



# The UK Habitat Classification User Manual

**Version 1.0**

The UK Habitat Classification Working Group

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## UK Habitat Classification – Basic Edition: Suggested Symbolology for Maps

## Glossary, Abbreviations and Acronyms

Annex I Habitats	Habitats listed in Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora
BAP	Biodiversity Action Plan
Broad Habitat	Categories within the Biodiversity Action Plan. All areas in the UK can be assigned to one of 27 Broad habitats
CEH	Centre for Ecology and Hydrology
CS2007	Countryside Survey of 2007
CSM	Common Standards Monitoring
EcIA	Ecological Impact Assessment
ESIA	Environmental and Social Impact Assessment
EUNIS	European Nature Information System
FEP	Farm Environment Plan
GIS	Geographical Information System (mapping software and databases)
IHS	Integrated Habitat System
INSPIRE	Infrastructure for Spatial Information in Europe
JNCC	Joint Nature Conservation Committee
LERC	Local Environmental Records Centre
MAES	Mapping and Assessment of Ecosystems and their Services
MAGIC	Website providing authoritative geographic information about the natural environment from across government
MMU	Minimum mappable/mapping unit
NVC	National Vegetation Classification
PEA	Preliminary Ecological Appraisal
Phase 1	National Habitat Classification Developed by Nature Conservancy Council from 1970s to 1990
Phase 2	Detailed habitat survey, typically using National Vegetation Classification quadrats
Priority Habitat	‘Priority habitats’ were used to denote those habitats identified under the UK BAP as being the most threatened and requiring conservation action. The original list has been superseded by the lists of habitats of principal importance for the conservation of biodiversity in England under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, Section 7 of the Environment (Wales) Act 2016, or their equivalents in Scotland (Nature Conservation (Scotland) Act 2004, Scotland’s Biodiversity Strategy and the Scottish Biodiversity List) and Valuing Nature – A Biodiversity Strategy for Northern Ireland to 2020. A definitive UK list is maintained by JNCC.
SNH	Scottish Natural Heritage
SSSI	Site of Special Scientific Interest
UKHab	The UK Habitat Classification
UKHab-B	UK Habitat Classification Basic Edition
UKHab-P	UK Habitat Classification Professional Edition



A photograph of a dense forest. In the foreground, a large, moss-covered log lies horizontally across the bottom. Behind it, a steep bank is covered in thick, vibrant green ferns. Several tall, slender tree trunks rise from the forest floor, their bark appearing smooth and light-colored. The upper part of the image is filled with a dense canopy of green leaves, with some light filtering through from above.

# **UK Habitat Classification: Foreword**



## Foreword

*Sophie Lake, co-author of Britain's Habitats: A Guide to the Wildlife Habitats of Britain and Ireland*

### What are habitats?

There are a huge variety of habitats in the UK ranging from ancient woodlands to flower-rich meadows and from exposed rocky mountain tops to sheltered saltmarsh. This diversity is due to the remarkably varied geology and climate of the UK, combined with the effects of thousands of years of human activity. While there may be some remote rocky mountain ledges, wooded ravines, stretches of shifting sandy or muddy foreshore and unstable cliffs that are predominantly shaped by natural processes, virtually all our habitats are semi-natural: a product of the interaction between humans and the natural environment.

### Geology, soils and topography

Given its size, the UK's geology is very diverse. In general, the underlying bedrock shapes the landscape of any given area, directly influencing soils and topography. The role of bedrock is perhaps seen most dramatically in the limestone pavements of karst landscapes and the cliff and scree habitats of mountainous regions. Weathering of rock through rain, snow and frost and the transportation of material by wind (and previously by glaciers) all play a role in habitat development by influencing surface deposits; much of Britain and Ireland are covered with glacial drift (including sands, gravels and boulder clay), which can support a diverse range of habitats.

Variation in soil nutrient availability, pH and permeability to water affects habitat type. For example, very sandy and free-draining substrates generally support acid grassland, heathland or oak-dominated woodland; deeper, moist clay or loam soils may support more mixed woodland or meadow and pasture. Topography also plays a role, influencing natural drainage and exposure to wind and cold and interacting with geology and climate. For example, many of our uplands are in the cooler, wetter north and west and here the acidic bedrock combined with waterlogged conditions have contributed to the prevalence of blanket bog on shallower, poorly drained slopes.

### Climate

The UK has a relatively mild climate for its latitude due to oceanic influences; but there is significant variation within the country: with dry, steppe-like habitats in East Anglia, parched limestone grassland with Mediterranean species in the south, temperate rainforest with abundant moisture-loving mosses and liverworts on the wet western coasts and peat-forming blanket mire with cotton grasses and carnivorous plants in the cool and moist north. In addition to rainfall, temperature and sunshine hours, wind is also a factor - exposure has created some of our most natural heathlands on mountain tops and maritime cliffs while wind-blown sand continues to shape sand dune systems and helps maintain the unique flower-rich machair grassland of the Hebrides.

Climate also interacts with soils in ways that influence the development of different habitats. For example, relatively well-drained soil under woodland is likely to be rich in nutrients, as those in the mineral soil or derived from decaying leaves are not leached out. However, under colder and wetter conditions, nutrients are washed down through the soil profile and become unavailable to plants.

The soil may become waterlogged and anaerobic – conditions suitable for the development of bog. The type of bedrock also plays a role here – on limestone, the calcareous influence is rarely completely leached out and the thin, well-drained and lime-rich soils can support very species-rich grassland or Ash-dominated woodland.

## Human influences

Humans have had a long-standing impact on habitats in the UK. In most cases, this is through the interruption of the natural process of succession, through which habitats gradually change over time. Sometimes, this has been intentional, e.g. felling woodland to create pasture or cropland; but in many cases it was a by-product of activities associated with subsistence agriculture.

Around 11,500 years ago, the glacial ice that covered much of the UK melted and the first significant movement of people into Britain and later Ireland began. As the climate warmed, trees colonised and spread and woodland replaced the tundra-like vegetation. The “Wildwood” reached its fullest extent in the Mesolithic about 6,000 years ago, although it probably never covered the entire landscape. Recent archaeological discoveries suggest that Mesolithic people were already managing the extent of woodland and, 1000 years later, Neolithic people were cutting trees for fuel, building materials and animal fodder. The development of metal tools led to an increased rate of tree felling, livestock grazing and harvesting which reduced or prevented tree regeneration. Heathland, grassland and wetland expanded as a result, although climatic changes may also have influenced the development of extensive blanket bog in the uplands. A combination of tree management; livestock grazing; drainage and land “reclamation”; wood, hay, heather and peat harvesting; and cultivation shaped the habitats that have persisted into the 21<sup>st</sup> Century. Although habitats have probably always fluctuated in area and character, it was not until the second half of the 20<sup>th</sup> Century that radical changes in land use greatly reduced the extent and/or quality of most habitats.

Our habitats are not “wilderness”, but their long history means they can support very diverse or specialist wildlife. We also cherish them for their cultural and historical significance and for the opportunities they continue to provide for people.

## Categorisation of habitats

Habitat categorisation makes it easier for us to inventory the extent of habitats in the UK and assess change over time. It also makes it easier to understand where plants and animals may be found and explore their needs for different vegetation types or structures for conservation purposes.

Habitats can be categorised according to the vegetation they support (e.g. oak woodland, heathland), their geographic context (e.g. upland, lowland, floodplain), their geology (e.g. calcareous, acidic, sandy, rocky) and hydrology (e.g. flowing, rain-fed, spring fed). However, no examples of the same habitat are identical, and there are transitions between different habitat types. Any classification should therefore be considered as describing nodes on a continuum. In some cases, varied habitats occur in predictable combinations that can, in themselves be considered to represent a distinctive habitat – for example the mix of grassland, scrub and wetland found in soft cliff, or the mix of veteran trees and grassland or heathland habitats known as wood pasture. This variation makes classifying habitats an art as well as a science.





# Introduction



# 1 Introduction

The UK Habitat Classification (UKHab) is a comprehensive habitat classification system for the UK that has been developed to benefit from changes in habitat categorisation, recording and analysis in recent decades. It is intended to assist ecologists to identify and map habitats in the field in a consistent and unified way and has been designed to provide outputs that are suitable for ecological impact assessment, habitat metrics and better data integration and sharing between organisations.

The UKHab User Manual accompanies other documents developed by the UK Habitat Classification Working Group. These comprise:

**The UK Habitat Classification-V1** (May 2018). An Excel workbook which includes the UKHab Primary Habitat hierarchy for the two editions that have been developed (described below); a list of Secondary Codes, including a Green Infrastructure Section; and a series of correspondence tables that provide a translation for Phase I<sup>1</sup>, NVC<sup>2</sup>, EUNIS<sup>3</sup> and FEP<sup>4</sup> classifications.

**The UK Habitat Classification – Habitat Definitions – V1.0** (May 2018). Document that defines all Primary Habitats and Secondary Codes.

**The UK Habitat Classification Field Key** (May 2018)

**Recommended GIS Symbology** files for users of ESRI and QGIS software.

All UKHab publications can be downloaded free of charge from:

<http://ecountability.co.uk/ukhabworkinggroup-ukhab>

In addition to the main publications, the UK Habitat Classification Working Group will be publishing further resources, including worked examples and FAQs, to assist users. All UKHab publications will be available via the website.

The purpose of this handbook is to provide users with sufficient information to plan and undertake a field survey using UKHab. It also provides a field key to the identification of all of the habitats in UKHab and a suggested GIS symbology for habitats within the UK Habitat Classification Basic Edition.

## 1.1 Rationale for UKHab

The principle aim of UKHab is to provide a rapid system for recording and classifying habitats which can be used for both earth-observed and field-based surveys. The system comprises a principal hierarchy (the Primary Habitats) - which include ecosystems, broad habitats, priority habitats and Annex 1 habitats - and non-hierarchical Secondary Codes. Habitat nomenclature and definitions

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<sup>1</sup> <http://jncc.defra.gov.uk/page-2468>

<sup>2</sup> Rodwell, J.S. (ed.) (1991-2000). *British Plant Communities: Volumes 1-5* Cambridge University Press.

<sup>3</sup> EEA (2012) European Nature Information System Habitat Classification 2012 – a revision of the habitat classification descriptions. EEA. Copenhagen.

<sup>4</sup> Natural England (2011) NE264: Higher Level Stewardship: Farm Environment Plan (FEP) Manual 3<sup>rd</sup> Edition and Natural England (2013) NE430: Official list of changes to Higher Level Stewardship Farm Environment Plan (FEP) Manual 3<sup>rd</sup> Edition

have been designed to remain as close to existing systems as possible in order that data can be collected, analysed and translated without ambiguity.

## 1.2 Key features

The classification is suitable for use in terrestrial, freshwater and coastal areas of the UK. It is principally designed around vegetation types; sub-divided by floristic, climatic or geographic differences; although it also includes habitats dominated by sessile animals and anthropogenic land uses.

UKHab has been designed to build on existing systems and includes the following features:

- Integrates with EU and other UK classifications, such as Phase I, NVC, EUNIS and FEP;
- Integrates with MAES (Mapping and Assessment of Ecosystems and their services) ecosystem types;
- Supports evaluation of habitats for ecological impact assessment and no net loss/net gain analysis;
- Suitable for recording digitally in GIS, using field or remote-sensed data capture;
- Simple and easy to use in the field, with systems designed to minimise the risk of misclassification and mapping errors;
- Integrates with large-scale GIS-based habitat datasets, such as CEH Land Cover Map, supporting the scoping of large-scale surveys and for sharing data regionally, nationally and internationally.

## 1.3 Architecture of UKHab

UKHab comprises two major parts, a hierarchical Primary Habitat system and a list of Secondary Codes. There are two editions of UKHab, the “UK Habitat Classification – Professional Edition” (UKHab-P) which includes all Annex I habitats and the habitats listed in EUNIS. The architecture of UKHab-P means it includes all terrestrial, freshwater and coastal habitats occurring in the UK. An abridged version “UK Habitat Classification – Basic Edition” (UKHab-B) includes all the common and easier to identify habitats but omits habitats that are either small, rare or have a very restricted geographic range, while retaining major habitat divisions and most Priority Habitat types. The two editions are totally compatible.

The classification of Primary Habitats is hierarchical with five levels. Habitat divisions within the Professional Edition are:

**Level 1:** Major ecosystem, currently covering terrestrial, freshwater and coastal ecosystems.

**Level 2:** 9 ecosystem types, based upon the Mapping and Assessment of Ecosystems and their Services (MAES) typology and corresponding with major habitat types within the EUNIS classification.

**Level 3:** 20 broad habitat types, corresponding directly with UK Biodiversity Action Plan Broad Habitats and closely to EUNIS.

**Level 4:** 80 habitats, including 47 UK Biodiversity Action Plan Priority Habitats, and further splits of Level 3 habitats.



**Level 5:** 104 habitats, including 69 Habitats Directive Annex I habitats and further splits of Level 4 habitats.

Both the Professional Edition and the Basic Edition include Secondary Codes, which are designed to give information on the environment, management and origin of mapped features. Secondary Codes are also used to map habitat mosaics and complexes and identify species features within Primary Habitats. A Green Infrastructure Typology is also included. The GI Typology can be used as a standalone system, or combined with the main classification.

## 1.4 Uses of UKHab

UKHab is principally designed for the mapping and classification of habitats, using either field or remote-sensed data. It can also be used to translate existing habitat data into UKHab using standardised habitat correspondence tables. It is suitable for use across the UK; covering terrestrial, freshwater and coastal ecosystems. It has not been tested outside the UK and does not extend beyond mean low water mark in coastal systems.

## 1.5 Purpose of the User Manual

This User Manual is designed to describe the key features of UKHab. It provides recommendations and guidance on how to collect habitat data using the UK Habitat Classification. Certain provisions of this guide are intended to describe data collection standards; these have been designed to ensure that datasets are prepared and stored in a consistent way.

**Standards are highlighted in bold type and these recommendations are expressed in sentences in which the principle auxiliary verb is “should”<sup>5</sup>.**

The methods used to collect data using UKHab are very similar to those used for other habitat survey methods, such as Phase 1<sup>6</sup> surveys. In summary, the typical approach is:

- Prepare for field survey by collecting existing data and scoping the likely habitats present;
- Determine the scope and scale of the survey, i.e. decide which Level of the hierarchy will be used for mapping and whether to use UKHab-P, UKHab-B or the stand-alone GI-typology;
- Collate survey metadata;
- Prepare pre-survey maps;
- Undertake field survey, mapping Primary Habitats and recording Secondary Codes;
- Create final maps, preferably using digital methods;
- Review and Quality Assurance.

The following sections describe the methodology in more detail.

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<sup>5</sup> This approach follows the convention established by the British Standards Institute

<sup>6</sup> JNCC (2003) Handbook for Phase 1 habitat survey – a technique for environmental audit



**Survey Scoping**



## 2 Survey Scoping

This chapter recommends an approach for determining the scope and objectives for a habitat survey using UKHab and how to prepare before commencing data collection. This section does not provide recommendations on equipment, how to plan and resource surveys or health and safety considerations. Guidance on these and other related issues are provided elsewhere, e.g. Smith *et al.* 2011<sup>7</sup>.

The methodology leading up to a survey follows the following steps:

1. Defining the scoping of survey with reference to project objectives
2. Setting the scale for mapping
3. Predicting likely habitats from existing information
4. Producing pre-survey maps
5. Compiling metadata

### 2.1 Defining the scope of survey

**The scope of a survey, i.e. the UKHab edition and Level of the primary hierarchy used for mapping should be determined at project inception and clearly stated in report methodology.**

The UKHab can be tailored to fit the scope and objectives of a wide range of projects. The scope may be influenced by the principle purpose of the survey; the resources available to carry it out; the likelihood of encountering rare or difficult to identify habitats; and the expertise of surveyors. The objectives of a project will determine what information is collected and the need for management and/or environmental data available through the Secondary Codes.

In order to maximise the future value of habitat data, it is recommended that the highest Level of UKHab that resources will allow to be accurately collected is used. For example, Earth Observation (EO) data are unlikely to be able to accurately differentiate between many habitats at Level 4 or Level 5 of UKHab and these limitations should be reflected when scoping surveys using this approach. Where detailed environmental or management data are required for a project's objectives then field verification will normally be needed. Surveys requiring detailed identification of Annex I habitats will normally need to be undertaken by experienced field surveyors able to confidently map and describe the difference between habitats at Level 5.

Pre-survey checks should be undertaken to determine whether there are known or possible locations of rare and/or habitats of high nature conservation priority, e.g. UK BAP Priority Habitats or Annex 1, within the survey area. Sites designated for their habitat features, including those at an international, national and local level would normally benefit from surveys at the highest Level and using UKHab-P. Project sites supporting semi-natural woodland, wetland, heathland or coastal habitats are also likely to benefit from survey using UKHab-P. Wetland survey in particular requires

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<sup>7</sup> Smith, G.F., O'Donoghue, P., O'Hora, K., Delaney, E. (2011). *Best practice guidance for habitat survey and mapping*.  
[https://www.heritagecouncil.ie/content/files/best\\_practice\\_guidance\\_habitat\\_survey\\_mapping\\_onscreen\\_version\\_2011\\_8mb.pdf](https://www.heritagecouncil.ie/content/files/best_practice_guidance_habitat_survey_mapping_onscreen_version_2011_8mb.pdf)

skilled ecological specialists to identify and map the habitats present and use the list of Secondary Codes to their full potential.

## 2.2 Setting the scale for mapping

**The Minimum Mapping Unit selected should be recorded in habitat metadata and used consistently for the entire dataset.**

The UKHab has been designed to function at two scales:

- If a project requires the detailed mapping of small features and where habitats could be very fine grained it is recommended that surveyors use the fine-scale minimum mapping unit MMU (25m<sup>2</sup>, 5m length). The fine scale MMU may be used for urban or small scale rural development projects, detailed surveys of designated sites and where subtle habitat differences are considered important for the survey scope.
- If a project is to undertake surveys on a landscape scale or is only collecting data at broader scales, e.g. Level 3 – Broad Habitats, the large scale MMU (400m<sup>2</sup> polygon and 20m length) is likely to be more appropriate. For some large unenclosed upland areas, a larger MMU of 2500m<sup>2</sup> may be selected to reduce the number of surveyor days required in the field<sup>Error!</sup>

Bookmark not defined.

In most cases, the purpose of the survey and the resources available will determine the MMU. It may be appropriate for larger scale MMU to be used for initial surveys and to identify areas that require further study, which could then be subject to more detailed UKHab surveys at finer scales and higher Levels of the hierarchy or using other methods, e.g. NVC. This approach to prioritizing resources should be clearly stated in the survey methodology.

## 2.3 Predicting likely habitat types from existing information

**Ecologists should collate existing baseline habitat data in advance of field survey in order to plan surveys appropriately.**

We are extremely fortunate in the UK that all of the country has been subject to some level of habitat mapping. For example, SNCO's in Scotland<sup>8</sup> and England<sup>9</sup> have made spatial datasets of Priority Habitat Inventories publically available and Wales recently produced a national Phase 1 habitat survey<sup>10</sup>. All parts of the UK have also published inventories of ancient woodlands. CEH has produced the Land Cover Map 2015<sup>11</sup> which provides spatial data for the whole UK that generally fits to Level 3 of UKHab (UK Biodiversity Action Plan Broad Habitats) and for some habitats will be at Level 4. Land Cover Map provides habitat data in a vector dataset using a 0.5ha MMU. At a more local level, Local Environmental Records Centres<sup>12</sup> are the primary sources for habitat data for locally designated sites or regional habitat survey information.

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<sup>8</sup> <https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=HABMOS>

<sup>9</sup> <https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england>

<sup>10</sup> <http://lle.gov.wales/catalogue/item/TerrestrialPhase1HabitatSurvey/?lang=en>;

<sup>11</sup> <https://www.ceh.ac.uk/services/land-cover-map-2015>

<sup>12</sup> LERCs for the UK at <http://www.alerc.org.uk/find-an-lerc-map.html>



Further information on the likely identity of previously surveyed habitats can be inferred from existing vegetation quadrat data; species lists or target notes as long as the data is geo-referenced (either by GPS or marked paper maps). A review of goodness of fit values for software analysis of NVC quadrat data is recommended to establish confidence limits on habitat types identified using programmes such as MATCH, TABLEFIT and MAVIS. In some cases, it may be possible to review vegetation data for positive indicator species as set out in Common Standards Monitoring Guidance<sup>13</sup>.

The purpose and classification of existing habitat data should be carefully interpreted as existing systems, in particular JNCC Phase I, do not translate exactly to Annex I or Priority Habitat types. Care must be taken not to assume that habitats are not present on the ground just because they are not present on previous surveys.

In addition to spatial habitat data held by statutory and non-statutory organisations, recent aerial photographs or unmanned aerial vehicle, aka 'drone', surveys can be interpreted by experienced ecologists and used to identify the likely broad habitats present. Aerial photography is particularly useful for identifying the likely extent of different habitats, which can be mapped as polygons, especially in unenclosed landscapes where habitats are less constrained by man-made physical features such as hedges and walls. Interpretation of aerial photography or other remote-sensed data is strongly recommended for larger-scale surveys in unenclosed landscapes. Users are encouraged to review existing guidance on this topic<sup>14,15</sup>.

Earth observation (EO) techniques can be used to identify particular habitats and features on the ground. The Crick Framework is a way to categorise how well EO techniques can be used to identify habitats and features on the ground. JNCC<sup>16</sup> describes these techniques and Medcalf *et al.* (2013)<sup>15</sup> demonstrate how EO data can be used to help measure the extent of habitat types.

A thorough review of existing habitat information before field surveys commence, especially on larger sites, is hugely beneficial as it allows the survey team to determine the scope, time resource and skills required for surveys.

## 2.4 Pre-survey maps

**Field surveyors should prepare pre-survey maps from existing information prior to commencing field surveys.**

Processing existing information before a field survey is likely to improve the quality of the habitat mapping and save time in the field. This is especially true in the unenclosed uplands where very large areas with few geographical reference points can make field mapping challenging even using modern GPS technology. It is also true in other habitat types where habitat patches can be obscured

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<sup>13</sup> <http://jncc.defra.gov.uk/page-2217>

<sup>14</sup> Hill, C.T., Cox, J., Lindsay, R., Groome, G. and Crowther, K. (2011) Consultation and Production of a Recommended Set of Standards for UK BAP Habitat Data. Report to Natural England.

<sup>15</sup> Medcalf K. A., Parker J.A., Turton, N., and Bell, G. (2013) Making Earth Observation Work for UK Biodiversity Conservation – Phase 2. Report to the JNCC and Defra.

<sup>16</sup> <http://jncc.defra.gov.uk/page-6281>

by tall vegetation, inaccessible slopes, wetlands or standing water or other features that preclude full surveyor access.

Surveyors should take account of topography when preparing pre-survey maps, especially when working in areas where habitat types may be poorly represented on two-dimensional maps, e.g. steep cliffs.

Pre-survey maps can be compiled using the range of data obtained from desk study. Typically these would be compiled in GIS layers, with the ecologist interpreting these data to create a single habitat layer based on the UKHab classification. Habitat attributes and confidence levels can be attached to assist planning fieldwork and should highlight where a habitat parcel requires ground truthing to confirm the presence of a specific habitat type. Pre-survey maps can be used to plan a field survey and may inform the survey route.

## 2.5 Compiling metadata

**The accurate recording of metadata is a requirement for all surveys.**

Metadata should follow established protocols and include the following information relating to UKHab:

- Scope and purpose of the survey.
- The edition of UKHab used, i.e. Professional or Basic.
- The MMU.
- The highest Level of UKHab Primary Habitat Hierarchy that the survey will record.
- An agreed list of Secondary Code groups recorded in the survey.
- Additional attributes recorded in addition to Primary Habitat and Secondary Codes (e.g. vegetation quadrat data, habitat condition, detailed habitat management information or woodland understorey).
- Map projection and units.
- Year of survey.
- Organisation undertaking the project.
- References for any existing datasets that have been used.





**Data Collection and Mapping**



## 3 Data Collection and Mapping

This chapter provides guidance on collecting data and mapping using UKHab. Principally, data will be collected in the field and recorded digitally in spatial datasets, i.e. GIS. Recording and coding data consistently, in accordance with this guidance, will enable higher quality comparative analysis and maximise the value of habitat data for other organisations. Although this section focuses field surveys the approach can be adapted to desk-based habitat mapping using earth-observed data.

### 3.1 Methods of field data capture

Field mapping is typically carried out in one of four ways:

- 1) Using a GIS/CAD map layer on a field computer/tablet/phone that has been loaded with the pre-survey map information.
- 2) Illustrating and annotating paper maps based upon Ordnance Survey data, existing topographic survey information, or other pre-existing map data.
- 3) In pencil on transparent overlays over aerial photography or the sheets produced pre-survey using the methods outlined above.
- 4) Annotating an existing Phase 1 or Phase 2 habitat or other habitat classification map either on paper or electronically.

Where mapping is to be carried out on paper, survey sheets should be printed at a scale relevant to the scope and extent of survey, but typically not less than 1:10 000 scale, and should include accurate field boundaries, roads and topographic information, if available. Field maps can be printed at scales up to 1:200, especially for detailed urban mapping of small scale projects, at scales larger than this there is a risk that mapped features are smaller than the allowable MMU of 5m or 25m<sup>2</sup>. Where mapping on paper, it is recommended that field maps are transferred onto fair copy paper maps in the office. It is also recommended that paper maps are digitally scanned as geo-referenced raster or image files or digitised to a GIS to ensure that data can be securely stored and backed-up.

It is beyond the scope of this guide to provide detailed standards for digital data capture and storage, whether this is undertaken in the field or office. However, in order to maximise the use of data, it is important that data are stored so that they can be shared in exchangeable formats with minimal loss of data. It is also critical to collect data that is spatially accurate, e.g. no overlapping areas and no unmapped areas within the survey boundary.

### 3.2 Assigning habitat codes

UKHab records habitat features in areas<sup>17</sup>, lines and points. Each habitat feature must be assigned to a Primary Habitat and may be further described by Secondary Codes.

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<sup>17</sup> Also known as polygons or regions, i.e. a line with nodes that joins together at the end, creating a two-dimensional object with an immutable area.



### 3.2.1 The Primary Habitat hierarchy

**Each area, line or point should be assigned to a single Primary Habitat from the UKHab hierarchy. Allowable feature types for each habitat are provided in the UK Habitat Classification – Habitat Definitions document.**

Area, lines and points can all be assigned UKHab Primary Habitats at the level of the hierarchy agreed in the project objectives (see Section 2.1). Primary Habitats should be identified using the habitat key (Section 3.3 and Appendix 1) or, if confident, by using the definitions provided. If it is not possible to resolve a habitat at a more detailed level of the hierarchy, it is preferable to code the habitats at a broader level, rather than try to ‘shoehorn’ into the wrong category. It is not allowable to have more than one Primary Habitat assigned to a single feature.

The Primary Habitat can be written in the long-form name, or coded according to the convention set out in the main classification. Primary Habitat codes should be written as a string of characters with no spaces. There is code for Level 1 categories and these are normally omitted.

A habitat recorded to Level 5 would follow the protocol [Level 2 letter],[Level 3 number],[Level 4 letter],[Level 5 number] e.g. neutral grassland with *Arrhenatherum* as a major component is g3c5 (Grassland, Neutral grassland, Other neutral grassland, *Arrhenatherum* neutral grassland). Lower case letters are to be used to avoid any possible confusion with Phase 1 or EUNIS codes.

### 3.2.2 The Secondary Codes

**Secondary Codes are mandatory for habitat mosaics (10-18); Priority and Annex 1 habitats that occur in multiple Primary Habitats (19 – 32) and habitat origins (33 – 41). The use of other Secondary Codes is optional, depending on the aims of the survey. Secondary Codes can only be used when associated with a Primary Habitat.**

Secondary Codes should be added to confirm the identity of a habitat (where necessary), and also to provide information on management and the environment relating to that habitat parcel. The number and type of Secondary Codes added to a Primary Habitat will vary depending on the habitats present and the objectives of the survey. There is no limit to the number of Secondary Codes that can be used for a single parcel.

The three mandatory sections of the Secondary Code are described in more detail below:

- 1) Habitat mosaics help describe specific features that often occur in multiple Primary Habitats. For example, rushes (14 and 15) can occur within a mix of grassland types due to waterlogging and/or a lack of management; scattered scrub (10) and scattered trees (11) can often occur at low densities such that habitats are better defined by the ground flora than the canopy vegetation.
- 2) Habitat complexes similarly occur across a range of underlying land uses and therefore do not easily fit within the hierarchical structure of UKHab. For example, priority habitat complexes with a long history of modification, such as wood pasture and parkland, can occur over wide areas and including a range of different habitats, including grassland, woodland and heathland. Some Annex I habitats are also habitat complexes which need the correct combination of Primary Habitat and Secondary Codes e.g. Machair (26), can be used in association with a range of Primary Habitats including grassland, sand dune and salt marsh.

- 3) Habitat origin is critical information for certain habitat types, in particular woodlands and freshwaters that can be substantially altered or created by man. The most important example is ancient woodland (33). In most cases, ancient woodlands in the UK are documented and inventories are readily available and should be reviewed as part of pre-survey planning. However, all inventories are provisional and subject to revision; in particular, smaller patches and woodlands that have been heavily modified in the past are continuing to be identified as ancient woodlands, even in areas with good published records.

Secondary Codes are typically grouped in the list with similar descriptors and allow surveyors to describe habitat features in a consistent way. Secondary Codes describe a wide range of habitat features, including the environment (e.g. groundwater levels 117-122); land management (e.g. grazing 58-62); structures (e.g. fences, banks and walls 67-72) and different anthropogenic land uses.

Secondary Codes should follow the Primary Habitat separated by a single space if being entered electronically in the field. For example, g3c5 10 59 118 161 is *Arrhenatherum* neutral grassland that has scattered scrub (10), is cattle grazed (59), mesic (118) and tussocky (161). Codes may be separated by punctuation e.g. commas (g3c5,10,59,118,161) in field or paper-based systems, but when digitised data should be entered separated by spaces, as described above, as this convention allows easier data analysis.

The range of Secondary Codes available for a survey should be specified at the start of the project, e.g. restricting use to those contained within UKHab-B or specifying that a subset of optional codes from UKHab-P would be used. It is important that all surveyors are aware of available codes to ensure there is a consistent dataset.

It is not necessary to list the Secondary Codes in numerical order.

### 3.3 UKHab Habitat Key

A useful feature for identifying Primary Habitats, especially for new users, is the UKHab Habitat Key. This is based on a field key extensively field-tested and used across the UK for Countryside Survey (CEH 2007). The colour-coded key identifies all Primary Habitats in terrestrial ecosystems and includes references to NVC vegetation types and EUNIS. Use of the key alongside the Definitions should increase consistency of habitat recording and reduce the risk of coding errors.

The UKHab Habitat Key is appended to this user manual and can be printed separately. Note that there is not a UKHab-B version of the key, although it has been designed so that users can stop at any point as they work through the hierarchy.

### 3.4 Determining habitat boundaries

**Surveyors should identify habitat boundaries where either the UKHab Primary Habitat or Secondary Codes change at a scale greater than the specified MMU.**

Typically, habitat boundaries are drawn where there is a change in habitat type or where linear boundary feature are >5m wide and therefore drawn as a polygon in Ordnance Survey MasterMap (e.g. roads, larger watercourses, railways etc.). Linear features <5m, which would be mapped as lines, can cross habitats without requiring a habitat area boundary.



Judging where to draw the line between habitats on the map can be difficult where there is a transition from one habitat to another. A well-used convention is that if one habitat type covers more than **70%** of the ground then it should be coded to that habitat. This convention has been used across Europe<sup>18</sup> and for Countryside Survey<sup>19</sup>.

Where there are a mixture of habitats covering somewhere between 30% and 69% of the ground, when there is a fine mosaic of habitats, or where there is an ecotone (or transitional zone) between two habitats that is wider than a MMU, the following should apply: a polygon should be drawn listing the most abundant Primary Habitat and applying the UKHab Secondary Code 130 for an ecotone. Where the ecotone code is used it is assumed that the polygons on either side of it will be the components of the ecotone. Other Secondary Codes that help describe the other components may also be used e.g. in a lowland dry acid grassland (g1a) polygon there could be 13 (scattered dwarf shrubs) and/or 12 (scattered bracken) and/or 10 (scattered scrub).

Mosaics are not allowable as polygons in UKHab because only one Primary Habitat can be assigned to each polygon.

### 3.5 Mapping linear features

**Mapped linear features must be recorded with a Primary Habitat and, where necessary, Secondary Codes following the same protocol as for areas. When mapping at the fine scale MMU of 25m2, linear features greater than 1m wide should be mapped as polygons.**

There are number of Primary Habitats that can also be mapped as linear features. However, lines should only be used where the feature is smaller than the specified MMU. If working on the fine scale MMU, most hedges should be mapped as polygons.

Linear features that do not have a Primary Habitat e.g. Secondary Codes for walls and fences (67-72) should be assigned to the Primary Habitat code of the habitat(s) on one side of the feature. For example, a fence that runs along the length of a cereal field would be c1c 69 (Cereal crops Primary Habitat and Fence Secondary Code).

It is not uncommon to come across linear features that are made up of different elements e.g. a ditch with a hedge and a grass bank. If the sum of these features is less than 5m wide (when using the 400m<sup>2</sup> MMU) then mapping is straightforward, with each element added as a separate line. In GIS linear features have no area and so they can be recorded on top of one another.

The convention for mapping a series of linear features together when the sum of their widths is greater than the MMU, i.e. a width greater than either 5m or 1m, is to map the widest element(s) as the Primary Habitat and add Secondary Codes or lines for the other elements.

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<sup>18</sup> Bunce, R.G.H., Bogers, M.M.B., Roche, P., Walczak, M., Geijzenborffer, I.J., Jongman, R.H.G. (2011). *Manual for Habitat and Vegetation Surveillance and Monitoring: Temperate, Mediterranean and Desert Biomes: First Edition*. Wageningen, Alterra, Alterra Report 2154, pp106.

<sup>19</sup> [www.countrysidesurvey.org.uk](http://www.countrysidesurvey.org.uk)

### 3.6 Mapping using the Green Infrastructure Typology

The Green Infrastructure (GI) typology is a section of Secondary Codes used in UKHab-P. Uniquely among Secondary Codes, it is hierarchical. It is designed for use either as a standalone system, for those wishing to record only Green Infrastructure elements, or in combination with the UKHab-P. Users may wish to use it in combination with UKHab-P to record the semi-natural habitats in urban and peri-urban areas to a more detailed level than the GI section allows. There is some duplication of codes between the GI section and Primary Habitats (to allow the GI section to be used as a standalone system); when using the GI section in combination with UKHab-P it is recommended that both codes are used.

When the GI typology is being used as a standalone system the list of Secondary Codes can be attached to features in exactly the same way as Secondary Codes when using UKHab-P or UKHab-B but without the need for a Primary Habitat to be added first, although it would be useful for all surveys to have a Primary Habitat attached to features.





Survey Reporting



## 4 Survey Reporting

This chapter provides guidance on reporting the results of surveys undertaken using UKHab. UKHab can be used for a wide range of purposes and the report should be tailored to the specific aims and objectives of the survey. In some instances, a standalone UKHab report may not be required and survey data would be incorporated into other reports, such as Preliminary Ecological Appraisals<sup>20</sup>, Ecological Impact Assessments<sup>21</sup> or ecological monitoring reports. However, in almost all cases it will be necessary to provide basic information to the reader to aid their interpretation of the survey data collected.

In addition to the specific guidance for reports provided below, reference should be made to CIEEM's Guidelines for Ecological Report Writing<sup>22</sup> for more general guidance.

### 4.1 Report structure

The structure and content of any report should be informed by the aims and objectives of the survey and the amount of detail required for a report should be proportionate to its purpose. Where a standalone report describing the results of a UKHab survey is required, the following sections are likely to be required:

- describe the purpose, scope and objectives of the survey;
- describe the methodology and provide survey metadata;
- highlight any limitations;
- describe the results of the survey and provide appropriately scaled maps;
- provide an interpretation and assessment of results;
- recommendations and conclusion.

### 4.2 Methodology

The methodology section of a report should provide sufficient information for the reader to be confident that the surveys were completed correctly and that the survey could be repeated. It should describe:

- who undertook the survey;
- the date and study area for survey;
- a description of operating conditions and any constraints or limitation on the methodology, e.g. access, time, competencies of surveyors or seasonal restrictions;
- details of desk study data accessed and used to inform the survey;
- explanation of any detailed sampling that was undertaken, e.g. quadrats or transects; and
- UKHab metadata (Table 1).

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<sup>20</sup> CIEEM (2017) Guidelines for Preliminary Ecological Appraisal <https://www.cieem.net/guidance-on-preliminary-ecological-appraisal-gpea->

<sup>21</sup> CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal. Second Edition <https://www.cieem.net/ecia-guidelines-terrestrial->

<sup>22</sup> CIEEM (2015) Guidelines for Ecological Report Writing - <https://www.cieem.net/guidelines-for-ecological-report-writing>

*Table 1 – Example of Summarised Metadata*

<b>Metadata Heading</b>	<b>Examples</b>
Scope and purpose of the survey	e.g. a baseline habitat survey
Area surveyed	e.g. the total area, with reference to the survey map boundary
The edition of UKHab used	i.e. UKHab-Professional or UKHab-Basic
The Minimum Mapping Unit	i.e. 25m <sup>2</sup> or 400m <sup>2</sup>
The Level of UKHab Primary Hierarchy used	e.g. Level 3, Level 4 or Level 5
List of Secondary Code groups recorded	e.g. UKHab-B Secondary Codes, all Secondary Codes or a predefined sub-set
Additional attributes recorded	e.g. vegetation quadrat data, habitat condition or detailed habitat management information
Map projection and units	
Year of survey	
Organisation and individual undertaking the survey	
References for any existing datasets that have been used	e.g. existing habitat data provided by LERC, SNCO

### 4.3 Mapping and data

The main product of UKHab is the survey map. Maps must be prepared at a scale suitable for the objectives of the study, typically at a standard scale between 1:200 and 1:10 000. For consistency with other UKHab products, the suggested mapping symbology appended to this guide can be used. The context of UKHab survey data is easier to comprehend when supported by base maps that show either Ordnance Survey Mastermap or up to date ortho-rectified aerial imagery.

UKHab surveys are likely to rely on a range of existing data sources. All sources of data should be appropriately referenced and copyright, terms and conditions of the use of data respected. Plagiarism must be avoided.

### 4.4 Interpretation and evaluation

Many reports will include a section that describes the habitats recorded within the survey area, summarising the characteristics of each habitat, their distribution, condition and an indication of current status or threats. This section should draw attention to any outstanding examples of particular habitats in the survey area. The report may evaluate habitats using a standard approach, e.g. identifying important ecological features using the approach described in CIEEM's EclA Guidelines<sup>21</sup>; or quantify habitats using a biodiversity metric. Survey data may also be used to inform an ecosystem service assessment or to support other qualitative or quantitative assessments of biodiversity value.

### 4.5 Author competence and quality assurance review

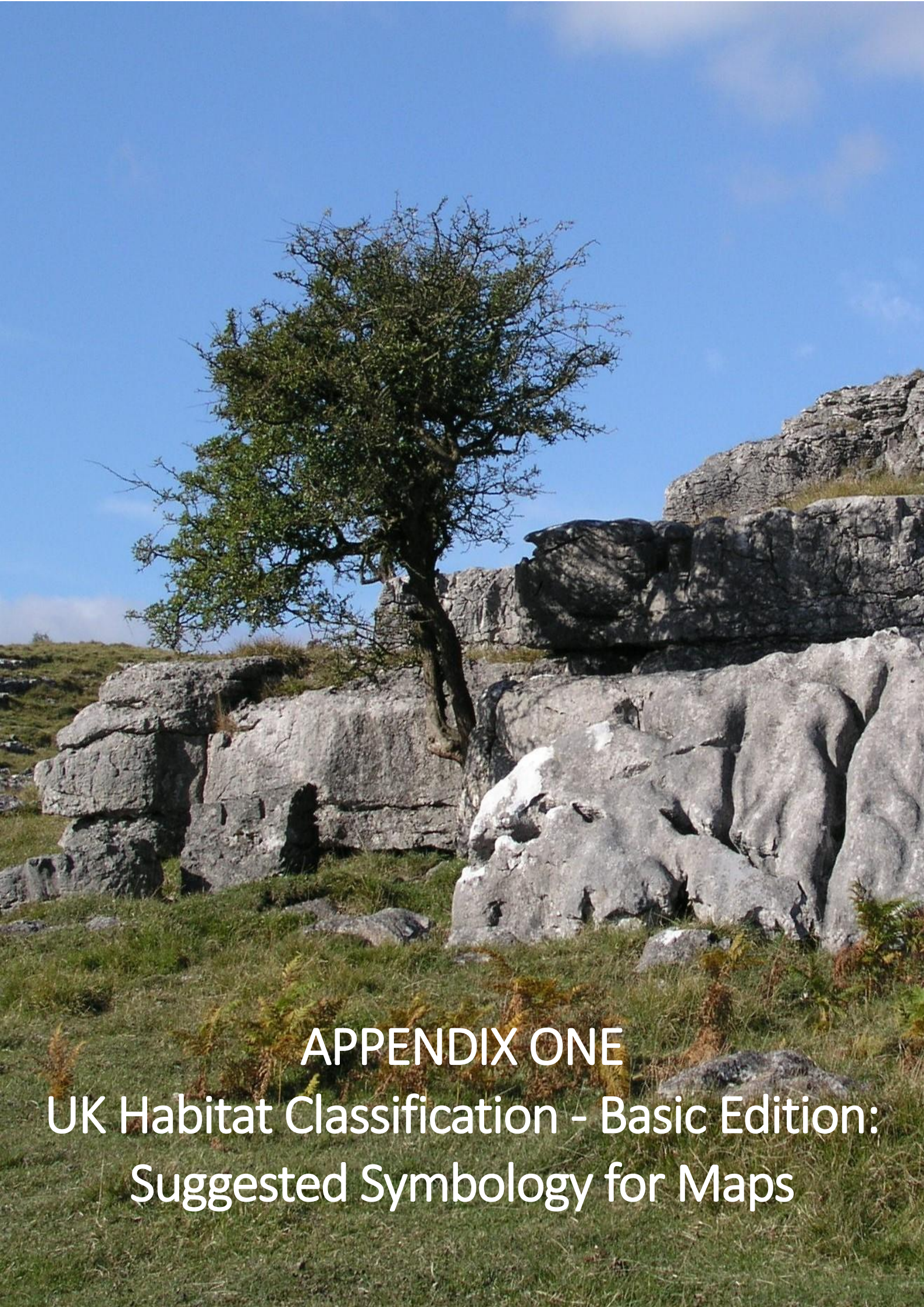
Report authors should be competent to undertake, review and report UKHab surveys. Where survey reports are prepared on a professional and commercial basis, reports should be subject to a quality assurance review to check accuracy and consistency of mapping and habitat classifications.



## 4.6 Recommendations and conclusions

A report should indicate whether the survey had achieved the initial objectives and should contain any recommendations for further or more detailed survey work that maybe required. Conclusions should summarise how the report meets the brief and provide a summary of the results and any interpretation.





## APPENDIX ONE

# UK Habitat Classification - Basic Edition: Suggested Symbolology for Maps



## APPENDIX ONE

### UK Habitat Classification – Basic Edition: Suggested Symbolology for Maps

The aim of this section is to provide a suggested symbolology for maps produced using the UK Habitat Classification Basic Edition (UKHab-B). We strongly recommend the nine basic colours for Level 2 in order that consistency is maintained across the UK. Two QGIS .qml files and two ArcGIS .lyr files, one of each with or without outlines for polygons, are provided to help mapping in GIS. Providing a coherent symbolology for all habitats in the UK Habitat Classification Professional Edition (UKHab-P) proved extremely difficult and until one has been agreed it is suggested that projects using UKHab-P that find habitats not included in UKHab-B design their own hatching system within the Level 2 colours for those habitats. A symbolology for the Green Infrastructure codes is in development.

	g - grassland
	w - woodland
	h - heathland and shrub
	f - wetland
	c - cropland
	u - urban
	s - sparsely vegetated land
	r - rivers and lakes
	t - marine inlets and transitional waters

The following tables show a system of hatching that attempts to follow a logical progression for each of the nine Level 2 types. For Level 3 the hatching follows the colour scheme of:

1 = [Level 2 colour] + white;














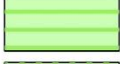





2 = [Level 2 colour] + pale yellow (in QGIS R=247, G=241, B=118 and in Arc = "Autunite Yellow");

3 = [Level 2 colour] + a pale version of the Level 2 colour;

4 only applies to g4 "modified grassland" where a solid bright green was used (R=0, G=255, B=13).


















The following pages give pictorial versions of the symbology for the 90 UKHab-B Primary Habitats and for a selection of linear habitats.

Primary Habitats in UKHab-B - Grassland	
	g - grassland
	g1 - acid grassland
	g1a - lowland dry acid grassland
	g1b - upland acid grassland
	g1b5 - montane acid grasslands (H6150)
	g1b6 - other upland acid grassland
	g1c - bracken
	g2 - calcareous grassland
	g2a - lowland calcareous grassland
	g2b - upland calacareous grassland
	g3 - neutral grassland
	g3a - lowland meadows
	g3b - upland hay meadows
	g3c - other neutral grassland
	g3c5 - Arrhenatherum neutral grassland
	g3c6 - Lolium-Cynosurus neutral grassland
	g3c7 - Deschampsia neutral grassland
	g3c8 - Holcus-Juncus neutral grassland
	g4 - modified grassland

Note that g3c7 is a cross-hatch that is visible at high magnification


















### Primary Habitats in UKHab-B - Woodland

	w - woodland
	w1 - broadleaved mixed and yew woodland
	w1a - upland oakwood
	w1b - upland mixed ashwoods
	w1c - lowland beech and yew woodland
	w1d - wet woodland
	w1e - upland birchwoods
	w1f - lowland mixed deciduous woodland
	w1g - other woodland-broadleaved
	w1g6 - line of trees
	w1h - other woodland mixed
	w2 - coniferous woodland
	w2a - native pine woodlands
	w2b - other scots pine woodland
	w2c - other coniferous woodland

### Primary Habitats in UKHab-B - Heath and Shrub and Wetland

	h - heathland and shrub
	h1 - dwarf shrub heath
	h1a - lowland heathland
	h1a5 - dry heaths, lowland (H4030)
	h1a7 - wet heathland with cross-leaved heath, lowland (H4010)
	h1b - upland heathland
	h1b5 - dry heaths, upland (H4030)
	h1b6 - wet heathland with cross-leaved heath, upland (H4010)
	h2 - hedgerow
	h2a - hedgerow (priority habitat)
	h2b - other hedgerows
	h3 - dense scrub
	f - wetland
	f1 - bog
	f1a - blanket bog
	f1b - lowland raised bog
	f2 - fen, marsh and swamp
	f2a - lowland fens
	f2d - aquatic marginal vegetation
	f2e - reedbeds











Primary Habitats in UKHab-B - Cropland and Urban	
	c - cropland
	c1 - arable and horticulture
	c1a - arable field margins
	c1b - temporary grass and clover leys
	c1c - cereal crops
	c1d - non-cereal crops
	c1e - intensive orchards
	c1f - horticulture
	u - urban
	u1 - built-up areas and gardens
	u1a - open mosaic habitats on previously developed land
	u1b - developed land. sealed surface
	u1b5 - buildings
	u1b6 - other developed land
	u1c - artificial unvegetated unsealed surface
	u1d - suburban mosaic of developed/natural surface
	u1e - built linear features

Note that u1e “built linear features” is solid red and is the same as the Level 2 symbol. This is to make roads and railways show up on a map.

Primary Habitats in UKHab-B - Sparsely Vegetated Land  
Rivers and Lakes  
and Marine Inlets and Transitional Waters

	s - sparsely vegetated land
	s1 - inland rock
	s1a - inland rock and scree habitats
	s1d - other inland rock and scree
	s2 - supralittoral rock
	s2a - maritime cliff and slopes
	s3 - supralittoral sediment
	s3a - coastal sand dunes
	s3b - coastal vegetated shingle
	r - rivers and lakes
	r1 - standing open water and canals
	r1a - eutrophic standing waters
	r1e - canals
	r2 - rivers and streams
	t - marine inlets and transitional waters
	t1 - littoral rock
	t2 - littoral sediment
	t2a - coastal saltmarsh
	t2d - intertidal mudflats

## UKHab-B Linear Features

-  g3c - other neutral grassland
-  w1g6 - line of trees
-  h2 - hedgerow
-  h2a - hedgerow (priority habitat)
-  h2b - other hedgerow
-  f2d - aquatic marginal vegetation
-  u1e - built linear feature
-  r1e - canal or ditch



