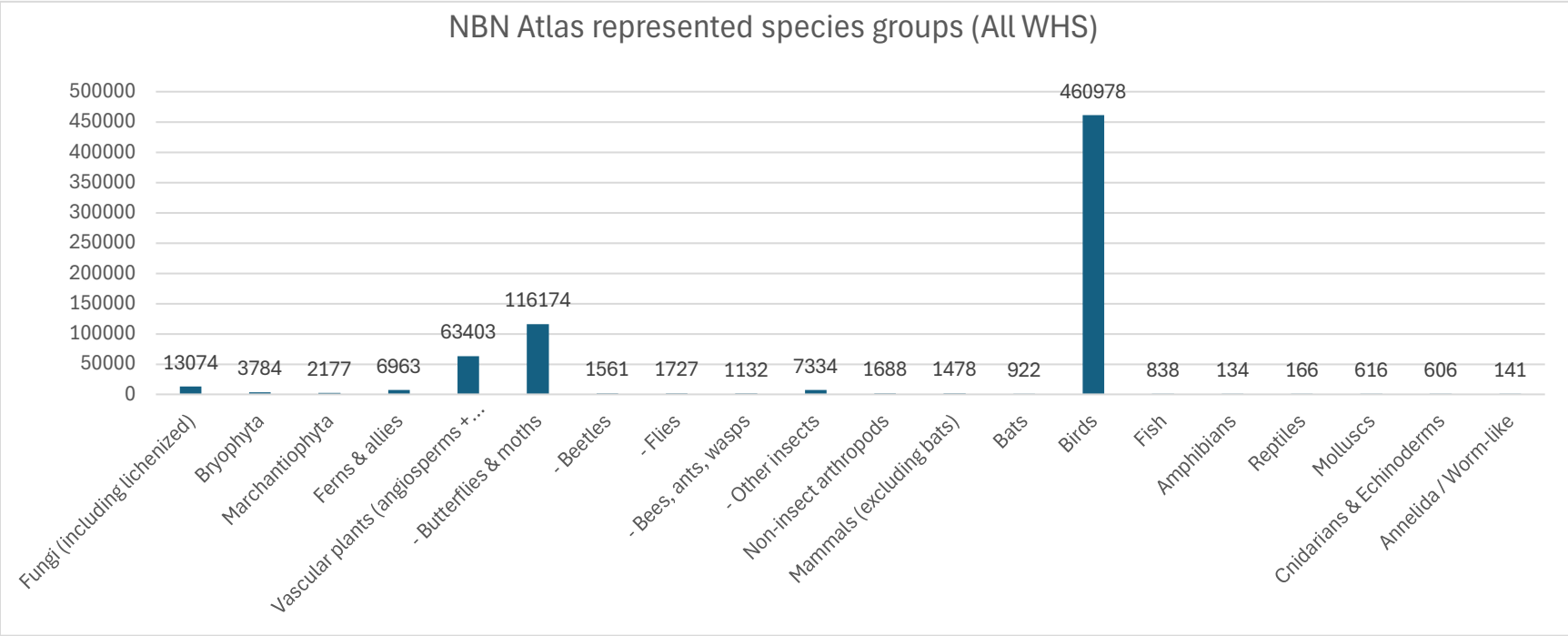


Figure 1. NBN Atlas species records (All post -2000 records)

[17] https://www.gov.uk/government/publications/habitats-and-species-of-principal-importance-in-england

The data shows that some Areas contain significantly more records per hectare than other WHS Areas, and this is probably due to recorder effort in these Areas (rather than a lack of species to record). A3ii has the most recorder effort by quite some margin, followed by A2. The next most recorded were A6ii, A3i, A5 and A10i. A10ii. A8i. Areas A8ii, A5ii, A5i, and A10ii were the poorest-performing Areas, all with fewer than 2 records per Ha. A5i was the worst performer overall, with only 0.33 records per hectare.

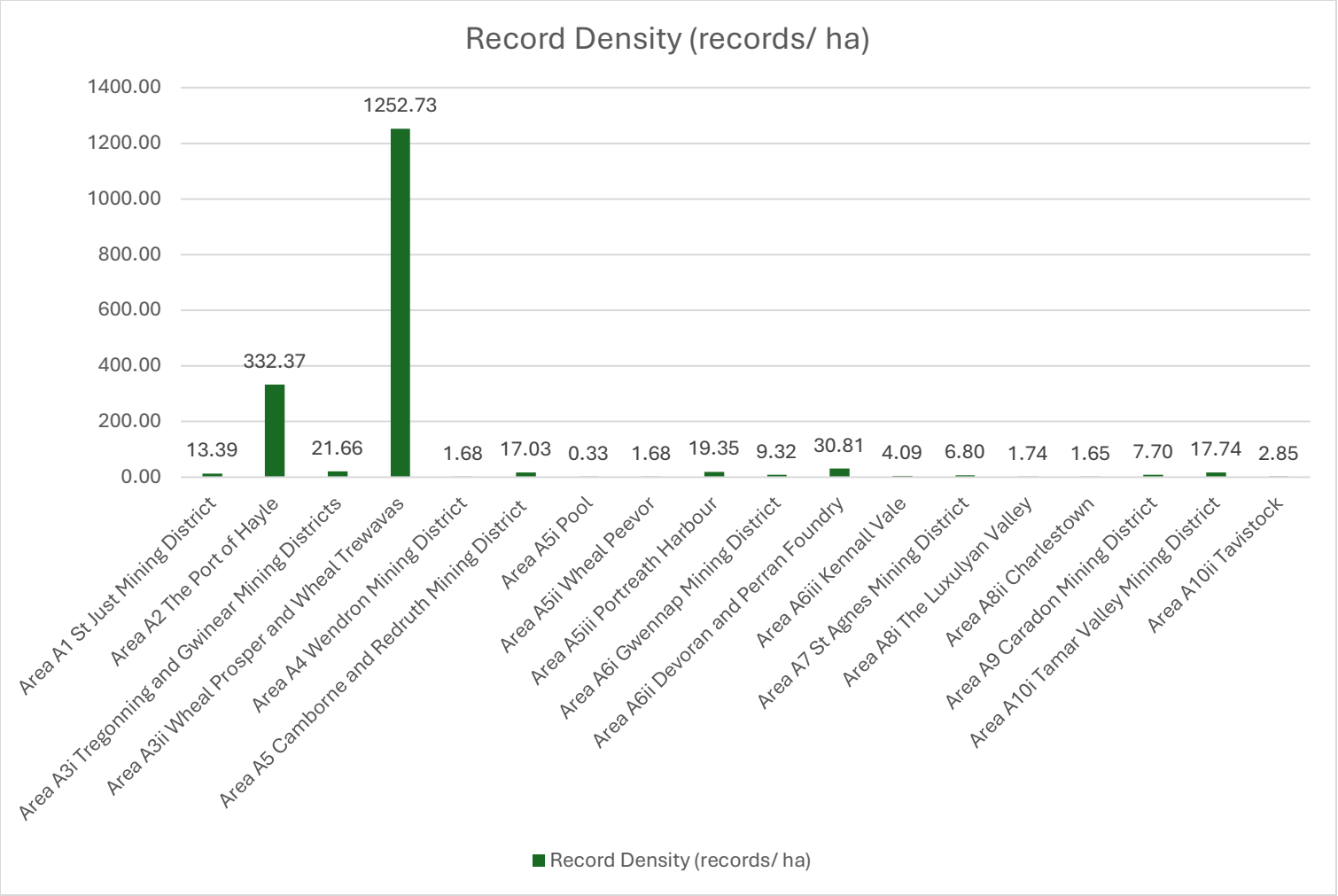


Figure 2. Species record density (records per Hectare) per WHS Area (NBN Atlas)

The picture follows a similar pattern for the NERC Act Section 41 species records, though there is a slightly lower density of S41 species in urban areas and in Area A4, Wendron District, though the reason for this isn't clear. Record density was also low in Areas A8i and A8ii.

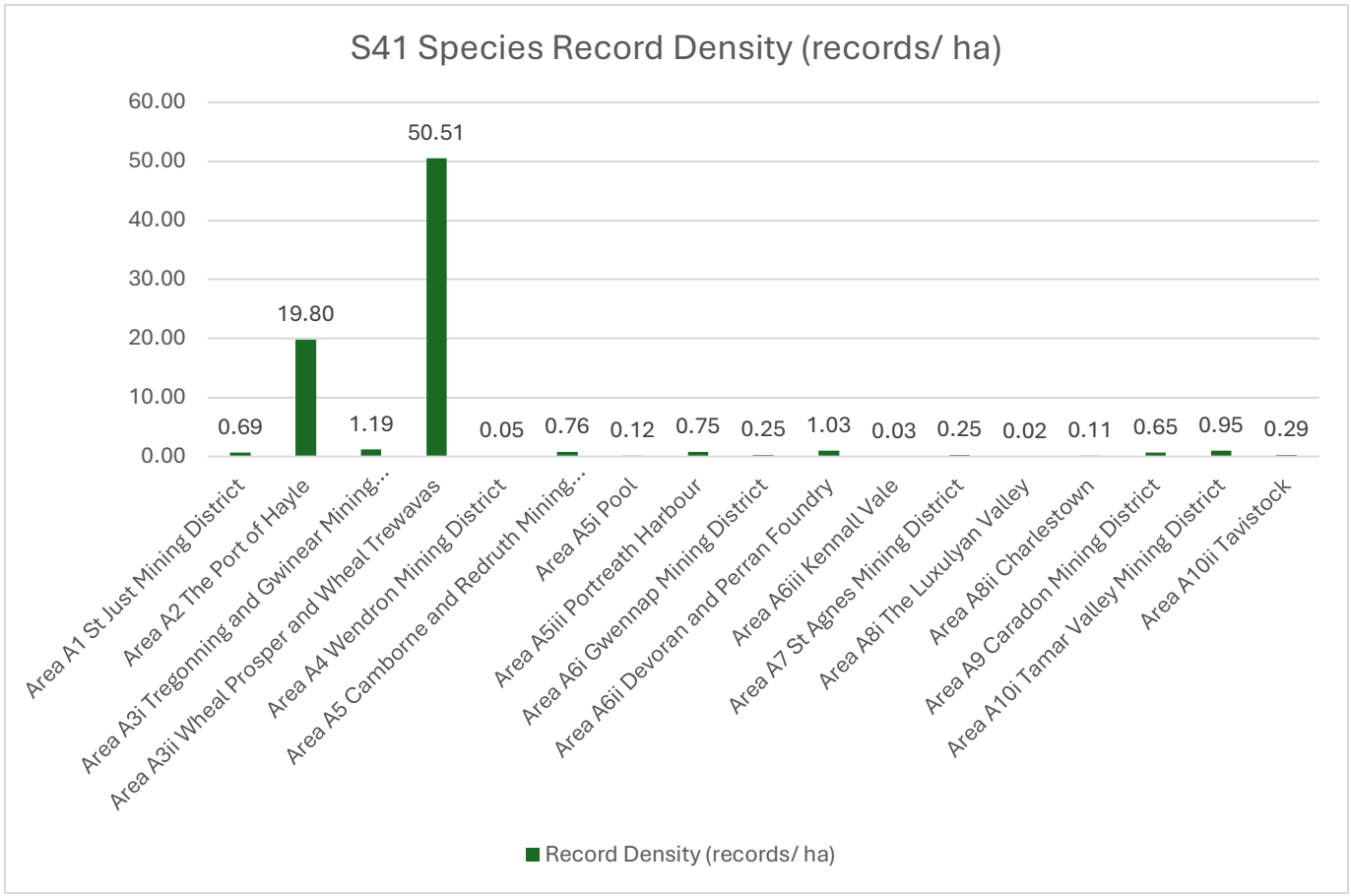


Figure 3. Species records density (records per Hectar) per WHS Area (NBN Atlas S41 species)

6.1.2. ERICA

Similar to NBN, the largest number of records in the ERICA database is of vascular plants, followed by moths (micro and macro). Fungi are the next most recorded group, followed by mosses, then beetles, and spiders. Like NBN, amphibians and reptiles are among the lowest recorded groups. ERICA contained very few bird records.

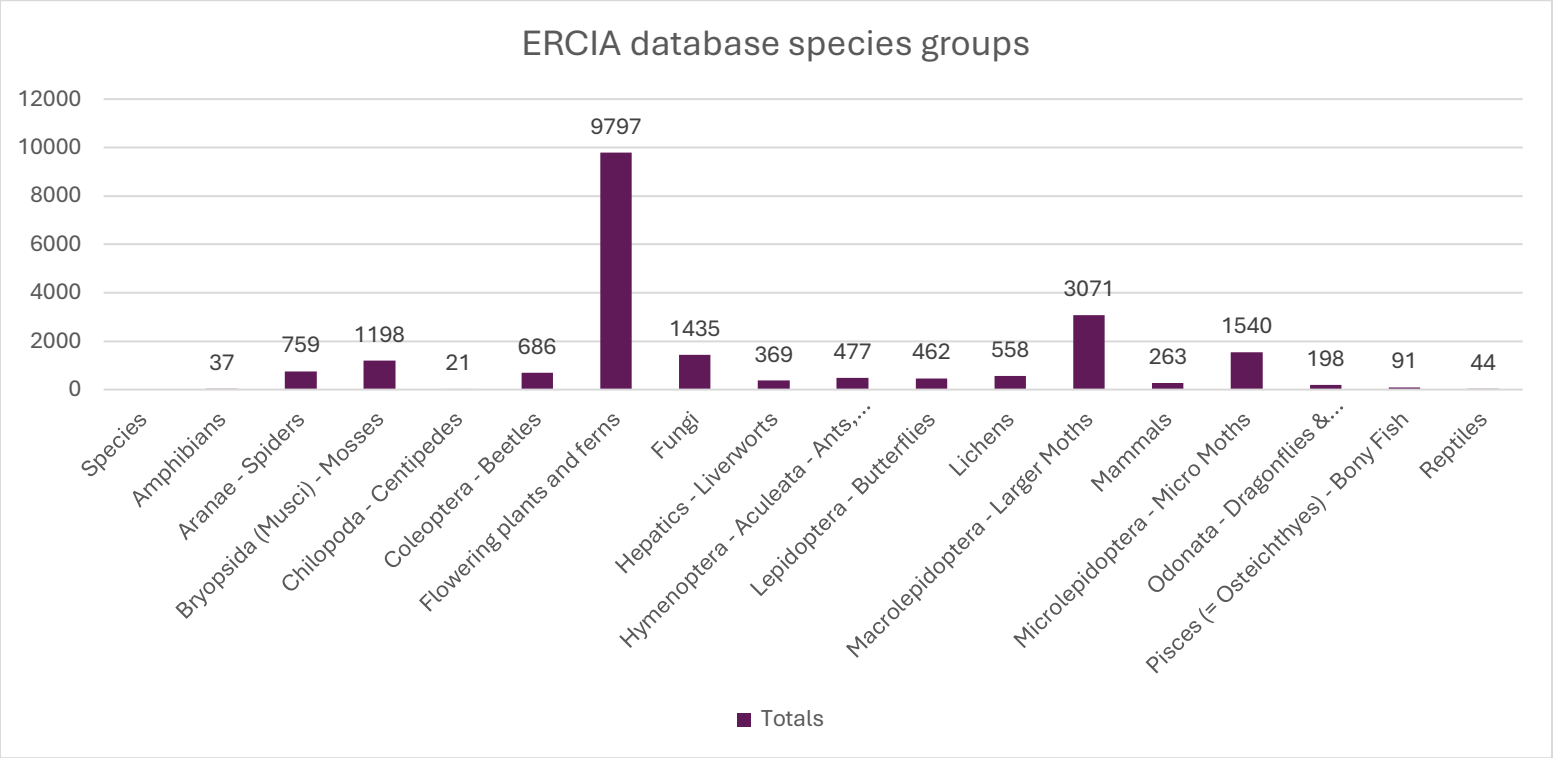


Figure 4. ERICA database species records (All post -2000 records)

Recorder effort is slightly different to the effort reflected by NBN, indicative of different recorders feeding into each database. A2 is high for both ERICA and NBN, with A8 and A5 the next highest for ERICA. Unlike NBN, Area A3 has the lowest record density, closely followed by A10.

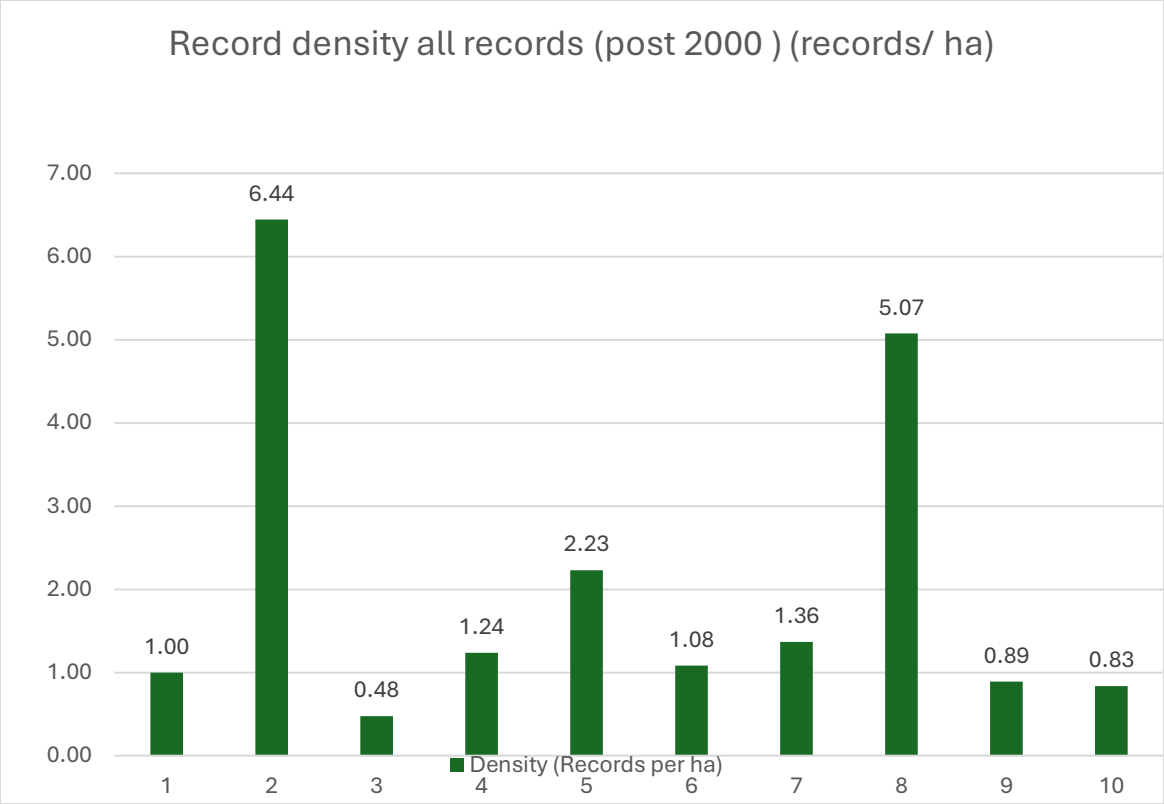


Figure 5. Species records density (records per Hectare) per WHS Area (ERCIA)

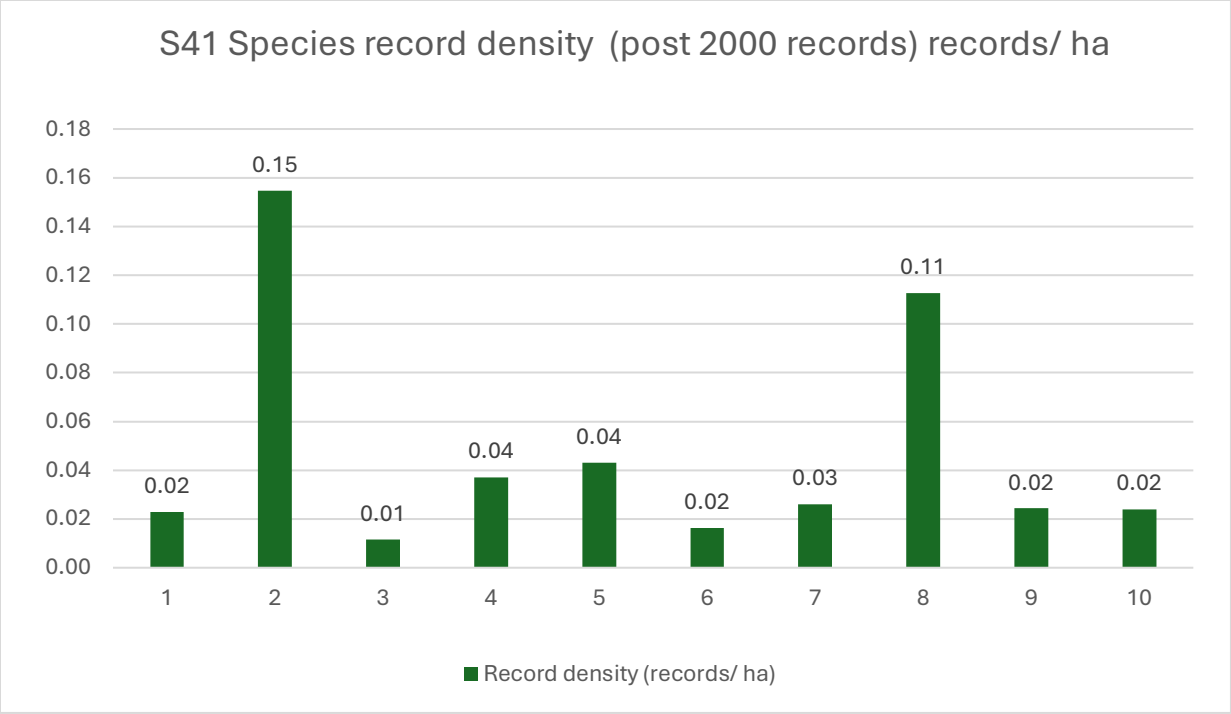


Figure 6. Species records density (records per Hectare) per WHS Area (ERCIA S41 Species)

6.1.3. DBRC

The Devon Biological Record Centre records for species on the Devon side of Area A10 were analysed. There were a total of 1986 post-2000 species records, of which the largest proportion were plants at 1368, followed by bats at 335. Behind this were ferns, mammals and invertebrates, with very low levels of all other major groups.

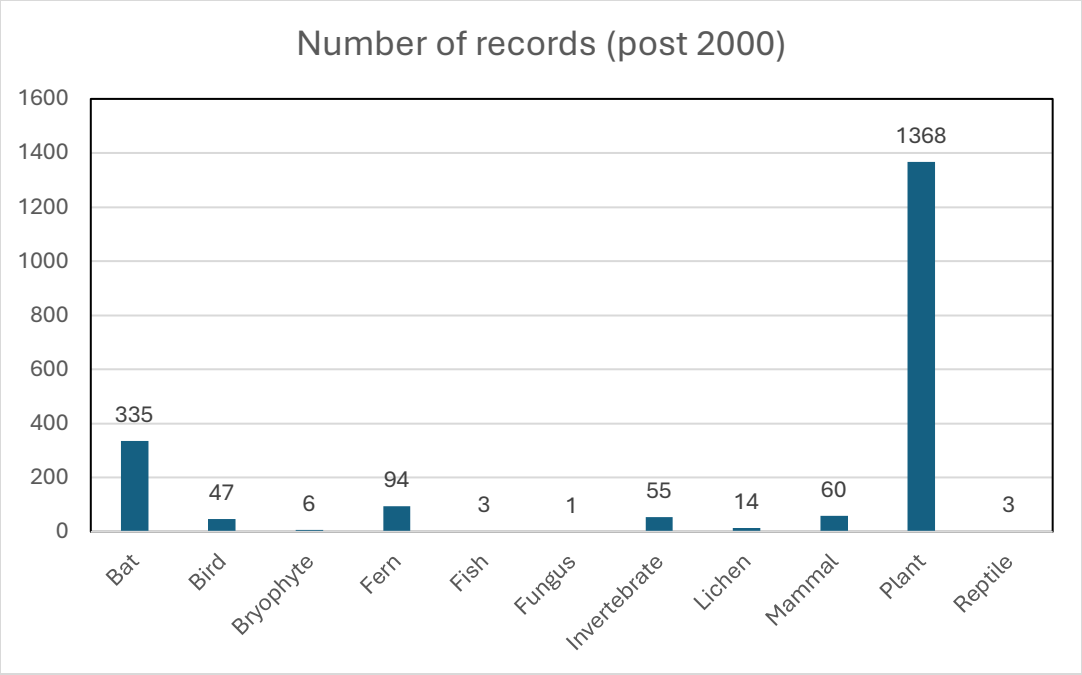


Figure 7. DBRC species records (All post -2000 records)

Table 8. Species record density – DBRC records

Approximate area of Devon side of WHS Area A10 = 1486.69 Ha	
Density of species records (all post 2000 records)	1.34 records/ Ha
Density of species records (S41 post 2000 records)	0.17 records/ Ha

7. WHS Statements of Significance

7.1. Statement of Significance content

As part of the ecological audit, a 'Statement of Significance' has been produced for each of the Areas of the World Heritage Site. The Statements of Significance are provided in **Appendix 4** and summarise the main national and local designations, species, land cover and opportunity mapping available for the ten separate Areas of the Cornwall and West Devon Mining World Heritage Site. The main ecological reasons for these designations have been summarised, and the species contributing to the designations, or other species of conservation interest, whether listed in the UK Red Data Book or a Section 41 species, have been included. Species records obtained from the National Biodiversity Network database or the Cornish Biodiversity Network (ERICA) database are summarised for the Natural Environment and Rural Communities Act 2006 Section 41 protected species.

In short, the Statements of Significance summarise the following

- key aspects of Sites of Special Scientific Interest (SSSI) citations,
- other designations such as nature reserves, and County Wildlife Sites
- other priority areas identified by conservation bodies, such as Buglife's B-Lines mapping and the RSPB's Priority Landscapes
- land cover in terms of the semi-natural habitats present within the Area
- protected species recorded for the Area.
- the key opportunities for nature recovery, as described in the Cornwall Local Nature Recovery Strategy and the draft Devon Local Nature Recovery Strategy (currently under consultation).
- profile by Area in Ha and % the designations, habitats, and proportions of land within a Countryside Stewardship agreement.

7.2. Accompanying maps

Each Area Statement of Significance is accompanied by a Geospatial PDF map that shows the information described in the statement. The PDFs contain spatial data, enabling users to toggle layer visibility, examine the attributes of points and polygons on the map and take measurements. The maps also contain point-species records for all NERC Act Section 41 protected species from the NBN Atlas and the Devon Biological Records Centre.

The Geospatial PDF maps for each Area from **Appendices 5.1 to 5.10**

7.3. Developing the Area Profiles

The areas of designation, priority areas and land cover (habitats) have been profiled for each WHS Area. The area of each dataset was calculated in QGIS (3.44) using the OSGB36 British National Grid (27700) projection, and distances were calculated in metres. This means that some area calculations may differ slightly from those stated in the original citation documentation, due to different methods used to calculate area. For example, the total area covered by the habitats data (Living England 2022 Map) is generally smaller than the areas of each WHS Area. This is because the WHS boundary extends slightly further out from the coast than the Living England data coverage. The most significant difference is seen between Areas A1 (St Just Mining District) and A7 (St Agnes Mining District), which have the most extensive coastlines.

Table 9. Profile of designations, priority areas in terms of area (ha) and percentage cover (%) for the whole of the World Heritage Site

Designation	**Area within the WHS (ha)**	**Area within the WHS (%)**
Buglife B-lines	7510.17	38
Buglife Important Invertebrate Area (IIA)	2675.36	14
Mid -Tier Countryside Stewardship	3240.57	16
Higher-Tier Countryside Stewardship	969.11	5
Devon County Wildlife Site (DBRS)	227.67	1
Devon Other Sites of Wildlife Interest (DBRS)	17.02	<0.5
Devon Unclassified Wildlife Sites (DBRS)	74.70	<0.5

Cornwall County Wildlife Sites (ERCCIS)	2854.95	14
Local Nature Reserves (LNR)	147.07	1
Marine Conservation Zone (MCZ)	49.65	<0.5
National Landscapes	7281.99	37
RSPB Important Bird Area (IBA)	2333.00	12
RSPB Priority Landscapes	185.10	1
RSPB Reserves	78.99	<0.5
Sites of Species Scientific Interest (SSSI)	1833.79	9
Special Areas of Conservation (SAC)	349.54	2
Special Protection Area (SPA)	30.41	<0.5
Total	**19709.66**	**100**

Table 10. Profile of land cover (habitats) in terms of area (ha) and percentage cover (%) for the whole of the World Heritage Site (source Living England 2022, Natural England)

Primary Habitat	Area within the WHS (ha)	Area within the WHS (%)
Arable & Horticultural	2765.24	14
Bare Ground	371.52	2
Bare Sand	58.17	<0.5
Bog	41.46	<0.5
Bracken	889.42	5
Broadleaved, Mixed & Yew Woodland	2295.19	12
Built-up Areas & Gardens	2228.93	11
Coastal Saltmarsh	79.06	<0.5
Coastal Sand Dunes	16.47	<0.5
Coniferous Woodland	439.47	2

Dwarf Shrub Heath	1899.73	10
Fen, Marsh & Swamp	260.90	1
Improved & Semi-Improved Grassland	2588.24	13
Scrub	1659.52	8
Unimproved Grassland	3872.05	20
Water	221.303	1
Total	**19686.66**	**100**

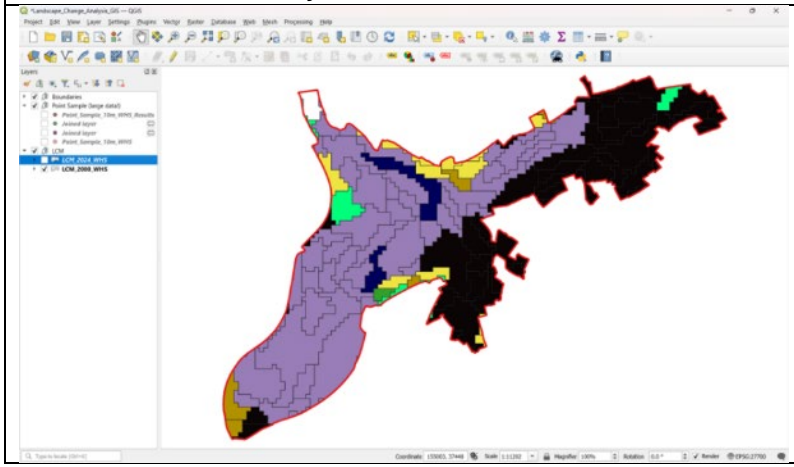
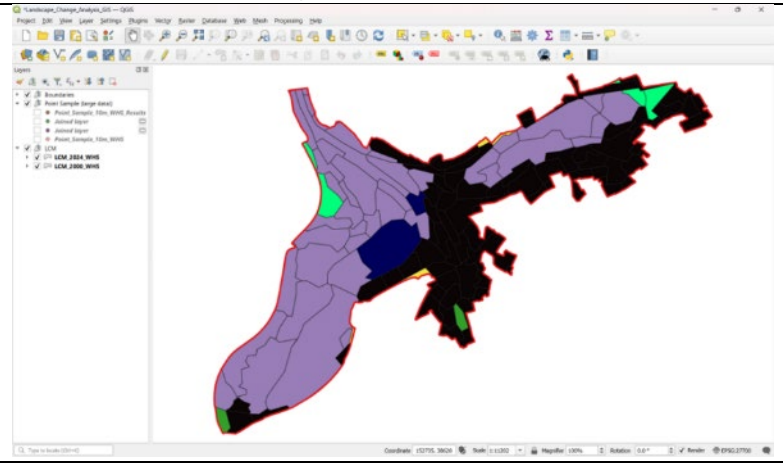
8. Landscape change analysis

Part of the ecological audit examined land-cover change in each WHS Area to determine gains and losses of land-cover types (habitats) at the landscape scale over a 24-year period from 2000 to 2024. The landscape change analysis also shows habitat change; where a habitat has been lost, it indicates which land-cover type(s) it has been converted to. The Landscape Change Analysis mapping showing the comparison between 200 and 2024 is provided in **Appendix 7.1 to 7.10**.

8.1. Landscape change analysis method

The landscape change analysis compared land cover data from the Centre of Ecology and Hydrology[18] for the years 2000 and 2024 by using a stratified points sample every 10m by 10m.

Figure 8. CEH Land Cover map for 2000 and 2024 for Area A2, The Port of Hayle

Area A2, The Port of Hayle, CEH Land Cover 2000	Area A2, The Port of Hayle, CEH Land Cover 2024
	

Change in Land Cover Classification was calculated using the Geographical Information System (QGIS, version 3.44), with data projected

[18] https://www.ceh.ac.uk/data/ukceh-land-cover-maps

to the 27700 OSGB36 British National Grid. Map Units were metres, and the Ellipsoid was set to Non/planimetric.

The Land Cover Map 2000 (LCM 2000) has a 25m-by-25m grid-square resolution, and the Land Cover Map 2024 (LCM 2024) has a higher 10m-by-10 m grid-square resolution, reflecting improvements in remote sensing across the period. LCM 2000 has 22 Land Cover Classes, and LCM 2024 has 21 Land Cover Classes, which can be further categorised into 10 Aggregate Classes.

8.1.1. Sampling Land Cover

Both the LCM 2000 and LCM 2024 layers were clipped to the WHS Boundary layer, assigned each land cover parcel its corresponding WHS Area name (e.g., A1, A2, etc.), and the area in hectares was calculated for each land cover parcel.

A 10 m by 10 m grid of points was created for stratified sampling to extract land-cover classes from the LCM 2000 and LCM 2024 layers. Using the 'Join Attributes by Location' Data Management Tool, the land cover parcel Class from the LCM 2000 and then the LCM 2024 data was sampled for each point to create a new layer detailing the land cover classes for each period. Finally, we calculated the total number of sampling points for each land cover Class and each WHS Area, then divided this number by 100 to get the estimated hectare coverage (number of points multiplied by 10m x 10m to get the estimated area, then dividing this area by 10,000 to get hectarage). The results are presented using the LCM 2024 Aggregate Classifications, reclassifying the LCM 2000 Classes accordingly to match the equivalent LCM 2024 Aggregate Class (see Table below).

For each WHS Area, the land cover Aggregate Class with the largest change was ground-truthed by comparing satellite imagery in Google Earth Pro from 2000 to 2024 and with the Living England layer (2022) from Natural England (see 9.2.1 below0

Table 11. Land Cover Map Aggregate Classes in LCM2024 and the corresponding Classes in LCM2000.

	Aggregate Class	LCM2024 Class	LCM2000 Class
1	Broadleaf Woodland	Deciduous Woodland	Broadleaved/Mixed Woodland
2	Coniferous Woodland	Coniferous Woodland	Coniferous Woodland
3	Arable	Arable	Arable cereals, Arable, Horticulture, Non-rotational Arable
4	Improved Grassland	Improved Grassland	Improved Grassland
5	Semi-natural Grassland	Neutral Grassland,	Neutral Grassland, Calcareous

		Calcareous Grassland, Acid Grassland, Fen	Grassland, Acid Grassland, Fen, Marsh & Swamp
6	Mountain, Heath & Bog	Dwarf Shrub and Heath, Bog, Inland Rock	Bracken, Dense Dwarf Shrub Heath, Open Dwarf Shrub Heath, Bogs, Inland Bare Ground
7	Saltwater	Saltwater	Sea/Estuary
8	Freshwater	Freshwater	Water (inland)
9	Coastal	Supralittoral Rock, Supralittoral Sediment, Littoral Rock, Littoral Sediment, Saltmarsh	Supra-littoral Rock, Supra-littoral Sediment, Littoral Rock, Littoral Sediment, Saltmarsh
10	Built-up Areas & Gardens	Urban, Suburban	Suburban/Rural Development, Continuous Urban

8.2. Landscape change analysis results

The results of landscape change for each individual WHS Area are detailed within **Appendix 4 Statements of Significance.**

Overall, for the WHS combined, the biggest Land Cover changes indicated by CEH Land Cover are as follows

- Improved Grassland (increasing),
- Semi-natural Grassland (decreasing) and
- Arable (decreasing).

The biggest increase in Improved Grassland (by 3742 ha) is mirrored by very similar areas in the reduction of Semi-natural Grassland (by 3026 ha) and Arable (by 2382 ha) Land Cover Classes. It is unlikely that all these changes in area can be attributed to changes in arable rotations towards Improved Pasture systems over the last 24 years. All the separate WHS Areas saw a reduction in Arable and Semi-natural Grassland Land Covers and an increase in Improved Grassland. Further investigation into the reasons behind this would be beneficial. The area of Mountain, Heath & Bog (by 800 ha) also increased across all WHS Areas, potentially due to the inclusion of the land class of Bracken in this category, which indicates Bracken encroachment. However, further investigation into this would be beneficial.

Built-up Areas & Gardens increased overall by 35 ha across the WHS, although it was a mixed picture across the individual WHS Areas, with no overall trend for increases in the Land Cover Class. It is unlikely that Built-up areas were converted to other Land Cover Types over the last two decades, and this change in area may be due to errors in classifying these Land Cover Types across datasets. Further investigation would be required before reaching firm conclusions.

Broadleaf Woodland increased (by 475 ha), with a small decrease in Coniferous Woodland (7 ha). Whether these changes are due to ecological succession over the last 25 years, active tree planting, or the way these two woodland types were classified using satellite imagery in the two time periods would require further investigation. The Forestry Commission policy of increasing broadleaved woodland relative to conifers and buffering conifer plantations with broadleaves may have had an impact. (e.g. the apparent change in 22ha in Area A8 from Coniferous to Broadleaf Woodland).

Overall, there are some interesting trends in Land Cover Change across the WHS over the last two decades, a reduction in the amount of Semi-natural Grassland and the potential encroachment of bracken could have a significant degrading impact on biodiversity in general. The impacts of changes in farming practices, from Arable to Improved Pasture, would require further investigation. Alternatively, increases in Heathland and Deciduous Woodland Land Covers would be considered positive for Biodiversity in general (but would require verification).

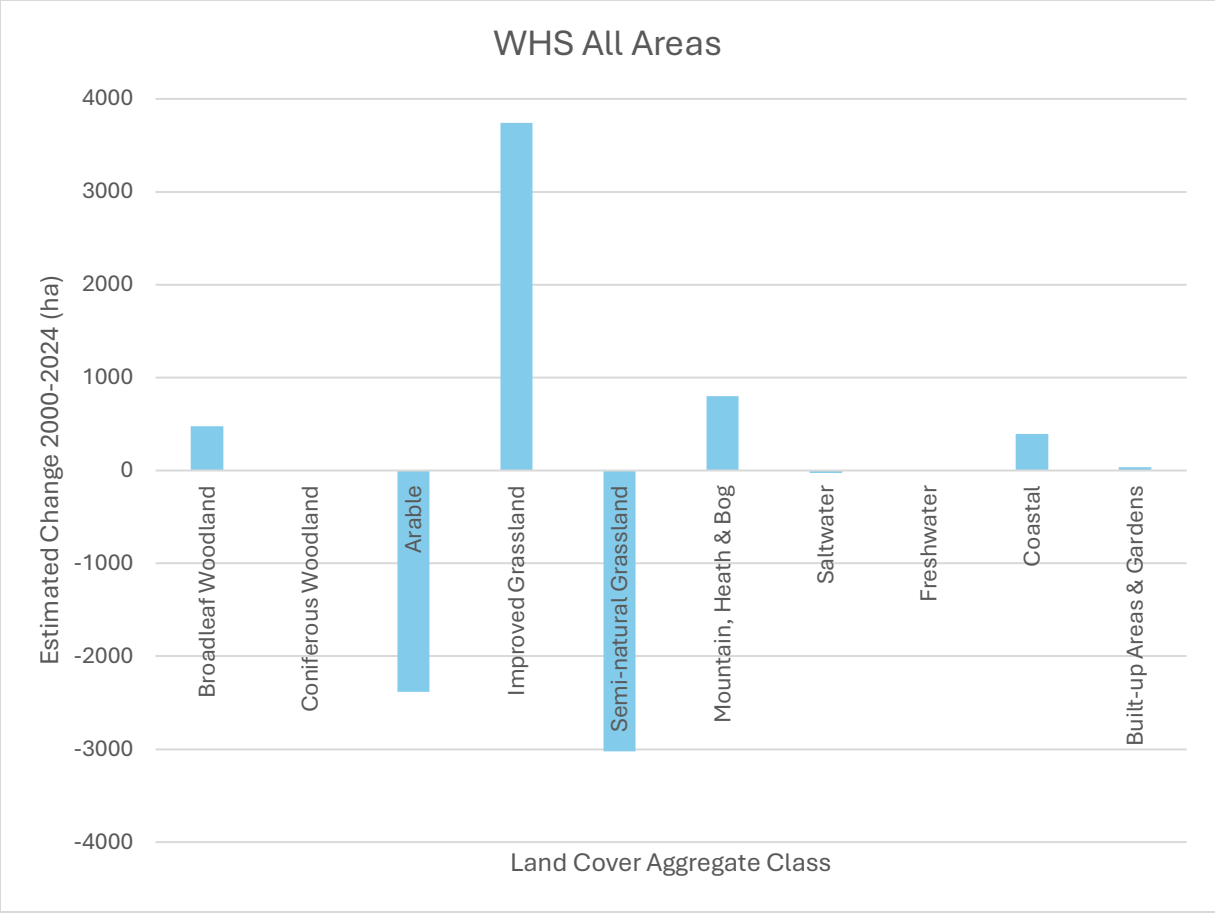


Figure 9. Land Cover changes for all World Heritage Site Areas combined (hectares) between the years 2000 and 2024

(source CEH Land Cover).

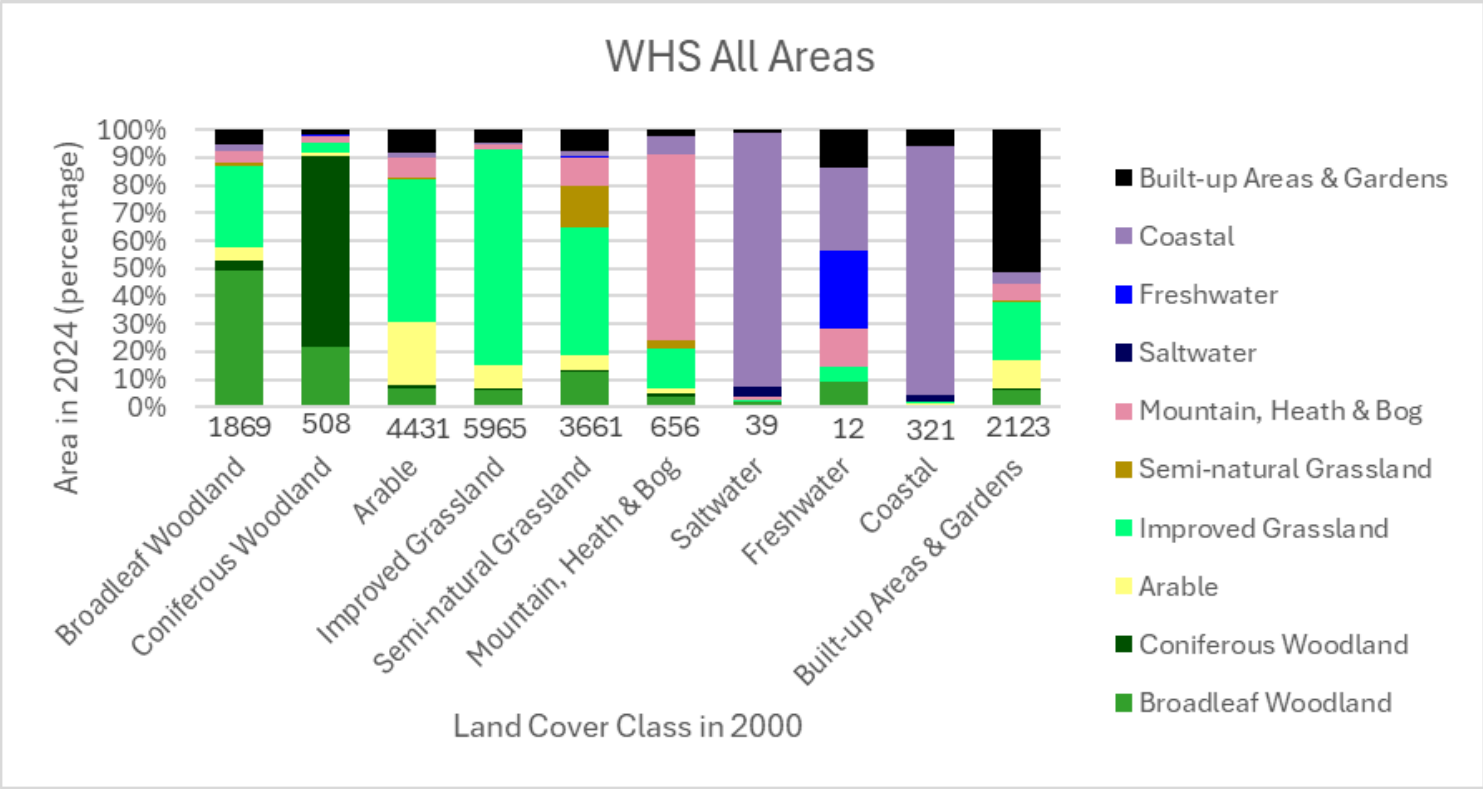


Figure 10. Overall results of the Landscape Change analysis

Each bar represents a Land Cover Class in the year 2000 (total area in hectares displayed at the bottom of each bar) and any subsequent percentage change in Land Cover Class by the year 2024 (using CEH Land Cover Map data).

8.2.1. Results of ground truthing

The ground-truthing results are set out in detail in **Appendix 6**. Checks against the CEH Land Cover 2000 and 2024 layers, using the Living England 2022 layer and the historic aerial imagery available in Google Earth Pro, revealed many inconsistencies between these datasets

and the CEH Land Cover data. This means that the results of the landscape change analysis should be regarded as relatively unreliable and used with appropriate caveats.

9. SWOT analysis

The process and results of the ecological audit have been carefully examined to identify current strengths to build on, weaknesses to overcome, and opportunities to improve the recording and management of nature in the World Heritage Site. The SWOT analysis also examined current threats to nature, as highlighted by the Cornwall and Devon Local Nature Recovery Strategies, and these may be addressed in future work. The SWOT details the lessons learned from the project and serves as a platform for follow-on work.

9.1. Strengths

The audit of information has demonstrated that there is a broad range of interesting and often rare habitats and species that are strongly associated with the Outstanding Universal Value (OUV) of the World Heritage Site

The maintenance and management of some habitats for their biodiversity value is largely consistent with the management requirements of the OUV features and landscape attributes of the WHS, meaning that benefits for nature are possible when investing in the management of heritage features and landscapes.

Several clear threads have emerged from the audit, which could be a focus of further work for the WHS team and partners, including

- The nature value of mine structures and their associated species
- The unique nature of linear features created by mining and their role as green corridors,
- The variety of other habitats across the designation

These clear themes are explored in the opportunities section 7.2 below.

The information gathered by the audit will be an important resource, providing a solid foundation for the WHS to move forward. It provides a basis for discussion with WHS partners and other ecological organisations and groups in Cornwall and Devon, grounded in evidence. Despite inevitable gaps in information, sufficient data has been gathered to identify strengths and weaknesses, and, importantly, opportunities for further work.

9.1.1. Strengths – habitats and species

The Cornwall Local Nature Recovery Strategy highlights that contaminated land allows areas to remain open and suitable for rare plants." Contaminated land is also a critical habitat for certain invertebrates such as predatory insects, solitary bees and butterflies. The Ecological Audit has demonstrated that the World Heritage Site contains a number of priority habitats and species groups that result directly from mining activity shaping the landscape. The habitats and species associated with the Outstanding Universal Value represent a key strength, where the management of the World Heritage Site and nature conservation are directly aligned.

From a habitat's perspective, there is a good amount of habitat mapping available, collected at different points in time, to provide a clear indication of the pattern and distribution of semi-natural habitats within the designation and to enable change assessments of extent. Datasets include

- Living England 2022 (Natural England)
- Centre for Ecology and Hydrology Land Cover 1990, 2000, 2007, 2015, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024
- Centre for Ecology and Hydrology Land Cover Change 1990-2015
- Devon Combined Habitats Layer
- ERCCIS Land Cover Maps 1988, 1995, 2005
- Natural England Priority Habitats Inventory
- Ancient Woodland Inventory

The habitat mapping is further strengthened by specific surveys, particularly for SSSI designations and some ecological surveys undertaken by the Cornwall Wildlife Trust. There is good crossover between the WHS geography and some of the most extensive SSSIs (such as the recently designated Penwith Moors SSSI). The designation citations for SAC, SSSI and County Wildlife Site are important references when determining value. The World Heritage Site designation, while not in itself an indicator of ecological value, will have achieved protection for the habitats and species within the boundary, particularly those associated with OUV.

Outside of designations, standalone habitat surveys have been carried out for sites in National Trust ownership, such as Cotehele and Levant Mine. Surveys are also available for those carried out as part of individual projects, such as Plantlife's Temperate Rainforest survey. While habitat condition surveys are a little thin on the ground, there is good information on heathland and coastal habitats, which are the

most extensive habitats covered by the SSSI designations. In particular, Area A1 sees the highest levels of information from the recent designation of the Penwith Moors SSSI.

9.1.2. Strengths – Recording groups

There is a busy and active recording landscape in Cornwall, taken forward by several key and often voluntary groups, including

- Botanical Cornwall Group
- Cornwall Butterfly Conservation
- Cornwall Reptiles and Amphibians Group (CRAG)
- Cornwall Mammals Group
- Budding Nature
- Cornwall Bryophyte Group
- Cornwall Moth Group
- Cornwall Bat Group
- Devon Bat Group
- Cornwall Fungus Recording Group
- Cornwall and Isles of Scilly Federation of Biological Recorders
- Cornwall Birds
- Devon Bat Group
- Devon Moth Group
- Devon Fungus Group
- Devonshire Association Botany
- Devonshire Association Entomology
- Devon Bryophyte Group
- Devon Birds

Most local groups feed into the local record centres – the Devon Biological Records Centre, the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS), and ERICA (Cornwall Biodiversity Network). Many of these groups also feed into national groups

to which they are affiliated, such as the Bat Conservation Trust's National Bat Monitoring Programme and the Botanical Society of Britain and Ireland (BSBI). Many local and national groups and organisations feed their data into the National Biodiversity Network (NBN) Atlas, a comprehensive database of species records for the UK that holds a significant number of records for the WHS. The NBN Atlas data is available to download, clipped to the designation boundary.

Recording is especially strong for vascular plants and birds, with significantly more NBN records than for other databases. The RSPB also holds significant information on bird populations, particularly for important seabirds. Bryophytes are reasonably well recorded through SSSI surveys and individual projects, such as Natural England's 2015 project on Cornish Path Moss. Lepidoptera (butterflies and moths) are also quite well recorded through several active butterfly and moth groups. Areas A2, A8 and A3ii are the most densely recorded Areas.

9.2. Weaknesses

The work to gather information for the WHS ecological audit has revealed several weaknesses in the availability and extent of data held by various parties on nature within the designation.

Weakness	**Explanation**
Overall, low levels of information and a significant number of gaps	The ecological audit has revealed a significant data shortage for most habitats and species in each WHS Area (See Section 6 for more information). Aside from the heathland in Area A1, information levels can be improved across all Areas and habitats, particularly those listed in Table 6. All species are poorly recorded, although birds and vascular plants are better recorded than other groups. (see section 6.1)
Patchy levels of response to requests for information	Many local and national organisations and groups were contacted as part of the study, with varying response rates. Because not all organisations and groups responded, and some provided partial or no responses, the true extent of the survey information and research cannot be fully known. Potential reasons for the patchy response rate include organisational capacity issues, record-keeping issues, the complexity of filing systems, or inconsistent recording of surveys and project-related information.
Lack of scientific research/ age of research	The gazetteer revealed that while there was some survey information on habitats, species records as detailed above, and good spatial mapping of habitats to a certain scale, there was much less scientific research on the nature value of habitats associated with the OUV of the World Heritage Site. The greatest contributions to the research space have been made by Adrian Spalding and his

	associates, particularly on invertebrates and contaminated land within the World Heritage Site. Much more research could be undertaken on all aspects of the nature value of the OUV, working in partnership with the Universities. Much of the available research is relatively old, and there is a need to update research across the board.
Disparate nature of information and lack of strategy around information	There is no readily available list of surveys across Devon or Cornwall, nor is there a single repository for surveys or research. This means that approaches must be made to individual organisations and groups to ascertain what is held, which is time-consuming. The World Heritage Site Ecological Audit is unusual in its strategic approach to determining the range of data held for key habitats and species. This has not been carried out generally within Devon and Cornwall, so there is no prioritisation or coordination of survey effort or research. Studies and surveys are species-led or are carried out to meet the aims of individual projects, rather than as part of a coordinated approach to monitoring the state of nature.
Data conflicts, mismatch and assessing change	Many datasets, for example, the various habitat maps, are not generated using the same method, which makes comparison between them difficult. Datasets span different periods, with many now quite old; for example, the 2005 Land Cover is 20 years old, so confidence in the dataset is reduced. The Devon Combined Habitats layer is an amalgamation of several data sets and is updated over time as new surveys are carried out, making it difficult to use for snapshot-in-time comparisons and for monitoring land cover change. On reviewing the opportunities layers for the Local Nature Recovery Strategy, multiple objectives were often listed within the opportunities layers, and there were some instances where the listed objectives may not be appropriate to conserve some of the habitats aligned with the OUV of the World Heritage Site, for example, LNRS objectives for tree planting in areas of contaminated land with important bryophytes. The results of the ground-truthing work carried out for the Landscape Change Analysis (see Appendix 6) show a high degree of disagreement among the different spatial habitat layers. The CEH Land Cover maps showed a high degree of inconsistency relative to aerial photographs, and when compared with Natural England's Living England layer (2022). However, the CEH Land Cover maps remain the only layer for which different years are available to assess change. The landscape change analysis could be repeated when the Living England layer is updated, as it is considered more accurate. Similarly, if ERCCIS updates the Cornwall Land Cover 2005 map, this is also thought to be more accurate than the CEH layers.
Data charges and availability	All the local species records repositories charged a fee for species records and spatial datasets, such as County Wildlife Sites mapping and citations. While some national spatial habitat mapping

	was free of charge, for example, Natural England's Living England and Priority Habitats Inventory layers, the Centre for Ecology and Hydrology also charged for their Land Cover data. The total cost of data was not justified in the audit, so the most expensive dataset, the ERCCIS species data, was not purchased; it could be purchased as part of any future targeted work. Many local groups contribute their records to the NBN Atlas, which is freely available. The Cornwall Bat Group and Mammals group feed their records into ERCCIS, and so these species groups may be under-represented within the audit, although they do feed into national affiliated organisations, which may also feed into the NBN. The NBN data was freely available as a CSV download from the NBN Atlas. Latitude and longitude information enable the point data to be mapped in GIS. The ERICA database is a standalone product which enables the examination of the data against other mapped data within ERICA. Tables exported from ERICA do not contain spatial identifiers and therefore cannot be mapped within external GIS systems. The National Biodiversity Network was by far the largest species dataset, with over 715000 post-2000 records, while the ERICA database contained 21000 records. There is an overall lack of clarity about which local groups feed records into which databases, and whether some groups contribute to more than one database. This made it difficult to determine whether some records in NBN are duplicated in the ERCCIS or ERICA datasets, and whether there is duplication between ERICA and ERCCIS.
Voluntary nature of local recording groups	The voluntary nature of most species recording groups means that recording occurs in a non-strategic way and is not necessarily focused on the World Heritage Site, tending to focus on nature sites of interest. Relying on volunteers increases the risk of inconsistent effort from year to year, leading to patchy data. There is a risk that groups could be forced to stop due to a lack of volunteer support.
Large size and separate geographies of the World Heritage Site	The large size and disparate nature of the World Heritage Site make gathering data on its biodiversity problematic due to the number of potential data sources, the time required for organisations to retrieve information, the size and difficulty of processing large datasets, and the costs of acquiring comprehensive data.
Consultancy charges for gathering data	While this ecological audit is relatively comprehensive, consultancy fees and a limited audit budget meant that some data sources could not be investigated due to the expected time and cost

	of undertaking them. Two main sources were identified that were not investigated due to time/ cost constraints • Cornwall Council's online planning register for site-based ecological reports and Environmental Impact Assessments produced as part of planning applications. • Unpublished research held by Plymouth and Exeter Universities. While the audit conducted an online search for published papers on ecology within the WHS, it did not contact the Universities for unpublished research, such as that arising from undergraduate and postgraduate dissertations.

9.1. Threats

The threats to mining landscapes and features that support nature are set out in the Cornwall Local Nature Recovery Strategy's specific section on mining landscapes. The Cornwall LNRS lists threats specific to the World Heritage Site outlined in Fig. 11 below. The LNRS does not list development pressure as a specific threat. However, competing land uses and development pressures exist on brownfield sites and in popular recreation areas. Although not listed in the Cornwall LNRS as affecting mining-related habitats and species, the audit steering group highlighted the potential impacts of leisure, recreation, and tourism on certain mining features, which could lead to habitat degradation. Examples include mine and ruin exploration, recently promoted on social media. Works such as access and trail improvements, the creation of new off-road cycle routes, and ancillary development such as cafes have the potential to damage archaeology, open and bare ground habitats, and mobilise contaminants.

The Cornwall Local Nature Recovery Strategy also identifies the potential for habitat creation initiatives to impact the ecology of the World Heritage Site, for example, through tree and woodland planting in other, more open habitats. Smallholdings and their bare stone walls and semi-natural grasslands are under particular threat, potentially since they may not be covered by an ecological designation and are perceived as low-grade 'farmland'. The 19th-century practice of planting over closed mine sites by the large estates is now an element of the OUV that requires careful management to preserve the remaining mine features. However, this would not be appropriate as a practice on unplanted mine workings today.

The Cornwall Nature Recovery Strategy includes opportunity areas for the following habitats

- Coastal Wildbelt
- Farmland, Hedges and Edges - Conservation Arable
- Heath and Moor Mosaics
- Intertidal
- Nature-Rich Grassland
- Rivers and Wetlands
- Rivers and Wetlands - Priority Rivers
- Town and Village Green and Blue Space
- Trees, Woodland and Scrub
- Trees, Woodland and Scrub - Ancient and Veteran Trees

The above habitat opportunity areas are mapped within the World Heritage Site. The areas were developed at a desk-based level using a number of ecological parameters, but may not have considered impacts on the World Heritage Site. Since the opportunity areas are relatively broad-brush, there may be cases where the Cornwall LNRS encourages habitat creation that conflicts with the OUV and existing habitats of value. The opportunity areas are included in the maps that support the audit (Appendices 5.1-5.10), but the opportunity areas should be used with care so as not to adversely affect the features and landscapes of the WHS.

Fig. 11 Specific threats to nature in mining landscapes, The Cornwall Local Nature Recovery Strategy

Contaminated land

"Residual pollutants from industry, such as heavy metals and acidic drainage, can leach into soil posing long-term risks to nearby ecosystems. Polluted substrates resulting from metalliferous mining activities can impede or prevent natural vegetation regeneration due to poor soil quality. ***Encroachment and loss of specialised habitats***

"The legacy of human activity in the landscape, including disused mines and quarries, can provide unique habitats. For example, structures are used as bat roosts in old engine houses and rare plant, and invertebrate communities are associated with post-industrial substrates. A careful balance of management is needed. Clearing and 'tidying up' these sites for public access, such as the removal of substrates, can remove these valuable habitats. Lack of management can lead to overgrowth of vegetation, in particular non-native invasive species, which can outcompete native flora and fauna, leading to a decline in biodiversity."

Tree and woodland establishment

"In some areas, tree and woodland planting may not be in line with the landscape character or heritage designation. All planting should follow the 'Right Tree in the Right Place' principal to align with and enhance the protected and historic landscape character. " The emerging Devon Local Nature Recovery Strategy identifies tree planting as a threat to Wildlife-rich grasslands and Heath, moor, bog and mire mosaics.

Inappropriate management

"The introduction of broad-scale and intensive management can disrupt habitat mosaics, change the character of historic mines and quarries and lead to loss of intangible cultural heritage associated with traditional land management. Conversely, an absence of management can lead to scrub encroachment and the eventual loss of open habitats and heritage assets." The WHS Monitoring Plan describes concern over proposed management for Cornish Path Moss, using heavy plant to create scrapes to 10cm, raising concern regarding disturbance of the mining features and potential damage to archaeological features.

Human disturbance

"Disused locations may attract recreational activities such as off-road driving, or illegal waste dumping, which disturbs and degrades these sensitive environments."

9.1.1. Forces for change more broadly

The Cornwall Local Nature Recovery Strategy and the emerging Devon Local Nature Recovery Strategy identify the following pressures acting on the key habitats and species contained within the WHS.

Table 11. Pressures action on the key habitats and species found within the World Heritage Site, (extracted from the Cornwall and Devon LNRSs

Pressure	Habitat (Cornwall LNRS)	Habitat (Devon LNRS)
Fragmentation and poor condition	Woodland; Nature-rich grasslands	Woodland and trees; Woody mosaics; Freshwater
Lack of management/ abandonment/ neglect/ lack of grazing	Woodland	Woodland and trees; Wildlife-rich grasslands
Climate change	Woodland; Farmland hedges and edges; Rivers and wetlands; Heath and moor mosaics; Nature-rich grasslands; Coastal wildbelt; Intertidal	Woodland and trees; Woody mosaics Wildlife-rich grasslands; Heath, moor, bog and mire mosaics; Coastal wildbelt
Timber processing capacity	Woodland	
Invasive non-native species	Woodland; Rivers and wetlands; Heath and moor mosaics; Coastal wildbelt; Intertidal	Soils and arable; Woodland and trees; Heath, moor, bog and mire mosaics;

		Freshwater; Coastal wildbelt; Green spaces, gardens and buildings
Pests and diseases	Woodland	Woody mosaics; Coastal wildbelt; Green spaces, gardens and buildings
Animal damage	Woodland	
Lack of skills and resources	Woodland	
Land use change	Woodland	Freshwater
Economic challenges	Farmland hedges and edges	
Declining soil health	Farmland hedges and edges	Soils and arable
Agrochemicals	Farmland hedges and edges	Green spaces, gardens and buildings
Loss of semi-natural habitat	Farmland hedges and edges	Soils and arable; Freshwater
Inappropriate management/ land management impacts	Farmland hedges and edges	Soils and arable; Woody mosaics
Changing agricultural policies and funding	Farmland hedges and edges	
Support (lack of)	Farmland hedges and edges	
Removal of boundaries	Farmland hedges and edges	
Disconnection from floodplains	Rivers and wetlands	Freshwater
Water quality/ Pollution and run-off/ excess nutrients	Rivers and wetlands; Heath and moor mosaics; Nature-rich grasslands; Coastal wildbelt; Intertidal	Freshwater; Coastal wildbelt
Encroachment	Rivers and wetlands; Heath and moor mosaics	
Wiers and blockages/ river channel and bed alteration	Rivers and wetlands	Freshwater
Complex land ownership	Rivers and wetlands	
Abstraction and water demand	Rivers and wetlands	Freshwater
Disturbance (and recreational disturbance/ pressure)	Heath and moor mosaics; Nature-rich grasslands; Intertidal	Soils and arable; Heath, moor, bog and mire mosaics; Freshwater; Coastal wildbelt
Land development/ development	Nature-rich grasslands; Town and village greens and blue space	Wildlife-rich grasslands; Green spaces, gardens and buildings
Grazing regimes	Nature-rich grasslands	

Frequency of cutting	Nature-rich grasslands	
Tourism and recreation	Coastal wildbelt	
Coastal development	Coastal wildbelt	
Scrub encroachment	Coastal wildbelt	
Coastal squeeze	Intertidal	
Community disconnection/ support	Town and village greens and blue space	Woody mosaics; Coastal wildbelt
Home improvement	Town and village greens and blue space	
Surface run-off	Town and village greens and blue space	
Verge management/ frequent cutting	Town and village greens and blue space	
Light pollution	Town and village greens and blue space	Coastal wildbelt; Green spaces, gardens and buildings
Fertilisers		Soils and arable
Maize		Soils and arable
Loss and lack of appreciation of low-intensity arable		Soils and arable
Plantation on ancient woodland sites (PAWS)		Woodland and trees
Source of suitable tree stock		Woody mosaics
Legislation/ protection		Woody mosaics
Markets for fruit		Woody mosaics
Root damage, soil compaction and shading		Woody mosaics
Funding		Woody mosaics; Freshwater
Agricultural improvement		Wildlife-rich grasslands
Viable livestock farming		Heath, moor, bog and mire mosaics
Purple moor grass expansion in the uplands		Heath, moor, bog and mire mosaics
Drainage		Heath, moor, bog and mire mosaics
Riparian zone management		Freshwater
Public perception and vandalism		Freshwater
Manipulation of fish stocks		Freshwater
Marine litter and plastics		Coastal wildbelt
Litter		Green spaces, gardens and buildings

9.2. Opportunities

The high value of some habitats within the WHS, particularly those habitats associated with mining features and the rarity of some of the species that utilise these habitats, represent a significant opportunity for the WHS Partnership to make positive interventions, particularly in addressing some of the gaps in evidence and strengthening some of the weaknesses identified in section 7.2 above.

9.2.1. Mining-related structures for biodiversity and their associated species

From the ecological audit research, a group of habitats has emerged that are strongly associated with built structures within the WHS and for which there is a total or near-total lack of information.

These habitats include:

- Masonry crevices – used by a range of invertebrates such as nesting spiders, providing niches for roosting bats and hosting lime-loving species such as some bryophytes on lime mortar between stones in old buildings.
- Roofspaces – Used by bats for roosting and hibernating, and by some structure-utilising birds such as Swallows, Swifts, House Marten and Barn Owl.
- Tall structures for perching/ nesting – Tall structures such as chimneys within the World Heritage Site can provide important nesting and hunting features for birds such as Corvids and Raptors.
- Leats, sluice ponds/ reservoir ponds and silt traps – These built features contain areas of wet ground/ wetland/ marsh and open freshwater, that can support a range of aquatic invertebrates, amphibians and reptiles.
- Underground spaces (shafts and adits) provide roosting and hibernation sites for bats.
- Tidal and subtidal stone and masonry crevices within historic harbour walls and quays, which provide niches for marine species such as shellfish, sea snails, seaweeds, starfish and rock-dwelling fish.

Key species groups include

- Bats
- Structure-nesting birds
- Raptors
- Amphibians

- Reptiles
- Crevice-dwelling coastal marine species

Very little is known about the extent, value and condition of the above habitats and their associated species populations. Much more work could be done engaging with local groups and volunteers to undertake targeted surveys, to boost species records, and better understand population dynamics. The limited knowledge and research on the above habitats and their species assemblages offer a range of research opportunities that could be pursued in partnership with the Universities of Plymouth and Exeter.

9.2.2. Other habitats associated with the Outstanding Universal Value of the World Heritage Site

There are several other habitats associated with the Outstanding Universal Value of the WHS for which very little is known, and few research projects have been undertaken. These include

- Contaminated land, mineralogical sites, bare ground and open habitats with rare species such as Cornish Path Moss, early successional flower-rich grassland swards and rare grassland swards on metalliferous sites, e.g. Calaminarian grasslands (Violetalia calaminariae). The open, bare ground of these habitats and the loose substrates are used by a range of invertebrates, including predatory beetles and spiders, Lepidoptera, and solitary bees (mining bees). Mining bees, in particular, offer a key opportunity to conserve and enhance this flagship species group within the World Heritage Site.
- Linear water features (canals and leats). The World Heritage Site is home to the Tavistock Canal, several other larger linear water/ wetland areas along disused waterways, and many mine leats which have not been significantly studied regarding their biodiversity value.
- Parkland and ornamental gardens. While some information may be available privately, the audit was unable to uncover much survey or research on the biodiversity of the historic parkland and gardens associated with the great mining estates of the WHS. Novel and introduced species may have a role to play in climate resilience which could provide a research opportunity
- Cornish hedges and Devon hedgebanks – While Cornish hedges and Devon hedgebanks are known as being species-rich havens for wildlife, often in quite intensively farmed landscapes, little information is available with respect to the importance of field boundaries associated with mineworkers' smallholding and their relationship to the rough grassland and sem-natural pasture habitats within the fields.
- Quarries are not generally part of the OUV of the World Heritage Site, but quarry lakes in particular are potentially home to a range of aquatic invertebrates and also host amphibians and reptiles. Herpetofauna are a much under-recorded group, and there is a

huge opportunity to better understand the populations of frogs, newts, toads, snakes and lizards that utilise wetland and water features within the World Heritage Site. Quarry faces will host a variety of cliff-nesting birds, potentially bats, mosses and liverworts, and wildflowers.

Key species groups associated with these habitats include

- Predatory beetles and spiders
- Bryophytes
- Butterflies and moths
- Solitary (mining) bees and bumblebees
- Aquatic invertebrates
- Amphibians and reptiles
- Bats

9.2.3. Green corridors and islands – species movement through the landscape

The final main opportunity presented by habitats associated with the OUV of the WHS is the range of habitats that provide stepping stones, habitat islands and habitat corridors. The WHS is synonymous with linear features along former mining tracks, routeways, paths, leat networks, tramways and inclines. Bridges and aqueducts, such as those in the Luxylan Valley, cross modern road and rail infrastructure and serve as green bridges over these barriers. Many of these linear features have been repurposed for recreation as long-distance, sometimes coast-to-coast, multi-use trails. These routes include the Coast to Coast (Bissoe) Trail, the Mineral Tramways, the Redruth and Chacewater Railway Trail, the Great Flat Lode Trail, The Tamar Trails at Devon Great Consols, the Tamara Coast to Coast Way, the Engine House Trail, and the Caradon Trail. Very often, these routes pass through urban areas, such as Redruth, creating important green links through former mining towns and villages to the rural areas beyond. The trails pass through a wide range of semi-natural habitats along their routes, including contaminated open areas and spoil heaps, early successional grasslands, open water, wetlands and ponds, streams, leats, lines of trees, patches of broadleaved woodland, and Cornish hedges. In addition, the mining towns and villages contain within them pockets of historic green and open spaces, such as preaching pits, such as Gwennap Pit and Methodist chapel

grounds and Church of England Chapel grounds, e.g. at St Day and Charlestown, that contain natural value and could act as urban refuges and stepping-stones of habitat, linking up with green corridors in places.

Aside from a few studies carried out by Cornwall Environmental Consultants on the Mineral Tramways, there is a significant paucity of detailed survey and research on these linear and pocket habitats. Their role as wildlife corridors and urban refuges is little understood, and this represents a rich seam of research that the World Heritage Site could support.

Key species groups utilising green corridors and islands could include

- Butterflies and moths
- Solitary bees and bumblebees
- Amphibians and reptiles
- Small mammals, e.g. voles
- High mammals, e.g. badger, fox, hedgehog and deer
- Passerine birds

9.2.4. Increasing knowledge, understanding and evidence

The Cornwall and West Devon Mining World Heritage Site Management Plan 2020-2025 highlights the following issue:

"*Develop new learning and additional understanding of the biocultural value across the Site, including climate and ecological value, vulnerability, impact and resilience.*" The Management Plan goes on to say that "*Increasing understanding that the mining landscape is a valuable natural, as well as cultural, asset is essential in safeguarding this biodiversity..... A Site's biocultural heritage is already identified and valued by UNESCO. Locally, Cornwall's Environmental Growth Strategy 2015-2065 recognised that the WHS is one of a number of resources that can make a valuable contribution to its agenda*"

The WHS has begun this work through the ecological audit, a first step toward effectively understanding and managing the biological resources within the WHS, in partnership with others. As described in this report, there are many information gaps and a lack of understanding of the value and condition of habitats and species within the WHS. This represents a key opportunity to increase knowledge and understanding of target habitats and species by

- working with local organisations in the nature sector

- partnering with learning establishments such as universities
- supporting local groups

Improving knowledge and understanding of the World Heritage Site's biodiversity value also presents a strategic opportunity to gather further evidence on important habitats and species, thereby advancing biodiversity protection.

9.2.5. The state of nature and monitoring

The Cornwall and West Devon Mining World Heritage Site Monitoring Report 2019 outlines the following opportunities for monitoring nature within the designation.

- *"Identify habitat information already available for target sites each (as baseline data) and devise monitoring methodologies as appropriate (requires specialist academic input)*
- *List existing records of protected species for mine sites within WHS (e.g. the non-vascular Ditrichum cornubicum [Cornish Path Moss] which is unique to Cornwall, only occurring on mine workings and one of 146 rare mosses recorded nationally), with details of quantities, where this information is available; record the habitats and habitat requirements of these species (requires specialist academic input)*
- *Consider establishing a mechanism which allows perceived changes or otherwise to be stated as trends, e.g. 'stable and improving' or 'unfavourable but improving'. Such condition statements could also be used as a straightforward means of expressing the condition of WHS-related ecology over time (requires specialist academic input)*
- *Pressure, state, response models (PSR) could be used to establish if management or other activities on sites are neutral, advantageous or deleterious for* WHS-related ecology (requires specialist academic input)"

The ecological audit outlined in this report goes some way toward identifying the available information for target sites, habitats, habitat networks and species and makes initial suggestions for ecological indicators for each WHS Area (see Appendix 8). As outlined above, more work is needed to fill data gaps and establish a baseline of conditions for the WHS, against which long-term monitoring of the state of nature can take place. The Statements of Significance for each WHS Area in Appendix 4 describe the critical habitats, important species, and ecological designations within each Area, and section 11 suggests ecological indicators as a starting point for developing, with partners, a strategic approach to monitoring the state of nature.

9.2.6. Improving management and trialling approaches

Improving a critical understanding of key habitats, species, and their condition is important for targeting management resources. However, there is also scope to develop projects and initiatives to improve habitat and species management, particularly those that represent a good opportunity for the WHS (see sections 7.2.1, 7.2.2, and 7.2.3 above). Nature recovery projects can be a good way to improve data while trialling approaches that enhance the OUV of the World Heritage Site and improve conditions for habitats and species. Conversely, projects to manage heritage and the Outstanding Universal Value of the World Heritage Site can seek to incorporate nature recovery and recording elements. The audit highlights the limited information available, but it has also identified some areas where projects could be developed without requiring significant further research, or where research could be incorporated into projects.

10. Recommendations

The following section outlines the key recommendations based on the audit findings, focusing on the main opportunities to strengthen understanding and improve management of the World Heritage Site for nature. The recommendations highlight where targeted investment could yield the greatest benefit and where win-win situations can be found for both the designation and the nature.

10.1. Target habitats and species groups

The audit has highlighted a series of habitats and species that are related to the OUV of the Cornwall and West Devon Mining Landscape World Heritage Site. These habitats and species represent the flagships of nature in the WHS and should be the focus of future work.

Mining-related structures and spaces (linked to OUV that provide habitat

- Masonry crevices
- Roofspaces
- Tall structures
- Leats, sluice ponds/ reservoir ponds and silt traps
- Underground spaces (shafts and adits) provide roosting and hibernation sites for bats.
- Tidal and subtidal stone and masonry crevices within historic harbour walls and quays

Other habitats of mining landscapes

- Contaminated land, mineralogical sites, bare ground and open habitats with rare species
- WHS related quarry lakes and faces
- Linear water features (canals and leats)
- Parkland and ornamental gardens
- Cornish hedges and dry stone walls of mineworkers' smallholdings Linear features, green corridors and stepping stones
- Linear features along former mining tracks, routeways, paths, tramways and inclines, bridges, leats and aqueducts

Key species groups associated with these habitats include

- Bryophytes

- Bats
- Butterflies and moths
- Solitary (mining) bees and bumblebees
- Aquatic invertebrates
- Amphibians and reptiles
- Structure-nesting birds
- Raptors
- Predatory beetles and spiders
- Crevice-dwelling coastal marine species

Of the above species list, bats and mining bees strike a particular resonance with mining and could be viewed as the 'poster species'.

10.2. Improving data and research

The audit has highlighted a general paucity of information and a need to increase surveys, recording, and research across the board. Increased survey effort and further research should be targeted at the habitats and species identified in 11.1 above. Of these 'flagship' habitats and species, the following had little or no information and therefore represent the highest priority.

Habitats

- Roofspaces and their importance for bats
- Tall structures for perching/ nesting
- Leats, sluice ponds/ reservoir ponds and silt traps
- Stone harbours and quays (Tidal and subtidal stone and masonry crevices)
- Linear habitats and their role as species reservoirs in species movement

Species related to OUV

- Predatory insects, e.g. beetles and spiders
- Marine species, e.g. shellfish, seaweeds, crab, small fish, starfish (associated with harbours and quays)
- Amphibians, e.g. frogs and toads
- Reptiles, e.g. Adder, Grass Snake, Common Lizard and Slow Worm

In addition, records for Mining Bees, Bats, and Lepidoptera (Butterflies and Moths) could be significantly improved. While there is research on the importance of mine sites for invertebrates, this could be updated and improved. Similarly, research on contaminated sites exists, although it could be significantly strengthened and updated.

Exeter and Plymouth Universities both run conservation-related degrees in Cornwall and represent potential partners in researching the value of mining-related habitats for nature. In addition, local groups exist for Marine species, Bats, Amphibians and Reptiles, Butterflies and Moths. Support is required for solitary bees, beetles, and spiders, since no county-level groups exist to record them.

10.3. Addressing land cover change

The audit has carried out land-cover change monitoring, presenting data on habitat change between 2000 and 2024. Overall, the results for the World Heritage Site show that semi-natural grasslands have declined more than any other habitat, consistent with the broader picture of the loss of species-rich grasslands across the country. Restoring lost species-rich grasslands and improving the condition of those that remain, on former miners' smallholdings, would significantly contribute to nature restoration. The restoration of lost Cornish hedges and dry stone walls associated with mineworkers' smallholdings would be complementary to this.

In addition to the loss of species-rich grassland, the land cover change analysis also showed an increase in the moorland category, almost certainly attributable to increased bracken invasion. Bracken management around former mine sites and mineworkers' smallholdings is also a priority.

Opportunities exist to partner with organisations that advise farmers, such as Natural England, The Cornwall and Tamar Valley National Landscape(s) and the Farming and Wildlife Advisory Group. There is an opportunity to undertake further survey to determine where relic species-rich grasslands remain and to better identify areas with potential for restoration. Restoration can be encouraged through the uptake of agri-environment funding or through the development of a specific nature recovery project.

10.4. Influencing strategy and action

The results of the audit highlight the nature conservation priorities within the World Heritage Site, as well as some of the main changes in habitats. The audit has identified key information gaps and weaknesses in the recording system. It has also identified several key opportunities to improve nature in ways that conserve and enhance the designation's OUV.

This useful information can be shared with organisations that develop policy and strategy on nature recovery, to embed the emerging nature priorities and actions for ecology within the WHS. The main organisation is Cornwall Council, responsible for the Cornwall Local Nature Recovery Strategy. There is an opportunity in future reviews to specifically address the nature priorities within the World Heritage Site in a more targeted way. The priorities and actions should also be shared with the Cornwall and Devon Local Nature Partnerships, the Cornwall and Tamar Valley National Landscapes and other key nature conservation bodies such as the National Trust and Cornwall Wildlife Trust.

10.5. Action for habitats and species

Target species are listed in 11.1 above, and the priority species for improving research and recording are listed in 12.2 above. Of the species and habitats highlighted as a priority for the WHS, the following species and their associated habitat are emerging as a focus for specific project activity

- Mine sites and invertebrates (particularly mining bees)
- Mine spaces, roofspaces and bats
- Leats, canals and quarries and Herpetofauna (Amphibians and Reptiles)
- Marine structures and their ecological communities
- Linear habitat mosaics around mining trails and their role in population dynamics and species movement

10.6. Monitoring

Section 11 in this report highlights the key monitoring indicators relevant to the ecology of each area of the WHS and overall. Monitoring should focus primarily on the target habitats and species identified in 11.1, with specific area monitoring if resources allow. Monitoring the state of nature in the World Heritage Site would require a baseline on the relevant monitoring indicators and then further monitoring on a five-year cycle. Mapped habitat data and species records would form the basis of the monitoring. Habitat condition could be monitored using a proxy indicator, such as SSSI condition, or through sample site surveys or other methods like remote sensing. Suggested monitoring indicators, means of data collection and potential partners are identified in **Appendix 8, Suggested Monitoring Indicators**.

The University of Exeter, Cornwall Wildlife Trust, The Environmental Records Centre for Cornwall and the Isles of Scilly, and Cornwall Council would be critical partners in establishing a monitoring scheme for the WHS since they are responsible for producing the State of

Nature Cornwall Report (last published in 2020). The Devon Local Nature Partnership publish the State of the Evironment Report for Devon (last published in 2018 and now being updated). On the Devon side of the WHS, the Devon Wildlife Trust, Plymouth University and the Devon Biological Records Centre would potentially support monitoring. A shared and common monitoring approach across the WHS would be important.

11. Appendix 1: The landscape Attributes of the WHS with nature potential

11.1. A1 St Just Mining District

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Tin and arsenic processing sites tin and copper mines water-powered stamping mills in valleys single-handed underground working • Tin open-works, such as at the Bunny and Ballowall, are some of the earliest in the Site • Ancient workings and adits on cliffs • Ancient outcrop workings and streamworks • Leats on cliff slopes Intact 20th century mine at Geevor • Dressing sites and arsenic works at Botallack, Levant and Kenidjack • Engine houses and other buildings high on the moor at Watch croft and Ding Dong
Mine transport	• The coast path is an important line of communication, linking the majority of the mine sites. Inland there is a complex network of historically derived footpaths
Ancillary industries	• Almost all of its principal industrial structures have been conserved
Mining settlements and social infrastructure	• Planned cottage rows, Methodist chapels, hotels, pubs, shops, civic buildings, surviving unaltered Count Houses, Small miners' hamlets with chapel and pub, Anglican churches
Mineworkers' smallholdings	• Mineworkers' smallholdings on cliff and moor
Great houses, estates and gardens	• Botallack and Pendeen Manors
Mineralogical and other related sites of particular scientific importance	• Important mineralogical sites, the most significant of these being designated as SSSI or County Geological Sites • The Aire Point to Carrick Du coastal SSSI was designated for a combination of geological/mineralogical and biological importance, Wheal Cock, Botallack, Wheal Owles and Gryll's Bunny being specifically mentioned in the citation. • Significant dumps of coarse-grained spoil and good underground access further enhance continuing scientific study and new finds

Landscape characteristics	• A predominantly west-facing coastline three stream valleys visible exposures and outcrops on its relatively high yet accessible cliffs Rugged West Penwith Coast • The coastal fringe Cliffs Fertile but treeless long-farmed plateau • Open bare upland moors – The Penwith Moors SSSI • The Cot, Kenidjack and Rose valleys are rare dissections of the plateau • Fast-flowing streams • Agricultural grasslands • Pre-existing patchwork of prehistoric and medieval fields groups of small rectangular fields carved out of marginal land by these early miner/farmers exposed to an Atlantic climate,
Notable sites	In the west and south: Wheal Hearle, Geevor, Levant, Botallack, the Wheal Owles mines, Wheal Call, Cape Cornwall, the Kenidjack and Cot Valleys, St Just; to the east: Ding Dong and Carn Galva Mine, Porthmeor Stamps.

11.2. A2 . The Port of Hayle

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Maritime infrastructure of extensive quays and wharves • Harbour features are particularly well-preserved, with long finger-like stone-faced quays and the banks which divide the channels stretching northwards towards the sea • Ponds and pools e.g. the Millpool.
Mine transport	-
Ancillary industries	• Harveys and Copperhouse Foundries
Mining settlements and social infrastructure	• settlement is ribbon-like, clustered into the twin settlements of Foundry and Copperhouse, fringing the estuary
Mineworkers' smallholdings	-
Great houses, estates and gardens	-
Mineralogical and other related sites of particular scientific importance	• The mineral-rich silts which have built up in the two pools have influenced their present character. Both are designated as SSSIs for their nature conservation importance, mostly for birds

Landscape characteristics	• Massive, extensive sluice ponds and mudflats • Location on the north Cornish coast fringed to the north by stable sand dunes • The demarcation between the 'natural' landscape of the estuary and the urban landscape of the settlements is sharply defined along the high tide line • The expanses of Carnsew Pool, developed to sluice the harbour. • To the north of both settlements, quays front muddy estuary shores and stretch out towards the harbour entrance and St Ives Bay. The Black Bridge on Sea Lane
Notable sites	Harvey's and Foundry Square, the quays, the railway viaduct, the sluicing ponds and the Black Bridge, the King George V Memorial Walk

11.3. A3. The Tregonning and Gwinear Mining Districts with Trewavas

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Metal mine adit drainage (Great Work) largest, and deepest copper and tin mines • Submarine copper mines strikingly sited engine houses (Trewavas and Wheal Prosper) • Largest and most important tin openworks (Great Wheal Fortune) • Mine dumps tin and copper mines scattered throughout the Area, with important concentrations of sites around Great Work, Godolphin, Wheal Fortune, Great Wheal Vor, and in Gwinear, although smaller scale sites are found elsewhere • The surviving mine buildings are rare, and the Great Wheal Fortune open-work is an exceptional example of what was once a more common feature of early tin mining • Islanded mine shafts • The cliffscapes in the south, particularly at Wheal Trewavas, represent mining archaeology with high integrity. • Mine sites are common and some provide important ecological habitats.
Mine transport	• The gentle topography of the Hayle river valley being an important mule train route connecting the mines of the Area with the port of Hayle
Ancillary industries	-
Mining settlements and social infrastructure	• Estate' settlements of Leedstown and Praze-an-Beeble mining-related ribbon development with a scatter of chapels Breage is a much earlier churchtown,
Mineworkers' smallholdings	• Scattered smallholders' cottages and fields smallholders' cottages dot much of the landscape
Great houses, estates and gardens	• Large swathes of parkland, representing the great houses and estates of Godolphin, Clowance and Trevarno • Two estates framed this landscape and controlled its wealth over centuries – Clowance and Godolphin. • Godolphin House has been carefully conserved, and is a particularly important element of this Area, as is Trevarno and its magnificent gardens on the eastern edge of the Area. • In three places, areas of woodland, often walled, which denote the perimeters of its great estates gardens and wooded parkland which surround it, much of this laid out with a collection of exotic trees. • Restored gardens at Trevarno

Mineralogical and other related sites of particular scientific importance	-
Landscape characteristics	• Godolphin and Tregonning Hills • The valley of the Hayle River to the north-west, the Area's only significant watercourse • The cliffscape of Rinsey-Trewavas in the south a rural Area, incorporating long-established farmland significant areas of downland • The stretch of cliff at Trewavas is spectacular, high, its granite bright with light reflected off the sea • Much of the Area is agricultural, the lower fertile land being generally down to early crops former downs are interspersed with long-farmed landscapes • The Area remains a patchwork of fields, scrubby downland (often former mine sites, intimate mixture of long- established farmland, • More recent Mineworkers' smallholdings • The enclosed estates, woodland and gardens of the great houses • Areas of uncultivated hilly downland, dotted with mine shafts • The occasional engine house, and scrubbed-over mine sites, some of the last being very extensive
Notable sites	Trewavas, Wheal Prosper, Great Work, West Godolphin, Great Wheal Fortune, Tindene, Tregurtha Downs, Tregonning and Godolphin Hills; Godolphin, Trevarno, Clowance.

11.4. A4. The Wendron Mining District

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Near-surface alluvial tin production from the marshy area on Porkellis • Relatively shallow shaft mines, often discovered as a result of outcrop working. • Sections of the underground 18th/early 19th century tin workings of Wheal Roots (Poldark Mine) many mine buildings have been demolished, making those that remain rare survivals. • Small number of surviving engine houses are important landmarks, particularly those at Wheal Ann and Trumpet Consols in the south and Wheal Enys just to the north of Porkellis
Mine transport	-
Ancillary industries	-
Mining settlements and social infrastructure	-
Mineworkers' smallholdings	• Extensive landscape of upland Mineworkers' smallholdings around Carnmenellis
Great houses, estates and gardens	-
Mineralogical and other related sites of particular scientific importance	• The heritage of tin streaming at Porkellis Moor has led to this area being designated as a SSSI for its bryophytes.
Landscape characteristics	• Moor at the confluence of the Cober River and the stream flowing south from Stithians • A marshland landscape owing its character to alluvial tin working • The narrow valley of the Cober River the open bowl of Porkellis Moor • The exposed granite uplands of Carnmenellis • Only the land flanking Porkellis Moors is of reasonable agricultural quality • The high land of Carnmenellis is exposed, poor grazing Medlyn Moors
Notable sites	Porkellis Moor, Trumpet Consols, Wheal Ann, Basset and Grylls, Wheal Enys, Medlyn Moor, Poldark (Wheal Roots underground); Carnmenellis smallholdings.

11.5. A5 The Camborne and Redruth Mining District with Wheal Peevor and Portreath Harbour

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Richest, deepest and most famous copper and tin mines • Complete mine site (King Edward) • Important mining ventures along the outcrop of the Great Flat Lode • Engine house landscape tin-dressing archaeology • Pumping, winding and stamping engine houses at Wheal Peevor, and its arsenic calcining complex • The few remaining engine houses are important landmarks • The chain of engine houses dressing floors and other mine buildings along the flat load from Wheal Uny and Wheal Buller in the east to Marshall shaft at South Condurrow is unparalleled anywhere else in Cornwall
Mine transport	• Industrial transport infrastructure the Mineral Tramways - The track beds of most of the railway and tramway systems survive and are increasingly being adopted as long distance trails paths and bridleways, linking important mine sites and making them accessible • The main line from Redruth to Hayle still follows the line of the original Hayle railway for much of its length
Ancillary industries	• Factory/ industrial sites
Mining settlements and social infrastructure	• Sustained extensive urbanisation from the beginning of the 19th century Redruth, • The 'capital' of Cornish mining and the mining engineering 'new town' of Camborne • The coastal mining port of Portreath, the hub of Cornwall's earliest industrial mineral transport infrastructure. • In Redruth there are impressive public and commercial buildings • South of the hills are the few settlements of Brea, Carnkie and Carn Brea • Large villas/houses in Camborne and Redruth, contrasting with the miner's terraces • Large gardens as well as notably tree-lined streets in more affluent neighbourhoods
Mineworkers' smallholdings	• Mineworkers' smallholdings are most visible in the area around Newton Moor, along the great flat load where isolated cottages dot a landscape of small fields
Great houses, estates and gardens	-

Mineralogical and other related sites of particular scientific importance	• Mineral rich substrates at West Bassett and Dolcoath provide ideal conditions for rare bryophytes and have been designated as SSSI's • A number of spoiled dumps within the Area are recognised as being mineralogically important
Landscape characteristics	• The chain of granite hills of Carn Brea, Carn Arthen, Carn Entral and Beacon dominate, dividing this Area into two. • Predominantly rural landscape of the rising ground to the South. • A series of deeply incised N flowing valleys dissect the northern plateau. • Intensively urban the remaining scraps of once open land now being rapidly built upon the southern section in contrast is very rural in character farming being a mixture of stock and horse grazing and arable.
Notable sites	East Pool and Agar Mine (EPAL), Cook's Kitchen, Dolcoath, the Flat Lode Mines (Wheal Uny, West Basset and Basset Stamps, North Basset, Marriott's Shaft and South Wheal Frances, the Grenville Mines, King Edward Mine, South Condurrow and Great Condurrow, Marshall's Shaft, Wheal Peevor, Portreath Harbour and Tramroad, Redruth, Kresen Kernow (Cornwall archive centre), Robinson's Shaft (Heartlands), the Tuckingmill fuseworks, Carn Brea; Camborne and Redruth towns with their chapels, workers' housing and public buildings.

11.6. A6. The Gwennap Mining District with Devoran, Perran and Kennall Vale

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• At Restronguet Creek, sub-estuarine mining in tin gravels was carried out. • Historically significant mine sites fragmentary remains of important arsenic works some of the engine houses within this Area are amongst the oldest to survive anywhere in Cornwall
Mine transport	• Extensive mineral transport infrastructures • Tramways including two of Cornwall's earliest and most important thread through this Area linking its mines to the ports of Devoran and Portreath - The main one being the Bissoe trail • The coast to coast trail inks the east and west part of the Area
Ancillary industries	• Perran Foundry complex, one of the 19th century world's most important engine foundries • The Kennall Vale Gunpowder Works is one of the largest and most complete gunpowder works to be found anywhere in Britain • Oldest engine houses to survive the mining port of Devoran iron foundries - Perran Wharf and Devoran nearby include the well-preserved remains of one of Cornwall's pre-eminent iron foundries
Mining settlements and social infrastructure	• Mining villages of Chacewater, St Day and Carharrack • Settlement of Devoran • Ruined Gothic-style church at Saint Day • Gwennap Pit (preaching pit)
Mineworkers' smallholdings	• Large areas of Mineworkers' smallholdings occupy its north and east, once the site of a huge expanse of downland but subsequently laid out to smallholdings, the boundaries of many of its tiny fields planted with oaks and hawthorns • Much of the northern part of the Area is covered with former smallholders' fields and is dotted with isolated cottages and small farms • Scattered smallholdings with roadside chapels • Surviving mine buildings now few and far between
Great houses, estates and gardens	• Williams' family great houses, estates and gardens.

	• Carclew, the ruins of the great house - its park and gardens, historically so important to British horticulture, remain open to the public • Exceptional concentration of large houses and estates in Gwennap, more so than any other Area within the WHS. • A number of these were built by mine owners and managers near to the mines themselves: Scorrier, Tregullow, Burncoose and Carclew, and others of landed mineral lords pre-date them: Trevince and Pengreep,
Mineralogical and other related sites of particular scientific importance	• Historically, scientifically and culturally important copper mineralogy • Kennall Vale with its wooded valley location – thickly wooded. It is one of the largest and most complete gunpowder works to be found anywhere in Britain. Its secluded valley site, dominated by the woodland originally established to absorb blast damage from accidental explosions, is now a managed nature conservation site • There are a number of other mineralogically-important sites within the Area, whilst the mineral-rich spoil dumps of the Poldice Valley have led to it being designated a SSSI.
Landscape characteristics	• Hectares of shaft littered heathland, the sprawling un-revegetated mine dumps of Poldice and the poisoned, ochre stained valley of Wheal Maid, each giving a small indication of the sheer scale of industrial activity which took place • A large and essentially rural area • The granite boss of Carmenellis in the northern part of the Area; the landscape is former downland much of it fairly homogeneous in character • Small valleys • Narrow lanes bounded by high hedges occasional patch of woodland • The landscape opens out at Poldice, Wheal Maid and the lower Carnon Valley and the scope and scale of former industrial activity becomes evident with sprawling, devastated landscape. • Ting Tang is now scrub woodland
Notable sites	Gwennap Pit, Perran Foundry, Carnon Mine, Wheal Busy, Killifreth, Unity Wood, Devoran, Kennall Vale, Poldice, Wheal Maid and the Consolidated Mines, Cusvey, St Day and its church, Portreath Tramway, Redruth & Chasewater Railway, Scorrier, Tregullow and Burncoose estates.

11.7. A7. The St Agnes Mining District

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Iconic coastal engine houses • Legacy of spectacular cliff workings • The scale and complexity of the early cliff workings at Cligga Head is unparalleled • Tin-dressing floors on cliff-tops and in narrow stream valleys. • Wheal Luna is a very good example of a tin open-work and Blue Hills Tin Stream Works has been restored to operation in Trevellas Coombe • Surviving engine houses • Cliff-top mine dumps at Penhalls and Perran St George • A number of the iconic mining structures of the Area remain in need of conservation, however, such as the Blue Hills pumping engine house at Trevellas Coombe
Mine transport	• The other principal route is the coast path, though this passes through rather than leading to anywhere within the Area. • History of mining and smallholding in this Area has resulted in a complex network of footpaths around the Beacon • Much of the coastal heathland is open access land under the CROW Act 2000
Ancillary industries	• British & Colonial Explosives Works at St George Common candle clay pits – used by miners to fix candles to their hats – around the lower slopes of St Agnes Beacon. • Trevaunance Cove and the nearby Coombe became a centre for a range of industrial activities, including several tin dressing works, a foundry, shipyard, lime kilns and a fish cellar
Mining settlements and social infrastructure	• Mining settlement of St Agnes, its mining fortunes reflected in its shops, pubs, hotels, chapels and public buildings, notably the Miners and Mechanics Institute
Mineworkers' smallholdings	• South and east of the Area contains a well-preserved and high density of smallholdings isolated cottages. • Extensive smallholders' fields and new farms underpin the character of the rural landscape away from the coast.
Great houses, estates and gardens	-

Mineralogical and other related sites of particular scientific importance	• Internationally significant mineralogy. • St Agnes is world-famous for its specimen mineralogy, including several type localities, and a number of spoil dumps within the Area are mineralogically important. • Three coastal areas within which mining activity took place have been designated as SSSI: Godrevy Head to St Agnes, Trevaunance Cove and Cligga Head (this last designation extending to Droskyn Point
Landscape characteristics	• The remnants of Trevaunance Harbour • Granite knoll of St Agnes Beacon forms its hub, from which the coast radiates away from to the east and south-west • To the south-east is relatively featureless level farmland, formerly downland, Plateau cut through by deep, narrow valleys - Chapel Coombe, Trevaunance Coombe; Trevellas Coombe and Porthtowan Coombe. • The granite of Cligga Head, with its spectacular, anciently mined, steeply dipping near-parallel greisen veins • Spectacularly sited engine houses and dramatic coastal mining evidence the coast from Trevellas through Cligga Head to Droskyn Point
Notable sites	Wheal Coates, Wheal Kitty, Wheal Friendly/West Wheal Kitty, Cligga Head, Wheal Tye/West Wheal Towan, Chapel Porth, Tywarnhayle, Great Wheal Charlotte, St Agnes Beacon, Trevellas Coombe, Wheal Ellen, Blue Hills Tin Streams, Gooninnis, St Agnes Churchtown and its Miners and Mechanics Institute.

11.8. A8. The Luxulyan Valley and Charlestown

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• Extensive water management system of sluice ponds and leats surviving remains of Fowey Consols: Austen's engine house • Fowey Consols was the most notable mine site within the Area, though Prideaux Wood Mine was also historically important, though this is rarely recognised • The small number of engine houses within and immediately surrounding the northern part of this Area are important elements within the story of its development, whilst Austen's engine house is a prominent landmark, though is currently not accessible by the public • The engine house at New Fowey Consols, Ponts Mill (known locally as Broadmoor Mine) is, conversely, entirely hidden from view within woodland an early industrial harbour with a very extensive and still-functioning leat and sluice pond system • Charlestown had a number of industrial undertakings such as a tin smelter and ropewalks, and its largest, the foundry, has recently been redeveloped Wheal Martyn (outside of the WHS boundary)
Mine transport	• Treffry viaduct/aqueduct, spanning the Luxulyan Valley • The site of one of Cornwall's few canals • An industrial railway In the Valley • The former tramway, the leat paths and the Velvet Path • The Charlestown leat was built to transport water to Charlestown harbour, 10km away • Large storage ponds in the valley above the harbour form part of the leat system
Ancillary industries	• Charlestown Foundry
Mining settlements and social infrastructure	• Industrial port of Charlestown the hamlet of Ponts Mill
Mineworkers' smallholdings	-
Great houses, estates and gardens	-
Mineralogical and other related sites of particular scientific importance	• Fowey Consols was known for its diverse and significant specimen mineralogy whilst Prideaux Wood Mine is also known for rare lode 'wood tin'.

Note: there is no Landscape characteristics section included for this Area?	• A County Geology Site (RIGS Site) near the Treffry Viaduct, at NGR: SX 05653 57121 (nominal centre), designates the distinctive geology of the outcropping granite core-stones formed by deep Tertiary Period weathering
Notable sites	Carmears Incline and wheel pit, Carmears Woods paths and leats, Luxulyan Viaduct, Ponts Mill, Carbeans Quarry, Fowey Consols; Charlestown with its ore floors and harbour.

11.9. A9. The Caradon Mining District

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• One of the most important 'eastern' tin mines which includes an early 20th century complex of exceptional integrity including the engine house • The site of anciently important tin streamworks. well-preserved tin openworks at Stowe's Hill • The rare copper dump-scapes encircling Caradon Hill • Caradon mines, in particular Phoenix, South Caradon and Marke Valley, are notable for their specimen mineralogy and important dumps and underground exposures remain • Ruined engine houses and chimneys punctuate the skyline around Caradon Hill
Mine transport	• Survival of the remains of the Liskeard & Caradon Mineral Railway. • The evidence for this network is well-preserved, underpinning trail routes through the Area. • The trackbed winds its way northwards from Liskeard around Caradon Hill, past Stowes Hill and far up into the moors beyond Kilmar Tor, where its abandoned extension to Launceston ends abruptly in a marsh.
Ancillary industries	• Development of important granite quarries around the railhead known as Cheesewring Railway (now Minions) • Quarries at the Cheesewring and Kilmar and Bearah Tors
Mining settlements and social infrastructure	• The settlements in and surrounding the Area are generally small, two storey and undeveloped • Hamlets of Mineworkers' cottages with their distinctive non-conformist chapels
Mineworkers' smallholdings	• A landscape of dispersed mining settlements with well-preserved Mineworkers' smallholdings around Pensilva
Great houses, estates and gardens	-
Mineralogical and other related sites of particular scientific importance	• Internationally significant mineralogy and an unusual example of a copper deposit hosted in the granite of Caradon Hill • The existence of notable copper-rich substrates supporting rare lower plants (bryophytes)

	• Extensive mining activity has left mineral rich substrates throughout the Area, and two sites – Phoenix United and Crow's Nest (South Caradon and West Caradon) have been designated SSSIs
Landscape characteristics	• A treeless, 'eastern', rural upland/ moorland occupying the south-eastern corner of Bodmin Moor • Deeply-incised valleys lead away from it to the east (Marke Valley and the Darley Valley) • The Witheybrook: boggy, broad, wide and anciently streamed for tin stretches away to the north • Smaller valleys run through Tremar Coombe and Craddock Moor to the south and south-west • Farming within the Area is extensive, rather than intensive, based on rough land stock grazing • Two hills – Caradon and Stowes - frame the Area to its north and south • The Caradon Hill area is treeless, elevated, and prominent in the surrounding landscape, its boundaries readily apparent
Notable sites	South Caradon, Gonamena, the Liskeard and Caradon Railway, Marke Valley, Wheal Jenkin, South Phoenix, Prince of Wales, Phoenix United, Stowe's Hill, the Hurlers, the Witheybrook streamworks, Goldiggings Quarry, New Phoenix

11.10. A10. The Tamar Valley Mining District with Tavistock

OUV Attribute	*Area characteristics supporting nature*
Mine sites, including ore dressing sites	• The most important and extensive survivals of arsenic refineries and calciners in the WHS (examples at Devon Great Consols [DGC], Gawton Mine, Okel Tor, Greenhill Works, Wheal Benny and at Coombe) • The scale, size, number and industrial significance of water-powered sites, and their extensive survival, is greater here than anywhere in the Site smelting remains in the Site, including silver-lead refining (at West Harrowbarrow and Weir Quay) and tin smelting (at Weir Quay) • The Bere silver mines (including South Tamar Consols which mined under the river and was eventually flooded) on the Bere Peninsula only true silver mines in Britain such as Wheal Brothers, Wheal Langford and East Wheal Vincent and Wheal Newton • The high ridge from Kit Hill along Hingston Down sited many mines, including Holmbush, Kit Hill and South Kit Hill, East Kit Hill, Princess of Wales, Wheal Sisters, Wheal Brothers, Wheal Langford and East Wheal Vincent, Prince of Wales, Harrowbarrow, Hingston Down and Drakewalls, evidence for many of which still survives
Mine transport	• Tamar industrial mineral river quays (e.g. Morwellham), a mine railway (Devon Great Consols) a mineral railway (East Cornwall Mineral Railway) • A mineral canal (The Tavistock Canal, including a section through the Morwelldown Tunnel) • A further short canal (the Tamar Manure Navigation) was cut at Hatches Green to allow river access as far upstream as Gunnislake • Numerous mine quays, mule tracks and mine roads
Ancillary industries	• Tavistock's iron foundries. The three iron foundries in Tavistock are important both historically and in terms of their high degree of survival in their principal buildings
Mining settlements and social infrastructure	• The presence of industrial housing, notably the 'Bedford Cottages'[19] in Tavistock and the surrounding Tamar Valley, Duke of Bedford's Civic Buildings in the Tavistock.

[19] https://www.cornishmining.org.uk/about/education/research-mineworkers-smallholdings-within-the-tamara-landscape-area

	• Settlements in the Tamar Valley such as such as Gunnislake and Luckett grew haphazardly in amongst the mines themselves • The three industrial settlements along the banks of the Tamar, Gunnislake, Calstock and Morwellham,
Mineworkers' smallholdings	• Terraces and blocks of embellished tied housing smallholdings on the Cornish side[20], large estate farms on the Devon side • Hingston Down smallholdings from former downland
Great houses, estates and gardens	• Cotehele House and Gardens. Cotehele's gardens were extensively remodelled and replanted using income from mining carried out on its estates. Both the house and spectacularly sited gardens are now managed by the National Trust.
Mineralogical and other related sites of particular scientific importance	• The Area is noted for its internationally significant mineralogy • The diversity of mineralogy is notable and, commercially, silver-lead, arsenic, tungsten and zinc were extensively mined in addition to copper and tin • Mines such as Bedford United and Old Gunnislake. • There are significant mine dumps within the Area with important mineralogy, though none have been designated as SSSIs. • Lockridge Mine is a SSSI and sits within the WHS Boundary - https://www.planning.data.gov.uk/entity/14500671
Landscape characteristics	• The River Tamar and Tamar Valley Market gardening is a unique and distinctive element of the cultural history of the landscape • The group of Tamar lime kilns, ubiquitous to the Tamar quays, are exceptional • The riverside and steep valley sides sited mines where the lodes outcropped on its banks and where adit drainage de-watered great elevations of ground the high granite ridge of Hingston Down and Kit Hill; at its centre, the high ground being readily distinguishable from the north, west and east • The deep, steep-sided valley of the Tamar cutting across the grain of the landscape and dividing the downs and moors to the west from the Devon plateau to the east • The valley is lush, green and deep, ever-present in the landscape • The Bere Peninsula adds further landscape character in the south of this Area

[20] https://www.cornishmining.org.uk/about/education/research-mineworkers-smallholdings-within-the-tamara-landscape-area

	• The agricultural landscape at the edges of and surrounding this Area is marked by large pasture fields, the lower land being a patchwork of large pasture and arable enclosures • The farms and field sizes are noticeably larger in west Devon than across the Tamar • Tavistock lies on the River Tavy • Blanchdown Plantation is a huge carpet of dark green • The more sheltered land nestled in the meanders of the river has long supported agriculture, and the lower slopes are scattered with small farms whose soft fruit industry became an important part of the local economy
Notable sites	Holmbush, Kit Hill, New Consols and Luckett, Wheal Benny, East Kit Hill, Wheal Langford, Wheal Brothers, East Cornwall silver smelter, Wheal Edward, Gunnislake Clitters, Gunnislake, Prince of Wales Harrowbarrow, Calstock, Cotehele and its Quays, Devon Great Consols, Morwellham and the George and Charlotte Mine, New Quay, Okel Tor, Weir Quay with its lead and tin smelters, Gawton, the Tavistock Canal, Tavistock Bedford Square, Tavistock Canal basin and the Tavistock foundries.