



Cornwall



ERCCIS

Isles of Scilly Land Cover Project 2005



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Introduction

Land cover is the landscape recorded as the sum of various component parts such as semi-natural habitats, agricultural land, towns and villages. An overview of land cover provides important information about the condition of the natural environment, a principle factor in the environmental, social and economic state of the Isles of Scilly.

This project has been undertaken to produce a summary of land cover within the Isles of Scilly in 2005 and this will be used as a baseline for mapping subsequent land cover change.

The need for this work has been recognised by the Isles of Scilly AONB Management Plan 2010-2014 and the Isles of Scilly Biodiversity Audit (ERCCIS 2008). Identifying and mapping land cover is a useful indicator to help monitor landscape scale change and this will also correspond with analysis carried out for Cornwall, most recently the Cornwall Land Cover Change Project 2005 (ERCCIS and Cornwall Wildlife Trust 2010).

Land Cover Classification

The Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS) has a long history of interpreting and mapping land cover based on aerial photographic surveys, using methods developed in the 1990s.

Although classification is broadly based on the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey (JNCC 2010), ERCCIS has developed a modified land cover classification which reflects the nature of the habitats found in Cornwall.

The Isles of Scilly 2005 land cover has been mapped to the ERCCIS land cover classification and then converted to a classification system set up by the JNCC (Jackson 2000) that assigns the whole of the UK's land surface and surrounding seas to one of 27 Broad Habitats (BHs). The BH system of classification is used because it is the

nationally accepted framework through which the Government is committed to meet its obligations for monitoring the countryside.

Methodology

The land surface of the Isles of Scilly was photographed in its entirety from the air in 2005 by Cornwall County Council and a geo-rectified raster image of the photographs was created to use as a background map. Land cover types were classified according to the ERCCIS land cover system, to a level that can be identified from aerial photography, and mapped digitally using ESRI's ArcMap v10.1. Additional information such as previous ground survey work was used to aid mapping where available, including habitat surveys carried out by Cornwall Environmental Consultants and the Isles of Scilly Wildlife Trust. This was converted to JNCC's Broad Habitats. Table 1 shows the ERCCIS land cover categories, their relationship with the BH classification system and total areas mapped.

This project summarises land cover across terrestrial Isles of Scilly up to mean low water mark and covers the five inhabited islands: St Mary's, St Martin's (and White Island), Tresco, St Agnes (and Gugh) and Bryher, together with the four largest uninhabited islands: Samson, Annet, St Helen's and Teän. Results are shown in Table 2.

A 'ground truth' of land cover mapping on the inhabited islands was carried out in February 2013. The islands were divided into 250 by 250 metre grid squares, of which 45 were selected to correspond with approximately 20% of the land area mapped. Habitats within the selected squares were mapped in the field, digitised and compared with the land cover maps in order to identify any errors in aerial interpretation. As the maps produced show 2005 land cover, this was used to calibrate rather than validate the mapping process.



Open water and wetland habitats at Porth Hellick. Photo by Tamara Weeks

Results

| Land Cover Habitat | Broad Habitat | Area |
|--|-------------------------------------|-------------|
| Arable | Arable and Horticultural | 211.5 |
| Bracken | Bracken | 272.4 |
| Bracken with Scrub | Bracken | 87.1 |
| Broadleaved Woodland | Broadleaved, Mixed and Yew Woodland | 52.2 |
| <i>Of which Boundary features</i> | <i>Boundary and Linear Features</i> | <i>25.0</i> |
| Broadleaved Woodland with Scrub | Broadleaved, Mixed and Yew Woodland | 3.4 |
| <i>Of which Boundary features</i> | <i>Boundary and Linear Features</i> | <i>0.8</i> |
| Built Environment | Built-up Areas and Gardens | 65.8 |
| <i>Of which Roads/tracks</i> | <i>Boundary and Linear Features</i> | <i>24.5</i> |
| Coastal AHWL Rock | Supralittoral Rock | 102.7 |
| Coastal AHWL Sediment | Supralittoral Sediment | 26.3 |
| Coastal Grassland | Supralittoral Rock | 70.4 |
| Coastal Grassland with scattered Bracken | Supralittoral Rock | 4.6 |
| Coastal Grassland with scattered Scrub | Supralittoral Rock | 1.5 |
| Coastal Heathland | Dwarf Shrub Heath | 147.3 |
| Coastal Heathland with scattered Bracken | Dwarf Shrub Heath | 4.3 |
| Coastal Heathland with scattered Scrub | Dwarf Shrub Heath | 5.0 |
| Coniferous Woodland | Coniferous Woodland | 37.6 |
| <i>Of which Boundary features</i> | <i>Boundary and Linear Features</i> | <i>2.7</i> |
| Coniferous Woodland with Bracken | Coniferous Woodland | 7.8 |
| Coniferous Woodland with Scrub | Coniferous Woodland | 3.3 |
| Disturbed Ground | Built-up Areas and Gardens | 2.0 |
| Dune Grassland | Supralittoral Sediment | 16.4 |
| Dune Grassland with Bracken/Scrub | Supralittoral Sediment | 24.7 |
| Dune Heathland | Supralittoral Sediment | 10.2 |
| Dune Heathland with Bracken/Scrub | Supralittoral Sediment | 9.1 |
| Garden | Built-up Areas and Gardens | 56.3 |
| Improved Grassland | Improved Grassland | 71.5 |
| Intertidal Rock | Littoral Rock | 355.8 |
| Intertidal Sediment | Littoral Sediment | 140.1 |
| Marshy Unimproved Grassland | Acid Grassland | 1.2 |
| Mixed Woodland | Broadleaved, Mixed and Yew Woodland | 6.1 |
| Mixed Woodland with Scrub | Broadleaved, Mixed and Yew Woodland | 2.0 |
| Open Dune | Supralittoral Sediment | 3.0 |
| Open Water | Standing Open Water and Canals | 15.8 |
| <i>Of which Saline lagoon</i> | <i>Inshore Sublittoral Sediment</i> | <i>1.6</i> |
| Scrub | Broadleaved, Mixed and Yew Woodland | 9.7 |
| <i>Of which Boundary features</i> | <i>Boundary and Linear Features</i> | <i>0.2</i> |
| Semi-improved Grassland | Neutral Grassland | 173.8 |
| Unimproved Grassland with Bracken | Acid Grassland | 33.6 |
| Unimproved Grassland with Scrub | Acid Grassland | 7.4 |
| Wetland | Fen, Marsh and Swamp | 19.7 |
| Wetland with scattered Scrub | Fen, Marsh and Swamp | 2.2 |
| Total | | 2064 |

Table 1: ERCCIS land cover types, their relationship to the JNCC Broad Habitat classification and total area (figures shown in ha)

| Broad Habitat | St Mary's | Tresco | St Martin's & White Island | Bryher | St Agnes & Gugh | Samson, Annet, St Helen's & Teän | Total |
|-------------------------------------|--------------|--------------|----------------------------|--------------|-----------------|----------------------------------|-------------|
| Acid Grassland | 12.1 | 2.3 | 17.2 | 5.0 | 5.7 | <0.1 | 42.2 |
| Arable and Horticultural | 162.0 | 13.1 | 15.1 | 5.6 | 15.6 | 0 | 211.5 |
| Boundary and Linear Features* | 33.9 | 7.0 | 3.4 | 3.1 | 5.9 | 0 | 53.1 |
| Bracken | 93.7 | 49.9 | 93.4 | 37.7 | 38.5 | 46.4 | 359.5 |
| Broadleaved, Mixed and Yew Woodland | 22.1 | 20.4 | 3.0 | 1.3 | 0.7 | 0 | 47.5 |
| Built-up Areas and Gardens | 63.7 | 14.8 | 8.9 | 6.2 | 6.0 | <0.1 | 99.7 |
| Coniferous Woodland | 22.3 | 23.0 | 0.7 | 0 | 0 | 0 | 46.0 |
| Dwarf Shrub Heath | 27.6 | 43.3 | 36.9 | 20.4 | 21.1 | 7.4 | 156.6 |
| Fen, Marsh and Swamp | 15.9 | 5.5 | 0 | 0 | 0.5 | 0 | 21.9 |
| Improved Grassland | 29.9 | 38.1 | 1.3 | 0 | 2.2 | 0 | 71.5 |
| Inshore Sublittoral Sediment | 0 | 0 | 0 | 1.6 | 0 | 0 | 1.6 |
| Littoral Rock | 71.9 | 46.8 | 64.7 | 39.4 | 51.2 | 81.8 | 355.8 |
| Littoral Sediment | 20.2 | 39.3 | 34.1 | 19.7 | 3.9 | 23.0 | 140.1 |
| Neutral Grassland | 107.5 | 16.9 | 21.6 | 15.0 | 12.8 | 0 | 173.8 |
| Standing Open Water and Canals | 1.4 | 12.3 | <0.1 | <0.1 | 0.4 | 0 | 14.2 |
| Supralittoral Rock | 53.0 | 11.5 | 25.3 | 26.3 | 30.5 | 32.6 | 179.2 |
| Supralittoral Sediment | 11.1 | 40.4 | 13.2 | 7.6 | 6.5 | 10.9 | 89.8 |
| Total | 748.1 | 384.7 | 338.8 | 188.9 | 201.4 | 202.1 | 2064 |

Table 2: Area of Broad Habitats per island and total (figures shown in ha)
 *Figures for Boundary and Linear Features include features possible to map; otherwise their area is subsumed within the adjacent habitat

Discussion

Arable and Horticultural & Improved Grassland Broad Habitats

A large proportion (approximately 10%) of the total land area is Arable and Horticultural habitat, which relates to the islands' flower-growing industry. These cultivated areas and remaining bulb fields can be an important habitat for rare arable plants (ERCCIS 2008). Due to the summer timing of aerial photography it was often impossible to distinguish actively farmed fields from those that have since been abandoned. In addition, this is a transient habitat and the ground truth data showed that many fields are part of a rotation system.



Bulb field with evergreen fences, St Martin's.
Photo by Tamara Weeks

Improved Grassland accounts for a small proportion of farmland, particularly when compared to Cornwall during the same year where over half of the total land area was Improved Grassland (ERCCIS 2010). It is thought this relates to the limited extent of livestock farming in the Isles of Scilly and the higher figures for St Mary's and Tresco correspond to improvement for cattle grazing and hay or silage production.

Neutral Grassland & Acid Grassland Broad Habitats

Most enclosed grassland in Scilly is thought to be improved to some extent (Parslow 2010), for example through liming, manure application or in some cases reseeding, and was therefore classed as Neutral semi-improved. However, the soils tend towards a lower pH with a limited available species list and can appear species-poor (Rosemary Parslow 2013 pers. comm.).

There may be some truly unimproved fields more closely resembling meadow habitat but it was not possible to identify these from the air.

Where fields appeared no longer managed with some invasion of bracken or scrub, the habitat was defined as Acid Grassland. However, all grasslands would require further study to determine their nature and distribution more accurately.

Boundary and Linear Features

This Broad Habitat covers 53 ha and includes roads (excluding 'urban roads' within Hugh Town), tracks and boundary features. Only those boundaries large enough to map are included in this figure; others are subsumed in the adjacent habitat, mainly enclosed farmland and gardens.

A few hedgerows of native elm exist but boundaries are predominantly evergreen 'fences' of introduced shrubs and trees such as *Pittosporum*, *Euonymus*, *Escallonia* and *Olearia* (English Nature 2006). Although primarily to shelter farmland, these fences can increase habitat diversity and act as wildlife corridors. The value of stone field boundaries is outlined in Historic Field Boundaries on the Isles of Scilly - Analysis of Biodiversity Importance (ERCCIS 2011).

Given the network of boundaries and characteristic small field size, this is clearly an underestimate and would require further study to attribute a more accurate area. Brief analysis focussing instead on the length of boundary features sampled those found within two 250 by 250 metre grid squares per inhabited island. This was used to estimate a total length of over 850 km, ranging from around 56 km on Bryher to 467 km on St Mary's.



Elm hedgerows at Trenoweth, St Mary's.
Photo by Tamara Weeks

Broadleaved, Mixed and Yew Woodland & Coniferous Woodland Broad Habitats

Woodland habitat is limited in Scilly, covering 4.5% and predominantly across Tresco and St Mary's. This mainly encompasses coniferous plantations and shelterbelts, mixed ornamental woodland, young broadleaved plantations, wet woodland and scrub communities. Hedges and green 'fences', where large enough to map, are classified separately under Boundary and Linear Features.

Some areas of scrub are scattered within other habitats, particularly occurring in mosaic with bracken. In these cases it was not possible to map individual stands and bracken was considered the dominant habitat. Ground truth data also indicated that some areas mapped as scrub represent non-native invasive species which can tolerate the salty, exposed conditions and grow vigorously. These include *Pittosporum* on Gugh, New Zealand flax *Phormium tenax* along the north coast of St Martin's and Hottentot fig *Carpobrotus edulis* at Porth Hellick on St Mary's.

Bracken & Dwarf Shrub Heath Broad Habitats

Bracken accounts for the largest area overall, and excluding Littoral Rock is by far the dominant habitat, covering 17% of the land area. With the exception of St Mary's (due the extent of farmland) this pattern is also observed for individual islands and as much as 47% of land on the uninhabited islands is mapped as Bracken when intertidal areas are omitted. As previously noted, this BH includes large areas mapped as 'Bracken with Scrub', a widespread habitat where stands of scrub within the bracken are too small to be mapped separately.



Dense bracken on St Helen's. Photo by Tamara Weeks



Regenerating coastal heathland and grassland, St Martin's.
Photo by Martin Goodall

Dwarf Shrub Heath is distributed throughout the islands, mostly occurring on slopes above cliffs and as larger tracts, particularly at the northern edges of Tresco, Bryher and St Martin's. Due to the strong maritime influence this habitat is defined as coastal heathland, displaying the characteristic waved pattern, and is of international importance.

Some areas suffering from bracken and scrub encroachment have been subject to active management through a programme of mechanical control and grazing schemes. The Waves of Heath Project was undertaken by the Isles of Scilly Wildlife Trust from 2003-2008 and Natural England has subsequently identified the islands as a priority target area for Higher Level Stewardship to support positive management. Ground truth work highlighted the presence of the resulting 'transitional' habitats where coastal heathland and grassland are being restored. Future land cover mapping should reflect these changes.

Fen, Marsh and Swamp & Standing Open Water and Canals Broad Habitats

Even when combined, these closely related BHs cover the least area (36 ha) and virtually all is confined to St Mary's and Tresco. Smaller pools and ponds exist on St Agnes and St Martin's whilst Bryher's saline lagoon is classified separately under Inshore Sublittoral Sediment. However, most areas of open water are thought to have at least some brackish influence.

The majority of the wetland is found within the Higher and Lower Moors complexes on St Mary's, both important Isles of Scilly Wildlife Trust reserves, and comprise reed and rush mosaics with invasion by willow scrub in parts. Ground truth work also reported a network of water-filled

ditches and the stream at Holy Vale but these are not visible from the air. Conversely, wetland habitat on Tresco only occurs as a fringe to the more extensive open water areas of Great and Abbey Pools, which together account for 12 ha of the island's area.

Built-up Areas and Gardens Broad Habitat

As would be expected, the size of Built-up Areas and Gardens BH per island corresponds with their population. For example, St Mary's holds approximately 77% of the population (Source: Office for National Statistics) and 64% of the built environment, concentrated around the principal settlement of Hugh Town. Historical features are also included here.

Gardens account for 56 ha (over half of this BH), with most houses having associated areas of grass lawns with trees and shrubs. As wildlife habitats, these no doubt provide useful opportunities for shelter, feeding and breeding. This Broad Habitat also includes the more extensive ornamental gardens of Tresco Abbey.

Supralittoral Rock & Supralittoral Sediment Broad Habitat

Supralittoral Rock encompasses the rocky habitats which border all of the islands. There are some areas of high steep cliffs, for example at the northern ends of Tresco and Bryher, but low cliffs and boulder beaches are predominant. They provide important habitats for breeding seabirds, although it is the uninhabited islands and rocky islets which support the largest populations (Heaney et al. 2008).

Coastal grassland is also defined within this classification. This generally forms a border along the cliff tops and grades into coastal heathland.



Sand dunes at Appletree Bay, Tresco.
Photo by Tamara Weeks



Built environment concentrated around Hugh Town, St Mary's. Photo by Tamara Weeks

However, unique carpets of thrift *Armeria maritima* spread across much of Annet.

Throughout the islands Supralittoral Rock covers approximately 9% compared to 4% Supralittoral Sediment. However, Tresco is unusual in that the latter accounts for 10% of the land area, with extensive dune systems and dune heathland towards the more sheltered south of the island.

Littoral Rock & Littoral Sediment Broad Habitats

Approximately 24% of the area mapped is Littoral Rock or Sediment. This high proportion reflects the nature of these low-lying islands, shown by the equivalent 1.6% cover around the coast of Cornwall (ERCCIS 2010). Most of the islands have a combination of intertidal rock and sediment, which includes some extensive sandflats, but the former is by far the dominant habitat.

A pilot study was carried out by the Isles of Scilly Wildlife Trust and ERCCIS in 2010 which mapped the intertidal biotopes of St Agnes and Gugh. Subject to funding, it is hoped that this work will be extended to the other inhabited islands. This would complement the terrestrial land cover maps and provide more detail of important intertidal habitats which provide the inextricable link to the marine environment.

Inshore Sublittoral Sediment Broad Habitat

Great Pool on Bryher is considered the only true saline lagoon in the Isles of Scilly. Although this Broad Habitat covers just 1.6 ha, it is included as saline lagoons are a scarce and internationally important coastal feature.

Conclusion

The landscape and biodiversity importance of the Isles of Scilly is recognised in their designation as both an Area of Outstanding Natural Beauty (AONB) and a Heritage Coast. In addition over 30% of the islands' land area is covered by a combination of international (Ramsar Site), European (Special Protection Area and Special Area of Conservation) and national (Sites of Special Scientific Interest) designations (Source: Natural England 2012).

Protecting this unique environment is underpinned by a detailed understanding of the habitats present, their distribution, quality and vulnerability to change. Mapping land cover of the Isles of Scilly is a fundamental part of this and the outcomes of this project provide a comprehensive overview. Together with habitat monitoring and reporting, this will help track changes, identify gaps in knowledge and guide land management.



Extensive intertidal habitats exist between the islands. Photo by Tamara Weeks

Recommendations

1. Extend the project to cover all islands within the Isles of Scilly

The archipelago comprises over 200 smaller uninhabited islands, islets and rocky outcrops. It would be valuable to include these and produce a comprehensive land cover map of the Isles of Scilly, particularly as many of these inaccessible and undisturbed areas are of great importance for wildlife. For example, the grey seal populations and breeding seabird colonies of the Eastern Isles and Norrard and Western Rocks (ERCCIS 2008).

2. Map UK Biodiversity Action Plan (UK BAP) Priority Habitats

Within the Broad Habitat classification system, a sub-set of Priority Habitats (PHs) is identified. PHs are those that are recognised in the UK Biodiversity Action Plan (UK BAP) as being at risk and in need of positive conservation action. There are 65 UK BAP Priority Habitats; of the terrestrial habitats, 14 have been identified by the Isles of Scilly Biodiversity Audit (ERCCIS 2008). However, national inventories exist for only two: Maritime Cliff and Slope and Coastal Vegetated Shingle (Natural England 2012). Consolidating current information to map their distribution and extent where possible would help measure changes in these important habitats and identify gaps in knowledge. This may require ground survey work as aerial interpretation alone cannot assess where habitats conform to the PH definitions.

3. Repeat the analysis to determine land cover change for 2005-2010

Carry out land cover change analysis using the same methods as for Cornwall to highlight changes occurring to the Isles of Scilly's land cover- an invaluable part of developing a detailed understanding of the Islands' land and wildlife resource, their quality and their vulnerability to change. In particular this will be useful in measuring the impact of Higher Level Stewardship Agreements, which currently covers approximately 70% of the Isles of Scilly land area (Source: Natural England 2012).

4. Research further the extent and nature of grassland habitats

Understanding of the nature and conservation importance of semi-natural grassland Broad Habitat in the Isles of Scilly is limited and would benefit from further research, for example identifying any truly unimproved meadow habitat.

5. Establish the status of agricultural land

More detailed sampling of farmland, particularly bulb fields, is required to determine if there are any trends in farmland condition, management

and relative value as wildlife habitat. This would also help measure the proportion of neglected areas and the rate at which these are invaded by bracken and scrub.

6. Measure the extent and nature of boundary features

Although very few conform to the national definition of a Priority Habitat (JNCC 2008), the hedgerows, green 'fences' and stone hedges of the Isles of Scilly contribute significantly to habitat diversity and connectivity, and support many species. Further work is needed to attribute an accurate measure of the extent and nature of the various boundary feature types.

7. Carry out more detailed mapping of intertidal habitats

The preliminary intertidal biotopes mapping carried out for St Agnes and Gugh by ERCCIS and the Isles of Scilly Wildlife Trust should be extended throughout the islands. Littoral Rock and Littoral Sediment Broad Habitats cover almost a quarter of the total area mapped in this project and a number of UK BAP Priority Habitats are found within this zone.

8. Map the extent and distribution of non-native invasive plants

Plants introduced to the Isles of Scilly have often been selected because of their tolerance to the exposed maritime conditions and grow very successfully when they escape into the wider environment. Identifying and mapping species which pose a threat to native wildlife and habitats will help monitor their spread, inform management and evaluate the impact of control measures.



New Zealand flax invades the coastal slopes of St Martin's. Photo by Martin Goodall

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Carpets of thrift on Annet. Photo by Tamara Weeks