Worcestershire **B**iological
Records **C**entre

Lower Smite Farm,
Smite Hill, Hindlip, Worcester, WR3 8SZ
Tel: 01905 759759. email records@wbrc.org.uk
Web site www.wbrc.org.uk

Final Report:
Malvern Hills AONB Hedgerow Survey 2009

Undertaken on behalf of the Malvern Hills AONB Partnership
with funding from Defra

Rebecca Lashley
WBRC Project Officer

November 2009

Executive Summary

1. This sample survey took place between May and September 2009 within the Malvern Hills Area of Outstanding Natural Beauty (AONB), which straddles the borders of the counties of Worcestershire, Herefordshire and Gloucestershire.

2. The survey was funded primarily by Defra, with additional funding from the AONB Partnership.

3. The survey aimed to gather information on the current biodiversity value of hedgerows within the AONB, the differing types and styles of hedgerow management being undertaken by landowners and the contribution of hedgerows to local distinctiveness.

4. 63 hedgerows within eight 1km grid squares were surveyed within the 105 sq km landscape area of the AONB using the Defra Hedgerow Survey Handbook methodology. A total length of 1890m of hedgerow was surveyed. Photographs of all of the hedgerows were taken.

5. A questionnaire on hedgerow management regimes and attitudes and influences on hedgerow management was returned by 34 landowners within the AONB. This questionnaire was adapted from one developed and used previously by ADAS.

6. 21 landowners attended an event in October 2009 on good hedgerow management and biodiversity. Natural England provided financial support for this event, which was organised by the AONB Partnership and the Farming and Wildlife Advisory Group.

7. 51% of surveyed hedgerows were recorded as shrubby with line of trees, 39.5% as shrubby hedgerows and 9.5% as lines of trees.

8. 41.26% of hedgerow sides bordered improved grassland. 24.59% bordered arable crops or set aside. 3.16% bordered woodland. 10.31% bordered a road.

9. 53.9% of hedgerows surveyed contained 5 or more woody species and can be classed as species-rich. Species richness broadly conformed to what would be expected based on the hedgerow origins (e.g. assarted hedgerows will tend to be more species-rich than late enclosure hedges).

10. 100% of surveyed hedgerows contained more than 80% cover of native woody species.

11. 45.6% of surveyed hedgerows passed the condition assessment criteria for all six of the following attributes: minimum dimensions; integrity/ continuity; basal canopy height; undisturbed ground; herbaceous vegetation cover; recently introduced species. For those hedgerows failing to meet all of the condition assessment criteria the most common reason was because the base of the canopy was more than 0.5m from ground level (hedge was becoming leggy).

12. 195 hedgerow trees were recorded during the survey; most were mature or veteran. 30 trees recorded fell within the size guide given within the Hedgerow Survey Handbook as being ancient for their species.

13. 50% of landowners reported via the questionnaire that they were still flailing/ cutting their hedgerows every year, despite often being aware that this was not best practice for maintaining and enhancing biodiversity.

14. 99.2% of hedgerows complied with the Cross Compliance requirement for a 2m uncultivated width from the base of the hedgerow.

15. In arable areas hedgerows are often becoming gappy through neglect and are not being replenished.

16. In areas of permanent pasture hedgerows were frequently becoming leggy, exacerbated by the basal growth being eaten by livestock. Subsequent livestock intrusion into the base of the hedge is resulting in soil compaction and erosion and the hedge becoming increasingly gappy.
17. The primary purpose of a hedge is to provide a stock proof field boundary and the best way of doing this is through a cycle of gapping up and hedge laying. Support needs to be given to train people in this skill and to assist landowners in financing this type of management.

18. Considering the origins of a hedgerow is vital when providing landscape and hedgerow management and restoration guidance to landowners. New management should be carried out with these origins in mind. Gapping up an old hedgerow or carrying out new hedgerow planting should also be considered in relation to the origins of the hedgerows in the immediate area and appropriate species used.

19. Discussions taking place at the hedgerow management event highlighted that landowners are still in some cases unclear as to the recommended frequency of hedgerow cutting and would also value advice on appropriate species to use to gap up areas of hedge where the hedgerow shrubs will need to compete with isolated hedgerow trees for water and light.

20. The Access database used to store the details from the hedgerow survey forms was not found by the surveyor to be very user friendly and data entry was quite a slow process (not having used Access before this could be attributed to the programme in general rather than this specific incarnation of it). The discrepancy between the ground flora species list on the survey form and the level of detail you are required to enter onto the Access database was a minor but particular annoyance.

21. Regarding the condition assessment criteria for undisturbed ground it is felt that to assume a hedgerow bordering permanent grassland is in favourable condition because of a lack of disturbance or other damage to the (roots of) woody shrubs is very misleading. Landowners are increasingly leaving wider margins around arable fields, reducing the impact of chemical inputs on the base of the hedge; in contrast the chemical inputs by livestock to the base of a hedge continue and can be just as damaging. Likewise, the damage to soil and roots caused by livestock through erosion and compaction of the ground should not be under-estimated.

Thanks to: the landscape and historic environment staff at Worcestershire County Council and Herefordshire Council for their help and advice, in particular Neil Rimmington, Steve Crowther and Jane Patton; Clare Dinham at the Malvern Hills AONB Unit and Tony Beysens and Janet Lomas at the Farming and Wildlife Advisory Group for the organisation and running of the hedgerow management event; Paul Esrich at the Malvern Hills AONB Unit for his support and guidance during the survey; Wendy Johnson and Rob Widdicombe for their advice on using the hedgerow survey methodology; finally, thanks to the landowners who gave access to their hedgerows for the purposes of the survey.

Contents

1. Introduction to the aims of the project

Hedgerows vary in composition and form across the Malvern Hills AONB. This difference is predominently a result of the differing origins of the hedgerows, including assarting and several distinctive enclosure patterns. The changing geology and soil type also influence the dominant woody species within the hedge and ground flora associated with the hedge. Finally, land use and management regimes will influence both the structure and vegetation composition. These elements combine to make the variation in composition, structure and management of hedgerows across the AONB a key component of local distinctiveness and landscape character, something the AONB Partnership were keen to explore further.

This survey project therefore intended to gather information on:

- The current biodiversity value of hedgerows within the AONB
- The differing types and styles of hedgerow management being undertaken by landowners
- The contribution of hedgerows to local distinctiveness

The hedgerow survey project was delivered in partnership in the summer of 2009 by the Malvern Hills AONB Partnership, Worcestershire Biological Records Centre, the Farming and Wildlife Advisory Group and Natural England, with additional support from Worcestershire County Council and Herefordshire Council.

2. The Malvern Hills AONB

2.1 Management of a landscape

The landscape of the Malvern Hills Area of Outstanding Natural Beauty (*figure 1*), straddling the borders of Worcestershire, Herefordshire and a small north western corner of Gloucestershire, is dominated by the granite ridgeline of the Malvern Hills. This gives way to rolling hills and wooded farmland to the north, west and south and common land, both enclosed and unenclosed, to the southeast. The 105 sq km AONB was designated in 1959 and is looked after by a partnership of local authorities – Herefordshire, Worcestershire, Gloucestershire, Malvern Hills and Forest of Dean – and conservation agencies. The current management plan was adopted in 2009.

2.2 Geodiversity and biodiversity

The geology of the Malvern Hills area is one of the most diverse in the West Midlands, spanning 700 million years of Earth's history. There are 48 Local Geological Sites listed within the AONB encompassing a quarter of those present within the two counties of Herefordshire and Worcestershire. 90% of the main ridge is composed of igneous and metamorphic rocks of the Malverns Complex, likely to have formed at the core of a series of volcanic islands during the Precambian era. Later series of sedimentary rocks found across the AONB derive from fluctuations in sea level and the presense of a marine environment at intervals during the Cambrian and Silurian periods. In contrast the Hills also contain rocks of desert sandstone origin formed when the UK landmass was situated near the equator.

This diversity of geology has resulted in biological diversity in the current vegetation cover. The landscape contains habitats including acid, neutral and calcareous grassland, woodland and traditional orchards and species of national significance such as high brown fritillary, adder and dormouse. The AONB encompasses fifteen Sites of Special Scientific Interest, one Local Nature Reserve and a number of locally recognised County Wildlife Sites.

Farming is the most significant land use within the AONB, occupying 80% of the land area. The majority of farms are small, with just under 95% of farmholdings under 100ha in size (Malvern Hills AONB Partnership, 2009).

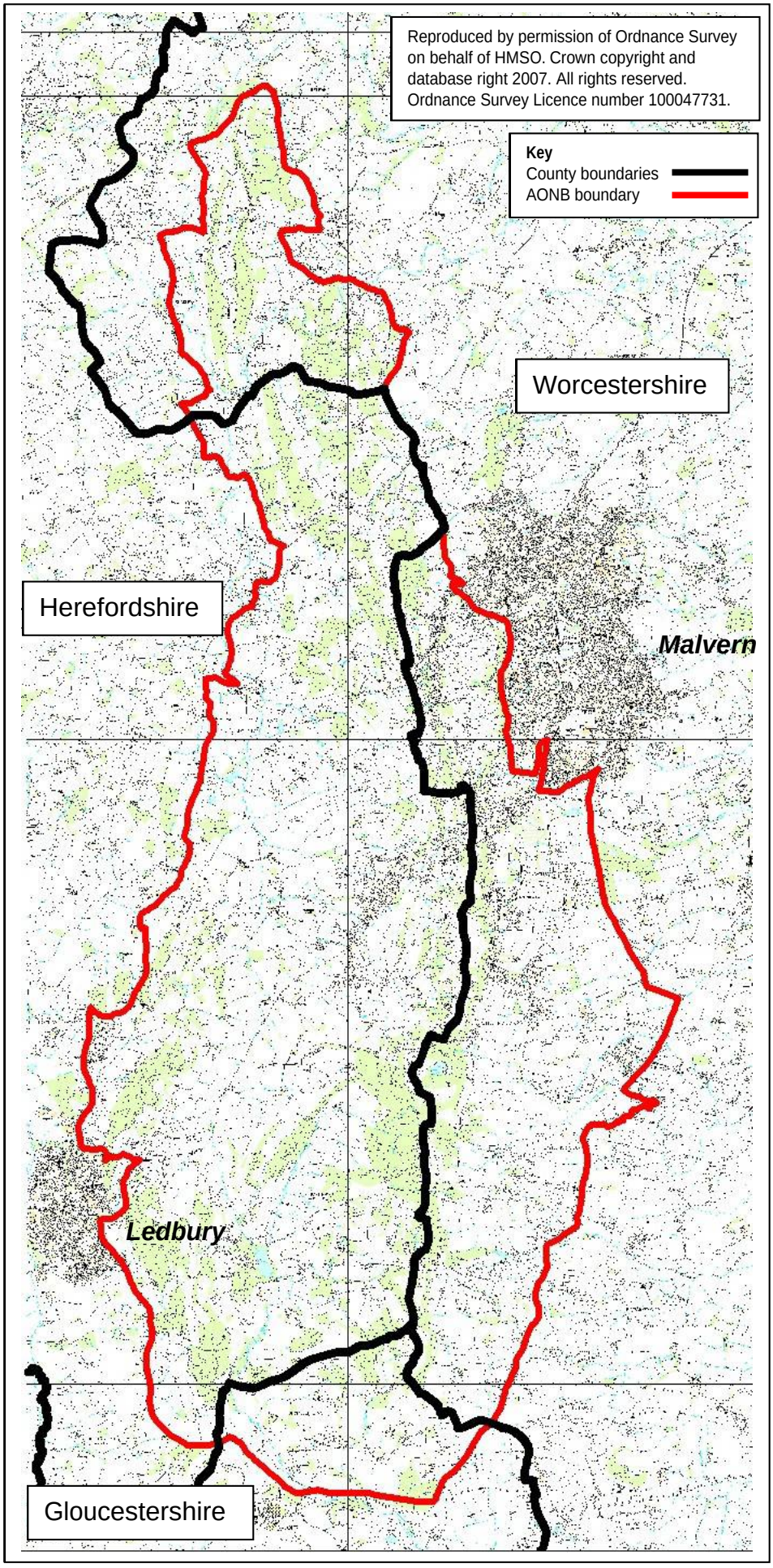


Figure 1. Geographical area of the Malvern Hills AONB

3. Landscape Analysis and Assessment Tools

A summary of the information in this section can be found in Appendix 1.

3.1 Landscape Character Assessment

Landscape Character Assessment, developed by the Countryside Agency and Scottish Natural Heritage, is used to identify and define the features of the landscape that are characteristic of a particular locality. The method is used to divide the landscape into areas of similar character. At a national and regional level these are called Joint Character Areas. At a county level, the landscape is divided again into Landscape Description Units (LDUs), of which there are 30 within the Malvern Hills AONB.

The LDUs were initially determined by analysing the definitive indicators of geology, topography, soils, tree cover character and land use and settlement pattern. Once the LDUs had been defined, additional descriptive information was added, looking at spatial character, ground vegetation, tree cover pattern, enclosure pattern and special characteristics such as building style. The smallest units of landscape character are Land Cover Parcels (LCPs). These describe any local variation of attribute that is present within LDUs such as minor changes in topography or enclosure pattern. The size of LCPs can vary considerably down to a few fields. The local authorities of Herefordshire Council, Worcestershire County Council and Gloucestershire County Council were responsible for the preparation of the county-level Landscape Character Assessments.

The areas of different landscape character can be assigned to a Landscape Character Type: generic descriptions of the various combinations of visually prominent attributes. Many of the Landscape Character Types present within the AONB include hedgerows as a distinctive part of the landscape character.

3.2 The Landscape Character Types of the Malvern Hills AONB

There are ten Landscape Character Types present within the Malvern Hills AONB (*figure 2*). The key characteristics of these are summarised below. The names and descriptions of each type are used in all three counties and boundaries developed without regard to current county political borders.

- **High Hills and Slopes**
  This Landscape Type is restricted to the summits and upper slopes of the Malvern Hills. Characterised by the hard rock geology and steep topography the landscape is unenclosed and maintained by rough grazing. Acid grassland and heathland are the dominant vegetation types.

- **Principal Wooded Hills**
  This Landscape Type has retained significant areas of interconnected blocks of ancient woodland, where the steeply undulating topography has resulted in a lack of easy access for agricultural activity. Field patterns and hedgerows are usually of an assarted origin with many remaining hedgerow trees.

- **Wooded Hills and Farmlands**
  This is a medium to large scale landscape where blocks of ancient woodland are broken up by areas of mixed farming. Hedgerow field boundaries are visually dominant due to the upstanding nature of the topography. Settlement is dispersed as scattered hamlets and villages and the blocks of woodland are generally linked by hedgerows or tree-lined stream corridors.

- **Forest Smallholdings and Dwellings**
  This Landscape Type is defined by dense networks of narrow lanes often with tall, mature hedges and small fields originating from the enclosure of woodland and common land. Settlement of distinctive cottages and smallholdings is densely scattered along the lanes.

- **Principal Timbered Farmlands**
  This rolling agricultural landscape with small pockets of irregular-shaped woodlands has a dispersed pattern of settlement amongst winding lanes and hedged fields. Hedgerow trees and

those lining stream corridors are densely scattered reflecting the assarted nature of the landscape.

- **Unenclosed Commons**
  The dominant feature of this Landscape Type is the lack of any enclosure and the use of the land as rough grazing. Settlement is generally clustered around the perimeter of the common in association with roads and any tree cover is also often restricted to the immediate area around the dwellings.

- **Sandstone Estatelands**
  The late enclosure of this Landscape Type is seen in the straight thorn hedges around large, ordered fields. The development of roads and settlements also reflects this pattern. Arable farming is dominant here and woodland is generally limited to large plantation woodlands or else present as belts along watercourses. The gently rolling topography and large open fields allow for wide views over the landscape.

- **Enclosed Commons**
  This Landscape Type also shows an ordered pattern of large, regular fields resulting from late enclosure. As with the Sandstone Estatelands it is an open rolling landscape with plantation woodlands, the difference being its common land origins and pastoral land use.

- **Settled Farmlands on River Terraces**
  Situated on fertile and free draining soils, this Landscape Type is characterised by small and medium scale cropping and horticulture within hedged fields. Woodland and hedgerow trees are largely absent, with tree cover generally limited to that surrounding the settlements.

- **Settled Farmlands with Pastoral Land Use**
  This Landscape Type is characterised by heavy soils, resulting in a pastoral land use with a pattern of small fields and dispersed settlement along narrow, winding lanes. Fields are boarded by hedgerows with hedgerow and streamside trees.

3.3 Historic Landscape Characterisation

English Heritage's national Historic Landscape Characterisation (HLC) programme is being delivered in partnership with local authority archaeology and historic landscape teams. In a similar way to Landscape Character Assessment, HLC assigns the building blocks that make up our landscape to a Historic Landscape Type based on historic character. It looks at remaining evidence for how past hedgerow and woodland management, land use, settlement pattern and enclosure changed and sculpted our landscape.

The HLC for Worcestershire is currently being undertaken by the Worcestershire Historic Environment and Archaeology Service. The HLC for Herefordshire was completed in 2002 by the Herefordshire Archaeology Service and the HLC for Gloucestershire completed in 2006 by the Gloucestershire Archaeology Service.

HLC Types that may be of particular relevance in giving insight into the hedgerow pattern present within the AONB are summarised below. It is indicated in the text whether the HLC Type was identified and described by the Herefordshire or the Worcestershire characterisation process, as different terminology is used in the two counties for what may be the same, or similar, type. The Worcestershire definitions are taken from the Malvern Hills AONB Historic Landscape Characterisation Project report (Crowther, forthcoming). The AONB covers a very small part of the county of Gloucestershire and no hedgerows were surveyed here; I have therefore not summarised HLC data for Gloucestershire. Readers will find the reference for the Gloucestershire HLC report at the end of this document should they wish to learn more.

- **FEL2 Assarted Enclosure *(Worcestershire)***
  'Assarting' refers to the clearance of woodland to create enclosed private farmland and/or settlement, usually reflecting land grants and tenancy arrangements in the medieval period. It results in patterns of small, very irregular enclosures interspersed with scattered small ancient woods and copses. Assarting in the strictest sense of the word is a medieval phenomenon occurring mainly in the 11th and 12th centuries; however clearance of woodland for farmland in this piecemeal manner seems to have occurred right up until the 19th century.

- **FEL6 Piecemeal Enclosure *(Worcestershire)***
  These are field systems that have been created out of the gradual, piecemeal enclosure of medieval open fields by informal verbal agreement between farmers, being less regular and structured than other types of later enclosure. They were established on a field-by-field basis and often comprise small irregular fields with at least two boundaries of a reverse 's' curve and/or dog-leg morphology and/or evidence for ridge and furrow, suggesting that they follow the boundaries of former medieval field strips. They are usually larger and often slightly more regular than assarts and are further distinguished from them by the lack of scattered small woods and copses typical of assart field patterns. They are often associated with dispersed settlement, commons and greens. Some irregular piecemeal enclosure may be of medieval origin but where it overlies medieval ridge and furrow was most probably created between the 14th and 17th centuries either by enforced clearance of the open fields or by agreement.

- **FEL8 Irregular Squatter Enclosure *(Worcestershire)***
  Small irregular fields, usually with an unordered, organic appearance, with sinuous or curvilinear boundaries. They are usually associated with networks of lanes, access tracks or small cottages and quarries, mining or other industrial activity. They are indicative of mostly illicit encroachment onto common land in the post-medieval and industrial periods (although there may be some examples which were legal).

- **FEL9 Encroachment Enclosure *(Worcestershire)***
  Small rectilinear or irregular fields that appear to have been encroachment onto common land in the post-medieval or later periods, however, they are not in close proximity to any settlement or industry.

- **FEL11 Parliamentary Enclosure *(Worcestershire)***
  Characterised by regular, small and large rectangular fields with 'ruler straight' boundaries and often with contemporaneous tracks and roadways. Reflects the planned nature of enclosure undertaken by surveyors during the 18th and 19th centuries and will have overwritten any prior landscape enclosure pattern. Generally the process of Parliamentary enclosure occurs throughout Worcestershire from the early 18th century but may be divided into two phases a) the large-scale enclosure of open fields on a parish by parish basis and b) the later piecemeal enclosure of commons and wastes from the early to mid 19th century.

- **FEL12 Planned Private Enclosure *(Worcestershire)***
  These are small to large fields with very straight boundaries and a rectilinear form, which gives them a geometric planned appearance, presumably deriving from planned but mostly often unrecorded episodes of enclosure by formal agreement between neighbouring proprietors during the late 17th to 19th centuries. This field pattern is often associated with very straight roads and dispersed farmsteads and frequently contains the remnants of medieval strip fields, both respecting and ignoring the layout of the open field furlongs. Morphologically, planned private enclosure is similar to parliamentary enclosure, although is not always laid out with quite the same precision. Most will be 18th to 19th century in date but some will pre-date the 18th century and may be contemporary with piecemeal enclosure.

- **FEL13 Field Amalgamation *(Worcestershire)***
  These are large irregular fields often with sinuous boundaries where field amalgamation has occurred since the OS 1st edition map. This mostly represents field boundary loss since the 1950's due to mechanisation and other changes in agricultural practices. It ranges from the loss of a single boundary (i.e. two fields merged into one) or many field boundaries being removed to form a single field. The resultant field is a hybrid, with edges that may have several periods of origin. This system may also contain relic elements of former boundaries within the field e.g. a field edge that does not connect to form a fully enclosed field enclosure.

- **FEL16 Modern Subdivision *(Worcestershire)***
  These enclosures have usually been created as a consequence of subdividing an older landscape type into smaller allotments for personal ownership and pony paddocks. It is found with greater concentration next to settlements and more urbanised areas or next to modern infrastructure development such as roadways and bypasses where older field patterns have been disrupted and reorganised e.g. a modern roadway subdividing pre-existing field systems. 20th century in date.

- **D3.1: Enclosure of Common Arable Fields *(Herefordshire)***
  Minimally enclosed – minimal insertion along major headlands
  This enclosure system is defined by boundaries set along major headlands that had developed as a result of common arable strip-field farming. The enclosure pattern shows long, broad, sinuous and curving boundaries in a sub-geometric patchwork. The dominance of sinuous boundaries implies limited reconfiguration or reorganisation through later survey-planning of the landscape.

- **L1.1: Adaptation of Earlier Enclosure System *(Herefordshire)***
  Boundary reconfiguration with minimal insertion of boundaries - former common arable fields
  This HLC type defines landscapes which appear to have been adapted from an earlier historic landscape character but have not been completely redefined as the earlier process of enclosure can still be distinguished. Three sub-types are characterised and reflect the various processes of change and continuity. This sub-type describes the minimal insertion of straight boundaries to further sub-divide existing sinuous strip field enclosure and is often found adjacent to HLC type D (areas characterised by the enclosure of common arable fields), from which the initial enclosure process of medieval common arable fields can be determined.

- **G2.1 Small Compass Enclosure of the Landscape *(Herefordshire)***
  Multiple entity planned areas - small enclosures with modified grid system
  Various patterns of reconfiguration and reorganisation are found within this broad HLC type. They all form coherent blocks of landscape mainly derived from geometric fields and straight boundaries with any variation in pattern the consequence of multiple landownership. In this sub-type geometric enclosures are formed by straight boundaries. Many of the enclosures are small and often focussed around farm buildings. The individual clusters of enclosure contribute to the character with field patterns joining each other at various angles.

- **G2.10 Small Compass Enclosure of the Landscape *(Herefordshire)***
  Multiple entity planned areas - estate division
  This sub-type of small scale enclosure is derived from the reconfiguration of existing enclosures through gradual boundary change over wide areas. Many of these areas are defined by the insertion of straight boundaries to subdivide areas between sinuous boundaries. However, there is an underlying regularity to the enclosure pattern over wide areas suggesting an influence of an individual or family estate. There are for some of the HLC areas clear correlation between this HLC type and estates with some areas abutting known parks and gardens or large estates.

- **G2.13 Small Compass Enclosure of the Landscape *(Herefordshire)***
  Multiple entity planned areas - reconfiguration of former wood pasture
  This sub-type of small scale enclosure comprises sinuous boundaries which form sub-geometric enclosures subdivided by patches of woodland. The very sinuous nature of some of the

boundaries perhaps suggests enclosures derived from woodland boundaries or former extents of woodland. The presence of dog-leg boundaries may suggest the possibility of former common arable fields, although these indicators are not extensive across the HLC type.

- **H1.2 Defined by Recent Degradation of Historic Character through Boundary Loss *(Herefordshire)***
  Limited sinuous boundaries survive
  This HLC type describes extensive removal of enclosure boundaries resulting in the loss of attributes and enclosure patterns that contribute to the historic landscape character of an area. The cause of boundary loss is not exclusively due to the intensification of arable farming but also the result of land use change such as quarrying. It is the extent of boundary loss and the creation of landscapes 'out of character' to their surroundings that make the distinction between areas affected by recent degradation. Surviving enclosures are significantly larger than in the surrounding HLC areas and limited sinuous boundaries survive.

3.4 Worcestershire Landscape Sensitivity Assessment

In 2008 Worcestershire County Council developed a process of *Landscape Sensitivity Assessment*. Sensitivity is defined as the degree to which the Resilience of the landscape - a measure of the endurance of landscape character - is influenced by its current Condition - the degree to which the inherent landscape character is represented today on the ground.

Sites that have been classified with *high* sensitivity would be most sensitive and least accommodating to change, on the basis of loss of landscape character. Those with *medium* sensitivity have a moderate potential for accommodating change. Those with *low* sensitivity may be regarded as least sensitive to change.

The sensitivity assessment is carried out at LCP scale and includes reference to the condition and composition of hedgerows within that LCP.

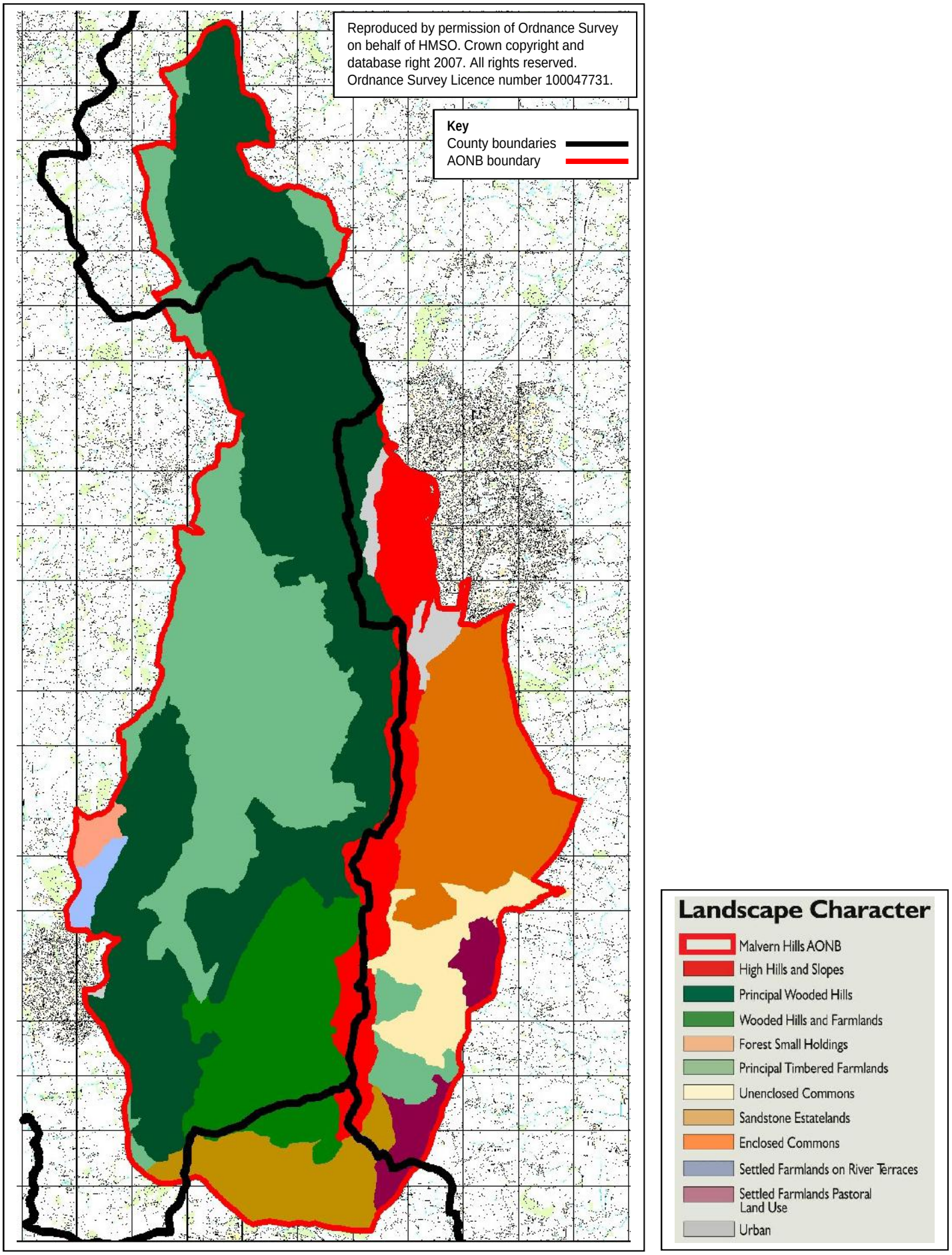


Figure 2. Landscape Types of the Malvern Hills AONB

4. Methodology and design of survey

The survey was carried out according to the Defra Hedgerow Survey Handbook and the methodology in selecting hedgerows for survey followed the guidance laid out in this publication.

4.1 Scope of the survey

Due to time and resource constraints it was decided to undertake a sample survey only by visiting a 1km grid square (monad) in each of the eight Landscape Character Types within the AONB where hedgerows are a dominant characteristic. These are:

- Principal Wooded Hills
- Wooded Hills and Farmlands
- Forest Smallholdings and Dwellings
- Principal Timbered Farmlands
- Sandstone Estatelands
- Enclosed Commons
- Settled Farmlands on River Terraces
- Settled Farmlands with Pastoral Land Use

Two Landscape Types within the AONB, High Hills and Slopes and Unenclosed Commons, were therefore disregarded for the purposes of this project.

4.2 Selection of survey areas

The Landscape Type data for the AONB was examined in GIS and possible survey areas located. Data from previous relevant surveys, such as the Herefordshire Damson Hedge Survey, were obtained and used to inform this decision process. Specialist advice was also sought from landscape and historic environment staff at Worcestershire County Council and Herefordshire Council.

It was noted that some of the Landscape Types covered such a small area within the AONB that we were very restricted as to which 1km square could be surveyed if we were to take account of that Landscape Type. These were Forest Smallholdings and Dwellings, Settled Farmlands on River Terraces and Settled Farmlands with Pastoral Land Use. As far as possible other grid squares were chosen to try and ensure that they fell completely within a single Landscape Type.

Once eight possible survey squares had been identified aerial photographs were used to confirm the presence or absence of hedgerows in order to avoid wasted trips into the field. This revealed that one of the grid squares chosen in order to cover a geographically-limited Landscape Type did not in fact have any hedgerow field boundaries within it. All enclosed land in this square was in fact bordered by woodland. This resulted in the Landscape Type of Settled Farmlands on River Terraces being eliminated from the survey. Due to problems identified late on in the project with the GIS data the Landscape Type of Sandstone Estatelands was also unfortunately not included within the survey. The AONB Partnership plan to visit and survey a grid square within this Landsacape Type during the 2010 survey season.

Maintaining the number of grid squares to be surveyed at eight therefore required two squares to be selected from each of two of the remaining relevant Landscape Types. The data were re-examined and a second square was selected from within the Principal Woodland Hills Landscape Type. The justification for choosing this 1km square included the presence of a damson hedge previously noted during the Herefordshire Damson Hedge Survey. An additional grid square was also chosen within the Enclosed Commons Landscape Type, allowing more detailed examination of the interesting enclosure patterns present here.

The 1km grid squares confirmed for inclusion in the survey were: SO7140, SO7241, SO7352, SO7443, SO7436, SO7841, SO7840 and SO7838 (*figure 3*).

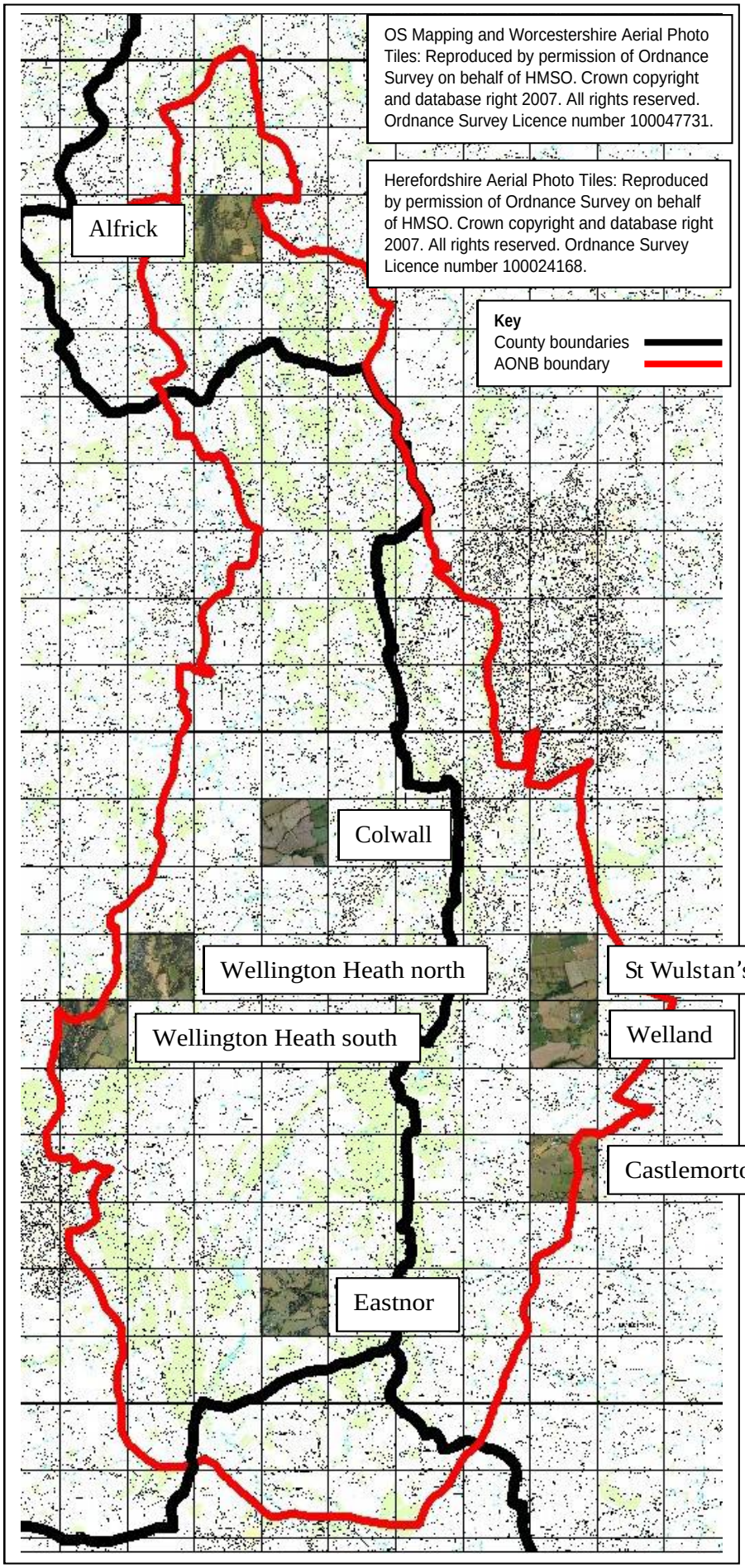


Figure 3. Hedgerow survey areas indicated by presence of the aerial photo tile

The 1km squares were then further divided into a 3x3 grid (hereafter referred to as the 'sub-divisions' of the grid square) and the Hedgerow Survey Handbook methodology used to select the hedgerows to be surveyed. There were nine sub-divisions, distributed across four grid squares, where no hedgerow could be identified using the aerial photographs either due to the presence of blocks of woodland or a very open pasture landscape. The absence of any hedgerows within a sub-division was always double-checked in the field by undertaking a walkover of the relevant area. In two instances this resulted in a hedge being located and surveyed within a different part of the sub-division. Conversely, within one grid square many of the features identified as hedgerows on the aerial photograph turned out to be fencelines covered in bracken and therefore could not be surveyed. In total 63 hedgerows were ultimately surveyed.

Current OS mapping and aerial photographs were used to check points of access for each of the hedgerows, e.g. location of footpaths and field gates, prior to beginning the fieldwork. This saved a lot of time when in the field.

4.3 Making predictions based on current data

Appendix 1 draws together and presents the key data for the Landscape Character Assessment, Historic Landscape Characterisation and the Worcestershire Landscape Sensitivity Assessment of the survey areas chosen where it relates to hedgerow composition, origins or condition. This desk study was undertaken prior to beginning the field work and provided a quick reference point when analysing results and drawing conclusions from the project. It also allowed some ground-truthing of the LCA and HLC data to take place.

4.4 Gaining permission for the survey

A letter informing landowners within the AONB of the aims and objectives of the survey and asking permission to include their hedgerows should their land fall within one of the chosen grid squares was sent out 3-4 weeks in advance of the work beginning by the AONB Unit. Landowners were provided with the contact details of the surveyor and invited to get in touch if they had any queries. In addition to this a database was compiled of all the landownerships relevant to each chosen grid square. The relevant farms were identified using current OS mapping and the contact details gathered by several means:

- Contact details provided by landowners returning the questionnaire (see section 4.6 below)
- Contact details already held by the AONB Unit
- Local Tree Wardens
- Phone book/Yellow pages
- A neighbouring landowner already contacted via one of the above means

All landowners whose land fell within a survey square were contacted by the surveyor by phone prior to their area being visited to confirm they were happy to allow access. No refusals were received.

4.5 Undertaking survey work

All sections of the Hedgerow Survey Handbook survey form were completed for each hedgerow surveyed (30m section). However, a more detailed condition assessment was carried out of any older 'veteran' trees found using a survey form developed by the Worcestershire Ancient Tree Project from the Veteran Tree Initiative (English Nature). These survey forms can be found in appendix 2. Note that some of the veteran trees recorded were not hedgerow trees or were not within the hedgerows being surveyed but the opportunity was taken never-the-less to record them as being of interest. Only those veterans found within a surveyed hedgerow are included in the statistics in section 5.6.

A method of estimating percentage cover of woody shrub species within the 30m survey section was used based on advice from a colleague who had undertaken hedgerow surveys previously. In the interests of assisting future hedgerow surveyors the method is outlined below:

a) The data used to estimate percentage cover was gathered by identifying each species occuring at 0.5m intervals along the 30m section of hedgerow. Beginning at one end of the 30m section a sideways step was taken and all species visible at that point in the hedgerow immediately in front of the surveyor were recorded by placing a dot in the species box on the recording form. This was repeated along the entire length of the survey section.

b) Once all species had been identified at 0.5m intervals the number of dots or 'number of occurences' for each species was totalled.
Example:
Dogwood – 14
Dog rose – 23
Hawthorn – 60
Hazel – 8
Field maple – 12

c) The total number of occurances for all species was calculated, in this instance *the total number of dots = 127.*

d) The percentage occurance of each species can be approximated as a proportion of the overall total:
In this example:
Any species with 127 dots of occurance would equal 100% coverage
63 dots = 50%
31dots = 25%
15 dots = 12%
7 dots = 6%

e) So, we can approximate percentage occurance for each of the five species in this example:
Dogwood = 12%
Dog rose = 19%
Hawthorn = 51%
Hazel = 7%
Field maple = 11%

f) The maths can be checked easily by totalling the percentages and refering back to previous figures.

This method was considered to be very successful, being easily and consistently replicated at each hedgerow and producing results that the surveyor was confident gave an accurate indication of the representation of each species. It required close examination of the hedgerow at frequent intervals which helped to ensure that no species was overlooked. Far from being time-consuming, a 30m section could be covered and results calculated in 15-20 minutes on average even for the most species-rich hedge. For a surveyor confident in their woody species identification and who has become familiar with the layout of the survey form it was found to be a quick, easy and enjoyable way to complete this part of the survey.

4.6 Gathering information on hedgerow management from landowners

A questionnaire was sent to landowners at the start of the project to collect data on hedgerow composition, management styles and regimes in operation thoughout the AONB. We also asked about attitudes towards hedgerow management and factors influencing management. A pre-paid reply envelope was included. We are grateful to ADAS for allowing us to adapt a questionnaire designed for their report *'Hedgerow Management – A study of farmers' and contractors' attitudes',* 2000. A copy of the modified questionnaire can be found in appendix 3.

5. Survey results

5.1 The contribution of hedgerows to local landscape character - results by survey grid square

The information on Landscape Character (LC), Historic Landscape Character (HLC) and Worcestershire Landscape Sensitivity (WLS) pertaining to each survey square are presented in appendix 1. Key elements of these that relate directly to hedgerow composition, origin or condition are discussed below, alongside the actual observations of the surveyor, to summarise where the LC/HLC/WLS data were felt either to be strongly supported by observations in the field or where it was not.

SO7352 Alfrick

This grid square falls within the Principal Wooded Hills Landscape Type straddling the wooded ridgeline between Alfrick and Suckley parishes. The assarted origins of many of its hedgerows are very obvious, with a rich mix of species including wild service and small leaved lime. Land use is a mixture of pasture for sheep and cattle grazing, orchard and hay meadow. In the northern part of the square fences have been added to sub-divide fields and some hedges have become gappy, however the land in question has been entered into the Environmental Stewardship scheme and hedges have been fenced off and planted to restore them. Several veteran oak pollards and a small-leaved lime coppice stool were found in this square and recorded. Hedge banks were found associated with 8 of the 9 hedgerows surveyed. Hedgerows are a key component of this landscape and many of the narrow lanes are bordered by tall, mature hedges on a bank.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Assarted pattern of woodland clearance overlaid with inserted pattern of piecemeal enclosure with semi-regular boundaries	Medium sized fields with sinuous assart-origin boundaries still evident but later, straight hedging additions prominent in places.
Mixed species hedgerows with hazel very prominent	The hedgerows in this area had the richest mix of woody species overall (16 recorded) than any other survey square. Hazel was present in 8 of the 9 hedges surveyed but was the dominent species in only one of those hedgerows. Hawthorn was the most consistently found species, being present in every hedgerow. Other frequently occuring species were dog rose and field maple. Other dominant species within individual hedges included english elm, blackthorn and dog rose.
Loss of organic field pattern in places	Insertion of straight boundaries was common, detracting from the sinuous organic hedgerow pattern
Locally poor age structure of hedgerow trees with most being mature or veteran	Trees abundant along watercourses but isolated hedgerow trees uncommon elsewhere. Four veteran oak pollards and one small-leaved lime coppice stool were recorded in the surveyed hedgerows. No young hedgerow trees were observed.
Neglected, unmanaged boundaries	Hedgerow management varied. Some hedgerows surveyed were fairly neatly managed, others were tall and mature.
Some hedge loss or fragmantation and occasional fencing additions	A small number of hedgerows had become gappy: these were now being restored under ELS. Some fencing sub-division of fields has taken place. Some hedge loss in preference to fences.

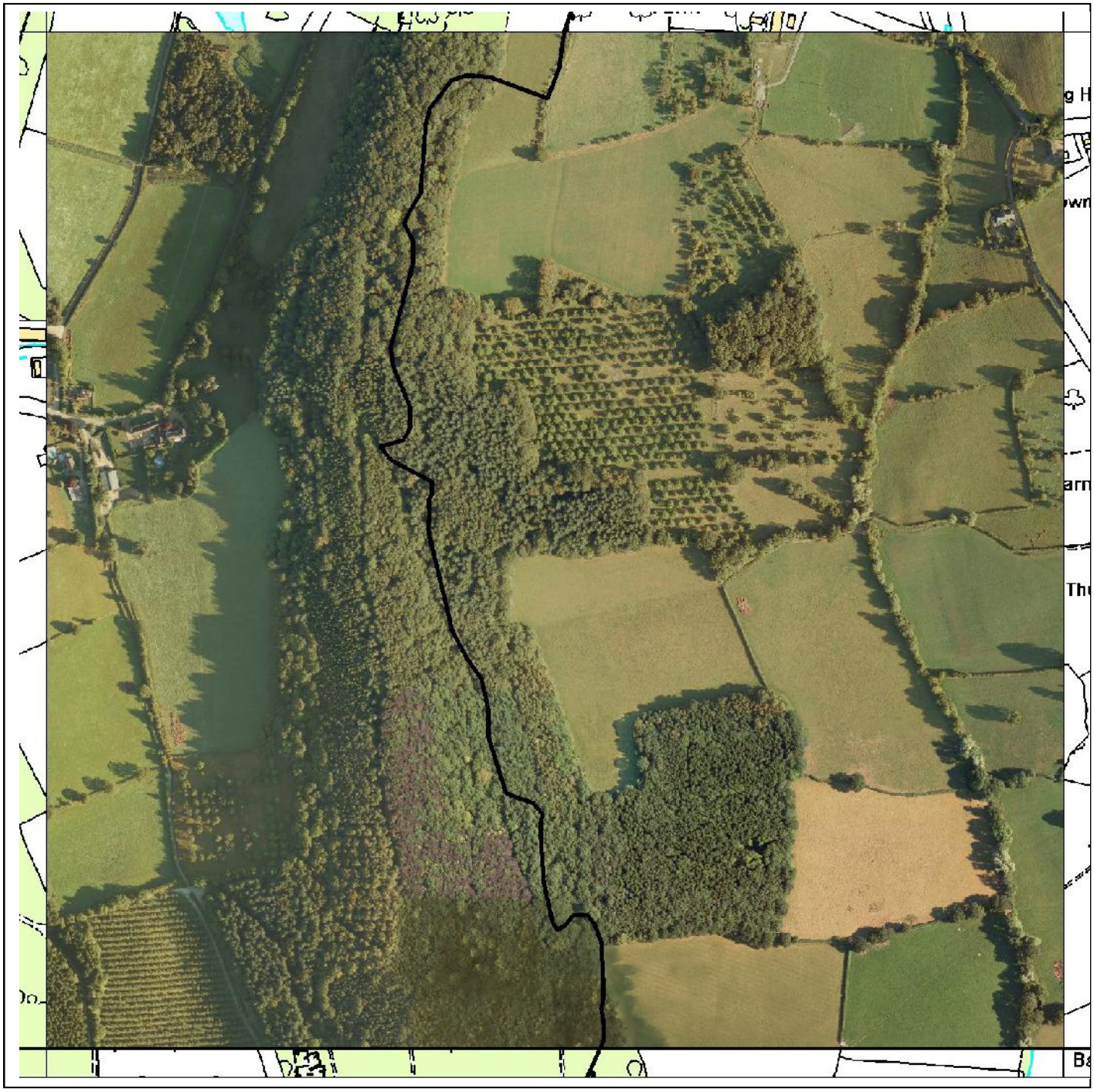


Figure 4. Alfrick Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Principal Wooded Hills Landscape Type that are of particular relevance in this grid square are to:

- Maintain and restore where lost the sinuous nature of field boundaries to reflect the assarted origins of the hedgerows
- Ensure new hedgerow planting contains a rich mix of species in keeping with existing hedgerows
- Encourage the establishment and care of new hedgerow trees and restorative management to veteran trees

SO7443 Colwall

This grid square falls within the Principal Timbered Farmlands Landscape Type. The land use within this area is a mixture of arable crops, improved sheep runs and semi-improved grassland. There is a small amount of semi-mature woodland including an area of recent plantation. The majority of hedgerows present are tall and mature. Where the hedgerow borders an arable field the hedge bottoms are generally intact and fairly thick. Where they border sheep pasture they have become gappy due to stock damage, with soil erosion around the roots and ground flora indicating enrichment. Margins around the arable fields were often wider than required under cross-compliance. Some of the margins were being mown at the time of survey (early July). Hedgerows are a very important element of landscape character in this grid square, preserving the wooded, sinuous nature of a landscape now dominated visually by arable farming.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Small to medium scale organic pattern of hedged fields	Fields medium-large with sinuous, organic pattern of woodland-origin hedgerows still very evident.
Assarted pattern of woodland clearance	Sinuous and often wide hedgerow boundaries show woodland origins. Clearance of woodland for agriculture has been thorough leaving no ancient woodland blocks.
Hedgerow condition deteriorating in places	Many hedgerows are tall and mature. Some hedgerows situated in areas of permanent pasture are becoming gappy with soil erosion due to livestock damage. Occasional short sections of hedgerow have deteriorated and there was one fencing insertion.
Densely scattered hedgerow oaks with good species and age variation of trees	Scattered hedgerow oaks of varying sizes from 10cm to 100cm Diameter at Breast Height were recorded – the age variation here was better than that found in any other survey square. Other isolated hedgerow tree species recorded were hawthorn, field maple, alder, ash, willow, black poplar and white poplar. A sessile oak sapling (planted) was also noted.

Figure 5. Colwall Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Principal Timbered Farmlands Landscape Type that are of particular relevance in this grid square are to:

- Maintain the good age and native species diversity of hedgerow shrubs and trees
- Preserve the remaining enclosure patterns, resisting field amalgamation, replacement of hedgerows with fences and straightening of boundaries
- Restore hedgerow structure where neglect is leading to gaps

SO7140 Wellington Heath south

This grid square falls across the boundaries of three Landscape Types: Principal Wooded Hills, Settled Farmlands on River Terraces and Forest Smallholdings and Dwellings. The land use within this survey square is almost exclusively grazing for horses and cattle. There is a small area in the southeast of the square given over to horticulture (fruit farm). The square encompasses most of the village of Wellington Heath, which is situated on a fairly steep wooded hillside to the western side of the square. The hedgerows in the village are mostly short lengths of intensively managed garden hedge often containing exotics or tall, mature hedges alongside the minor roads. Several roadside hedgerows were surveyed; verges were very narrow or non-existent and the hedges were tightly trimmed back for visibility. Away from the village some hedgerows were very over-mature and fences had also been used to divide up amalgamated fields for horse paddocks. The area is still reasonably wooded with some substantial blocks breaking up the landscape. The assarted character of the landscape has mostly been lost but some hedgerows do still retain their woodland origins and show the old woodland boundary. Hedgerows are an important component of the wooded character of the area but the landscape character is compromised by the fencing additions and insertion of low, straight hedgerow boundaries.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Tree cover mainly confined to scattered (densely in places) hedgerow trees although there is an ongoing loss of these and many of those remaining are mature or veteran	Several hedgerows were tall and over mature but isolated hedgerow trees were rare. Overall the tree cover was divided fairly equally between woodland and hedgerow. No veteran trees were found within this grid square.
Original assarted pattern of woodland clearance overlaid with a piecemeal grid enclosure	Large blocks of woodland remain in this area and the old woodland edges can still be identified through the hedgerow pattern. The farmland in-between shows a strong sub-regular piecemeal grid enclosure and also a later, more modern and more regular grid enclosure.
Boundaries are generally in good condition but there is some progressive loss and degradation of hedges in places. Some loss of hedges has increased field size. Hedgerows often tall and over mature.	Some fields have been amalgamated and fences inserted to create horse paddocks. Some hedgerows in less than perfect condition due to livestock damage. Several hedgerows were tall and over mature.

Figure 6. Wellington Heath south Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Principal Wooded Hills, Settled Farmlands on River Terraces and Forest Smallholdings and Dwellings Landscape Types that are of particular relevance in this grid square are to:

- Respect the tall, over mature nature of hedgerows where these occur
- Preserve the small to medium scale enclosure pattern and maintain the integrity of the organic, assarted field pattern where this is still present, avoiding insertion of grid-like boundaries
- Encourage the establishment, care and maintenance of hedgerow trees

SO7241 Wellington Heath north

The Landscape Type present across this grid square is Principal Wooded Hills. This area is heavily wooded and almost all un-wooded land is either sheep pasture or cut for grass. The boundaries of two registered parklands meet within this grid square and some of the parkland trees, notably oak, sweet chestnut and pine, remain and survive as veterans. Many of the fields are enclosed entirely by woodland and most of the features identified as possible hedgerows on the aerial photographs were found to be fence lines covered in bracken. Only one hedgerow was surveyed in the top northwest corner of the grid square following a walk-over of the whole area. Hedgerows are not characteristic of this 1km grid square, instead the character is dominated by interconnected blocks of ancient woodland and the influence of the designed parkland.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Assarted pattern of woodland clearance overlaid with piecemeal enclosure pattern	The survey area is dominated by assarted fields and medium sized, interconnected blocks of ancient woodland. Evidence of the past enclosure of strip fields can still be seen in several places in the form of low earthworks and changes in ground vegetation although the boundaries are now gone. A small area in the north west corner of the survey square falls outside the registered parkland and here we move to a larger scale pastoral landscape with hedged fields and little woodland.
Wooded streamlines and hedged fields	Not at all evident in the majority of this grid square. The small area in the north west corner does conform to this character.
Significant loss of hedgerow trees with those present often mature or veteran	Hedgerows are not characteristic of this particular grid square. Trees of interest are old parkland or woodland edge trees.
Poor hedgerow condition	The single hedgerow surveyed was leggy with an average mix of species. Ground flora showed the hedgerow's woodland origins (dog's mercury).

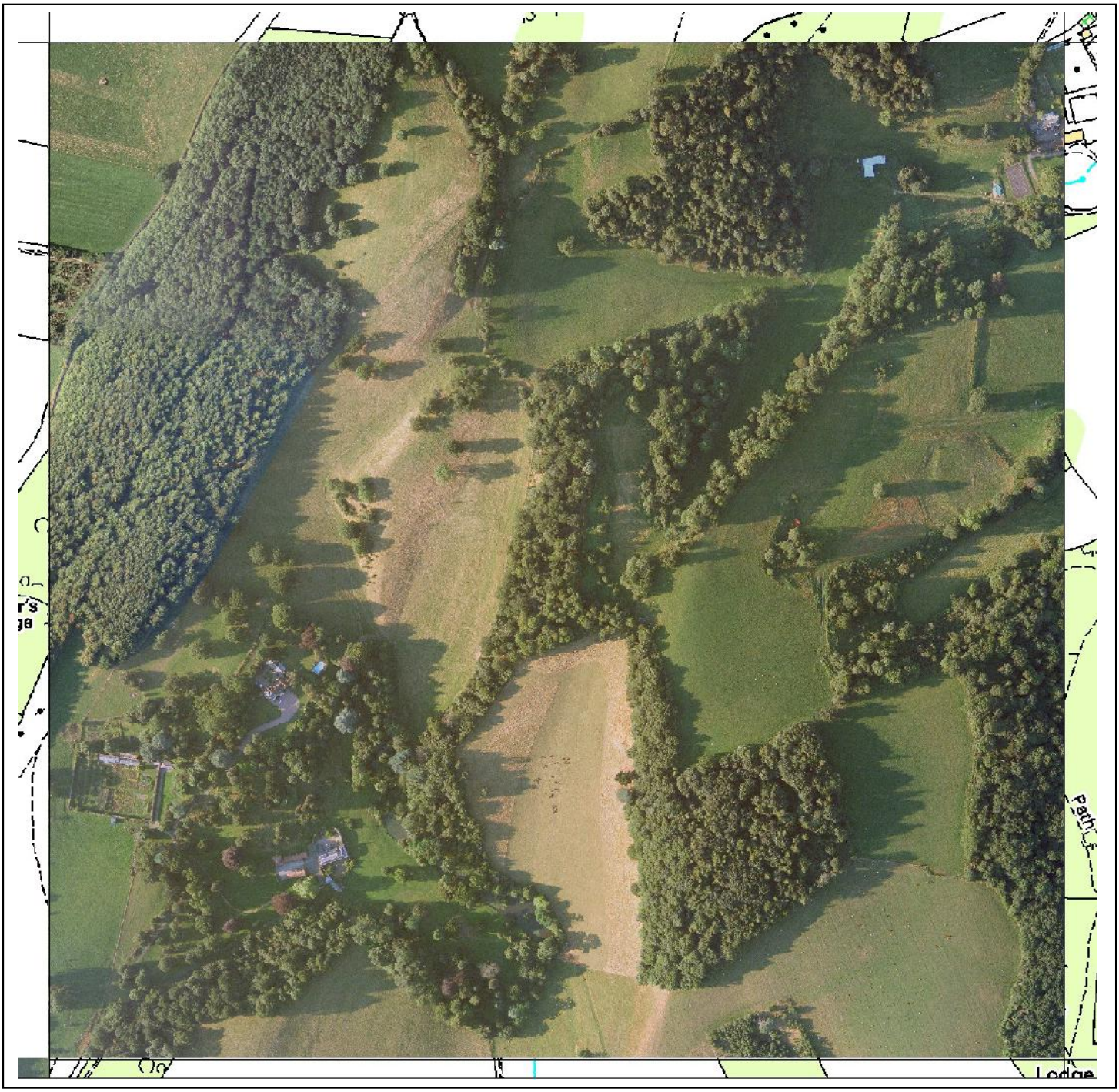


Figure 7. Wellington Heath north Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows are not relevant to this particular grid square. It is important to recognise the characteristic lack of hedgerows and avoid detracting from this character through the sub-division of fields by the insertion of straight geometric boundaries.

SO7436 Eastnor

This grid square falls within the Wooded Hills and Farmlands Landscape Type. The land use within this survey square is almost exclusively sheep pasture interspersed with blocks of woodland, with the central area of the square being a very open pasture landscape. The field boundaries in the southern part of the grid square often occur as lines of trees, particularly those bordering streams or ditches. Along the watercourses steep banks and tall ground vegetation (and occasionally fencing) had generally prevented stock damage; away from the watercourses stock damage to the bottom of the hedge was more obvious (and quite extreme in the case of one surveyed hedgerow). Parts of the roadside hedges were on stone-facing banks. Sinuous hedgerow boundaries between the woodland blocks and along watercourses are an important visual characteristic of this area.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Large hedged fields with hedgerows linking woodland blocks	Fields hugely variable in size. Hedgerow and streamside trees link woodland blocks but the corridors are very narrow.
Loss of previous field enclosure pattern	Sinuous boundaries still very evident but the landscape is now much more open and the small scale enclosure character lost. Woodland blocks have shrunk or disappeared and the character of this grid square is now strongly influenced by the parkland landscape imposed on top.
Declining hedgerow condition with some introduction of fences. Significant loss of hedgerows in some areas.	Several hedgerows had grown out and some were significantly leggy and gappy exacerbated by stock damage. Some hedgerow boundaries have been replaced by fences.
Some loss of hedgerow trees (significant in places)	Isolated hedgerow trees were not characteristic of this survey square although several hedgerows had grown tall and over mature and now existed as lines of trees. Occasional isolated trees were present as in-field trees or remnant parkland trees.

Figure 8. Eastnor Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Wooded Hills and Farmlands Landscape Type that are of particular relevance in this grid square are to:

- Maintain the condition and integrity of strong, sinuous hedgerows linking woodland blocks
- Focus on restoring hedgerows that have become gappy and leggy and maintaining any associated stone facing banks
- Discourage insertion of fenced boundaries

SO7841 St Wulstan's

This grid square falls within the Enclosed Commons Landscape Type and is a mix of arable land and some sheep, cattle and horse grazing. The south western part of the grid square is the St Wulstans Local Nature Reserve and the boundaries on all sides of this site are a mix of young and mature woodland. The majority of hedgerows are straight and geometric but several different 'blocks' of geometric enclosure are evident distinguished by differences in field size, shape and direction of boundaries. Hedgerows in the northwest part were mostly gappy and species poor, with one very noticeable exception. Some hedgerows in the southern part of the survey area were tall and over mature, but again often becoming gappy. The overall integrity of the hedgerows in this area was very poor.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Geometric, large-scale, late enclosure field pattern becoming fragmented in places	Medium-large scale geometric pattern broken up by the presence of St Wulstans nature reserve in the south west corner of the grid square.
Generally unmanaged thorn hedges with some loss. Some hedgerows becoming fragmented and gappy due to increasing arable land use.	Hawthorn and blackthorn were the most frequently occuring and dominant species. Some hedgerows were composed almost entirely of one or both of these. Hedgerows were often gappy, sometimes to the point of complete loss. Land use was predominently arable.
Some garden hedge and fence intrusion and some sub-division of fields with fences in places	Very occasional sub-division with fencing in sheep pastures.
Thinly scattered hedgerow trees	Isolated hedgerow trees were a very occasional feature.

Figure 9. St Wulstans Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Enclosed Commons Landscape Type that are of particular relevance in this grid square are to:

- Restore the integrity of the hedgerows where they are becoming gappy due to neglect in arable areas

SO7840 Welland

This grid square also falls within the Landscape Type of Enclosed Commons. The grid square is predominantly arable farmland with some livestock grazing including a few fields of semi-improved grass with flora such as knapweed and birds-foot trefoil. Half of the hedgerows surveyed were neglected and over mature with others intensively managed, short and becoming gappy and or leggy. Overall, hedgerows tended to be in poor condition with one or two exceptions. Several veteran oak pollards were found and recorded. The variation in field size and shape resulting from the late but piecemeal enclosure is even more obvious in this grid square than St Wulstans to the north. The field boundary character of this grid square is quite disjointed as a consequence. Several fields have also undergone post-war amalgamation for arable cultivation which further exaggerates the boundary variation across the square.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Geometric pattern of large, late enclosure pastoral fields with pattern becoming fragmented	Sub-regular pattern with fields varying hugely in size. Some amalgamation has taken place. Arable farming dominates broken up with areas of pasture.
Regularly and intensively managed thorn hedges in deteriorating condition and becoming gappy. Loss is high in some areas. Elm is also prominent in the hedgerows.	Hawthorn and dog rose were the most frequently occuring species, found in 9 and 7 respectively of the hedgerows surveyed. Elm was found in only one hedgerow but it was the dominant species there. Blackthorn was also frequent, found in 6 hedgerows and often the dominant species. Hedgerows in the square were divided between those neglected and over mature and those managed intensively. Some hedgerows were gappy and occasionally replaced entirely by fencing.
Encroachment of fenced gardens occurs in some places with some fields also broken up by fencing additions.	This influence was not noted on those hedgerows selected for survey. Sycamore and garden privet were recorded in one roadside hedge.
Thinly scattered hedgerow trees	Many hedgerows were tall and over mature, both alongside and away from watercourses. Some hedgerows in the north of the survey area had scattered isolated hedgerow trees. Hedgerow pollards were an occasional feature in the south east of the grid square.
Some sub-division of fields with fences	No sub-division was noted during the survey.

Figure 10. Welland Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Enclosed Commons Landscape Type that are of particular relevance in this grid square are to:

- Restore the integrity of the hedgerows where they are becoming gappy due to neglect in arable areas
- Maintain the varied field scale characteristic of this area, whilst guarding against further hedgerow loss through field amalgamation
- Discourage the replacement of hedgerows with fences

SO7838 Castlemorton

This area is split between two Landscape Types: Unenclosed Commons and Settled Farmlands with Pastoral Land Use. The hedgerows in the northernmost part of this survey square border Castlemorton common. The common is managed by low intensity cattle grazing, with more intensive horse grazing being predominant on the farmed side of these hedges. In the southern part of the survey square the land use consists of both arable and sheep grazing with cropping blocks proving livestock fodder. Several hedgerows were tall and over mature but most were kept short and were in places becoming gappy and or leggy. Some of the verges between road and hedgerow are very narrow. Hedgerow pollards were a characteristic feature of the whole area. The enclosure patterns here are very interesting, particularly on the boundary between the two landscape types, and so the pattern of hedgerow field boundaries are a key part of the landscape character.

Summary of Landscape Character, Historic Landscape Character and Landscape Sensitivity (refer to Annex 1)	**Summary of actual observations in survey square**
Settlement around the perimeter of the common leads to a loss of unenclosed character through the intrusion of hedges and fences around paddocks and gardens. Away from the common there is a small to medium scale sub-regular pattern of pasture fields (and increasing arable land use) associated with settlement	Hedgerows semi-regular away from the common; more sinuous along the common edge due to encroachment enclosure pattern. Sub-regular medium scale field pattern seen away from the unenclosed common with some amalgamation. Settlement is dispersed along the road sides and is not yet at a scale that detracts from the landscape character.
Hedgerows sometime managed, sometimes neglected with some loss or removal. Elm found in hedgerows.	Only one hedgerow was found to contain elm and in a very small quantity. Occasionally hedgerows were neglected and either gappy or tall and mature but most were managed.
Occasional fencing additions	Limited fencing additions.
Thinly scattered hedgerow and streamside trees with some localised loss and sometimes in poor condition	Frequent hedgerow trees including many old pollards. Most of these were in reasonable condition although management had long since lapsed.

Figure 11. Castlemorton Survey Square with aerial photograph overlaid on OS mapping

Guidelines for the enhancement and protection of hedgerows within the Unenclosed Commons and Settled Farmlands with Pastoral Land Use Landscape Types that are of particular relevance in this grid square are to:

- Restore the integrity of the hedgerows where they are becoming gappy due to neglect
- Encourage the establishment and care of new hedgerow trees and restorative management to veteran trees

5.2 Hedgerow type

32 hedgerows surveyed (51%) were classified as 'shrubby with lines of trees' (see Hedgerow Survey Handbook for definitions). There were two variations: hedgerows with a distinctive and separate shrub and tall, mature tree layer (shrubby with lollipops); and hedgerows where a lack of management had resulted in some of the shrubs growing out into trees. 25 hedgerows (39.5%) were classed as shrubby hedgerows, with few or no isolated trees, and 6 (9.5%) as lines of trees. The latter were usually found bordering streams/wide ditches and generally consisted of species such as crack willow and alder.

Over mature hedgerows were sometimes difficult to place in one category despite the 2m-to-base-of-canopy rule. This was usually because any trees present were the same species as within the shrub layer, e.g. hawthorn, holly or field maple, but simply in a taller form. Where hedgerows had grown into lines of trees many were managed by cutting back the first 2-3m in height and leaving the taller growth resulting in a dense mushroom profile. Most hedgerow shrub species sucker or regenerate readily from the base, which continues even when those shrubs grow out of the top of the hedge, and this type of mushroom management only encourages the shrubs/ trees to also continue suckering and regenerating between ground level and 2m in height. This blurred the boundary between shrub and tree and made it difficult to determine where the shrub layer stopped and the higher canopy began.

5.3 Hedgerow connections

Each hedgerow surveyed was connected to an average of 2.26 other hedgerows. In real terms the number of connections varied from 0 to 5.

5.4 Adjacent land use

95% of hedgerows surveyed were adjacent to either grassland or an arable crop on one or both sides with the majority of sides (52 sides or 41.26%) bordering improved grassland. Several 'other' categories were recorded: set aside, orchard, garden, cemetery and common land. These are included in the table as a sub-category of the broader land use. 41 hedgerows had differing land uses on the two sides. The 22 hedgerows where land use was the same on both sides were mainly situated in areas of arable farmland.

Table 1. Land use bordering the surveyed hedgerows

Adjacent Land Use	Number of hedgerow sides bordered by each land use	Contributing survey squares (number of individual hedgerows in brackets)
Arable crop	30 (23.8%)	Colwall (11), St Wulstans (9), Welland (7), Castlemorton (3)
- Set aside	1 (0.79%)	Castlemorton (1)
Improved grass	46 (36.5%)	Alfrick (11), Colwall (2), W. Heath N (1), W. Heath S(8), Eastnor (8), St Wulstans (4), Welland (5), Castlemorton (7)
- orchard	2 (1.58%)	Alfrick (2)
- garden	3 (2.38%)	W. Heath S(1), Welland (1), Castlemorton (1)
- cemetery	1 (0.79%)	W. Heath S(1)
Semi-improved grass	16 (12.69%)	Alfrick (2), Colwall (5), W. Heath S(3), Eastnor (1), St Wulstans (2), Welland (2), Castlemorton (1)
- common land	2 (1.58%)	Castlemorton (2)
Semi-mature woodland	2 (1.58%)	Eastnor (1), Castlemorton (1)
Mature woodland	2 (1.58%)	Alfrick (1), St Wulstans (1)
Major road	4 (3.17%)	Eastnor (2), Welland (2)
Minor road	9 (7.14%)	Alfrick (2), W. Heath N (1), W. Heath S(3), Eastnor (1), Castlemorton (2)
Unsurfaced track	3 (2.38%)	St Wulstans (3)
Footpath	2 (1.58%)	W. Heath S(2)
Stream	3 (2.38%)	Eastnor (3)

5.5 Associated features – presence, condition and management

All the hedgerows surveyed had another boundary feature of some sort associated with them, the most common being a fence.

Table 2. Associated boundary features found

Associated feature	Number of hedgerows where feature found	
	One side	both sides
Bank	19 (30%)	3 (4.76%)
	One side	both sides
Fence	47 (74.6%)	8 (12.69%)
Ditch	29 (46%)	

Table 3. Bank type and management

Bank management	Half bank	Full bank
Earth	18 (28.5%)	3 (4.7%)
no management	4 (6.3%)	0
fenced off	5 (7.9%)	3 (4.7%)
grazed	5 (7.9%)	2 (3.2%)
mown/cut	4 (6.3%)	
Stone	1 (1.6%)	
no management	1 (1.6%)	
fenced off		
grazed		
mown/cut		

5.5 Condition assessment

40 hedgerows (80 sides) can automatically be classed as in favourable condition for the undisturbed ground and perennial herbaceous vegetation cover assessment as both sides of the hedgerow border either woodland, grassland or a road. This equates to 63% of surveyed hedgerows.

The other 23 surveyed hedgerows between them have 31 hedgerow sides that border arable farmland. Of these 31 hedgerow sides: 96.8% of hedgerow sides have a width of undisturbed ground 2m or greater; 100% hedgerow sides have a width of perennial herbaceous vegetation 1m or greater.

Table 4. Width of undisturbed ground and herbaceous vegetation cover next to each hedgerow side surveyed

Distance	Undisturbed ground (number of sides)	Vegetation cover (number of sides)
Less than 1m	0	0
1-1.9m	1 (3.2%)	11 (35.5%)
2-2.9m	14 (45%)	7 (22.5%)
3-3.9m	4 (13%)	2 (6.4%)
4-4.9m	3 (9.7%)	3 (9.7%)
5-5.9m	2 (6.4%)	3 (9.7%)
6-6.9m	2 (6.4%)	2 (6.4%)
7-7.9m	3 (9.7%)	0
Over 8m	2 (6.4%)	3 (9.7%)

Only 1 hedgerow side surveyed had an undisturbed ground width of less than 2m. Some of the sides recorded within the 2-2.9m category were very marginal i.e. the 2m width only barely scraped by. In the vast majority of cases the herbaceous vegetation extended right up to the edge of the crop with no bare ground. One hedgerow surveyed had an undisturbed ground width of 4m but the herbaceous vegetation actually extended for a total of 8m, well into the crop.

41 hedgerows (68%) had more than 20% cover of the nutrient-enrichment indicator species nettle, dock and cleavers (either a single species or in combination) resulting from chemical inputs to the hedge bottom such as agricultural fertilisers or livestock dung. The most frequently occurring species was

nettles, with an average of 9.6% coverage on each of the 126 hedgerow sides, with real values varying from 0% to 50%. Only three hedgerows had no percentage cover of any of these species.

Only two hedgerows surveyed had any introduced non-native species within them. These were a roadside hedge containing both sycamore and garden privet and a recently gapped-up hedge containing a cherry species. The remaining 61 hedgerows, or 96.8% of those surveyed, had no percentage cover of introduced non-native species at all. Of the hedgerows that did the sycamore and garden privet together accounted for 10% coverage of the woody species present and the cherry species just 6% coverage and therefore these hedgerows, too, just qualify as being in good condition for this attribute.

The table below indicates the number and percentage of hedgerows surveyed falling within each shape

Shape	Number of hedgerows	Contributing survey squares (number of individual hedgerows in brackets)
Trimmed and dense	14 (22%)	Alfrick (4), Colwall (2), W. Heath S(2), St Wulstans (1), Welland (3), Castlemorton (2)
Intensively managed	2 (3%)	Eastnor (1), St Wulstans (1)
Untrimmed	24 (38%)	Alfrick (4), Colwall (4), W. Heath S(4), Eastnor (2), St Wulstans (2), Welland (5), Castlemorton (3)
Tall and leggy	9 (14%)	Alfrick (1), Colwall (1), W. Heath N (1), Eastnor (2), St Wulstans (2), Welland (1), Castlemorton (1)
Untrimmed with outgrowth	4 (6%)	W. Heath S(1), St Wulstans (1), Castlemorton (2)
Recently coppiced	0	
Recently laid	0	
Other (line of trees)	6 (9%)	Colwall (2), Eastnor (3), Castlemorton (1)
Other (mushroom)*	4 (6%)	W. Heath S(2), St Wulstans (2)

* 'mushroom' shape describes a hedgerow that has grown out into or been allowed to remain a line of trees but is managed by trimming back the first 2-3m in height and leaving the top. The hedge is considerably narrower at the bottom with wide, hanging stems at the top and in profile appears to have a mushroom shape.

52 hedgerows (82.5%) had a cross-sectional area of at least 3m². 63 hedgerows (100%) had a height of at least 1m. 55 hedgerows (87%) had a width of at least 1.5m. 56 hedgerows (88%) had gaps comprising less than 10% of the hedgerow length. 60 hedgerows (95%) had no gap greater than 5m.

Of the 57 shrubby hedgerows (either with or without lines of trees), 35 hedgerows (61.5%) had the base of leafy growth a minimum of 0.5m from the ground. 22 hedgerows (38.5%) had the base of leafy growth more than 0.5m from the ground.

5.6 Isolated hedgerow trees (including veteran trees found within surveyed hedgerows only)

195 isolated hedgerow trees were recorded during the survey. This was an average of 9.7 trees per 100m.

Only one young isolated hedgerow tree was found; a (planted) sessile oak sapling in the Colwall survey square with a girth of 5cm (0.5% of the total trees recorded).

32 hedgerow trees (16.5% of total tree recorded) had a Diameter at Breast Height (DBH) of 1m or over. A total of 41 considered to be veterans underwent a full assessment of their form and condition. These veteran tree records and a location map can be seen in appendix 2. Taking into account the size guide for veteran trees given within the Hedgerow Survey Handbook it was determined that 30 of the 195 trees recorded were truly ancient for their species.

5.7 Species richness

53.9% of hedgerows contained 5 or more woody species. There was an average of 4.9 woody species per 30m survey section across the 63 hedgerows surveyed.

Table 6. Number of woody species found in each of the surveyed hedgerows

Number of woody species in the hedgerow	Hedgerows with that number of woody species	Contributing survey squares (number of individual hedgerows in brackets)
1	2 (3.2%)	St Wulstans (1), Welland (1)
2	6 (9.5%)	Eastnor (3), St Wulstans (2), Welland (1)
3	11 (17.5%)	Colwall (2), W Heath South (2), Eastnor (2), St Wulstans (1), Welland (2), Castlemorton (2)
4	10 (15.8%)	Colwall (3), W Heath South (2), St Wulstans (1), Welland (2), Castlemorton (2)
5	8 (12.7%)	Alfrick (1), Colwall (2), W Heath North (1), W Heath South (1), St Wulstans (1), Welland (2)
6	9 (14.2%)	Alfrick (3), Colwall (1), W Heath South (1), Eastnor (1), St Wulstans (1), Castlemorton (2)
7	11 (17.5%)	Alfrick (3), W Heath South (2), Eastnor (2), St Wulstans (1), Castlemorton (3)
8	3 (4.7%)	W Heath South (1), St Wulstans (1), Welland (1)
9	2 (3.2%)	Alfrick (1), Colwall (1)
10	0	
11	1 (1.6%)	Alfrick (1)

100% of hedgerows surveyed met the condition assessment for having at least 80% cover of native woody species (when including archaeophytes* and sycamore). Two hedgerows were found to contain non-native species (sycamore, garden privet and a cherry *sp.*). These non-natives accounted for just 10% and 6% of the woody species coverage within the two hedges concerned.

**A plant species which is non-native but was introduced in ancient times rather than being a modern introduction.*

5.8 Hedgerow and margin management

29 (46%) of the hedgerows surveyed had been flailed or trimmed within the last two years. A total of 34 hedges (54%) had been either laid or coppiced in the past but no recent management of this type was found during the survey. Three hedgerows had been gapped up within the last two years.

Table 7. Number of hedgerows observed to have undergone different types of management

Hedgerow management	Flailed/trimmed	Coppiced	Laid	Planting/gapping
Signs of recent management <2 years	29 (46%)	0	0	3 (4.7%)
Signs of management 2-10 years	16 (25.4%)	2 (3.2%)	0	0
Signs of older management >10 years		22 (34.9%)	10 (15.8%)	0

5.9 Ground flora

85 ground flora species were recorded during the survey either in the hedge bottom or within 1m of the hedge bottom. A species list can be seen in appendix 4. The average number of ground flora species found per 30m hedgerow section surveyed was 9.68.

The highest number of ground flora species recorded at a single hedgerow was 16 and the lowest was 3. 27 hedgerows (42.8%) had a proportion of bare ground underneath in addition to any ground flora. Reasons for the presence of bare ground included the patchy coverage typical of an arable field margin dominated by arable weeds and livestock damage in pasture fields where animals had continually walked along the line of the hedgerow and caused erosion of the ground vegetation.

Ground flora more associated with the field environment, such as the commonly sown improved grass species, were often found extending right up to the base of the woody stems of the hedge. 'True' hedge ground flora species were less often encountered. Overall, hedgerow ground flora was found to be more commonly and strongly influenced by the field or margin flora adjacent to it, particularly where the hedge was becoming leggy or was tightly trimmed so there was little shading.

6. Hedgerow management questionnaire results

Questionnaires were sent to all landowners within the AONB for whom the AONB Unit had current contact details. 34 questionnaires were returned by post. A copy of the modified questionnaire used in this project can be found in Appendix 3. The information gathered via the questionnaire is reported below.

Number of woody species within the hedge

Questions 4 and 5 on the questionnaire related to the species occurring within the hedgerows on the farm. For those species considered to be frequently found in hedgerows (including hawthorn, blackthorn and hazel) landowners were asked to estimate as a percentage the proportion of each species within their hedgerows. For other commonly occurring woody species landowners were simply asked to tick a box to indicate presence.

Landowners may have included hedgerow tree species within this section, as they were not specifically requested not to. Some landowners did indicate on the form where a species was present only as a hedgerow tree but the majority did not. For this reason all species data was assumed to relate to shrub species.

26 landowners (76%) reported having five or more species present within the hedgerows on their farm. However, without requesting further information or undertaking a visit to those farms we do not know if those five or more species occur within the same or different hedgerows on the farm and therefore whether the hedgerow(s) in question should be considered species rich, containing more than five woody species each per 30m section. Nine landowners (26%) reported the presence of ten or more species within their hedgerows and it is more likely that on these farms individual hedgerows are indeed species rich.

30 landowners (88%) reported bramble as being a component of their hedgerows. Hedge bindweed (reported by 19 landowners or 55.8%) and honeysuckle (16 landowners or 47%) were common with clematis infrequent (4 landowners or 11.7%).

Table 8. Number of woody species within the hedgerows belonging to each questionnaire respondent

Number of woody species within the hedgerows on the farm	Number of respondents agreeing
1	0
2	1 (2.9%)
3	2 (5.8%)
4	2 (5.8%)
5	3 (8.7%)
6	2 (5.8%)
7	3 (8.7%)
8	7 (20.3%)
9	2 (5.8%)
10	5 (14.5%)
10+	4 (11.6%)

Dominant woody species found

The data gathered on this section of the form was difficult to quantify accurately for the reasons explained above. However, certain trends came through very strongly and the dominance of hawthorn was one, with 27 landowners (79.4%) reporting it to be the dominant woody species present with their hedgerows.

Composition of hedge bottom flora
One landowner (2.9%) reported that the majority of hedge ground flora on his farm comprised arable weeds such as cleavers and sterile brome. Five (14.7%) reported that hedge bottoms were dominated mainly by grasses with wild flowers. The remaining 26 landowners who answered this question (76%) said that hedge bottoms comprised coarse grasses and weeds such as nettles and thistles.

Frequency of hedge cutting
17 landowners (50%) undertake an annual cut of their hedgerows. Two reported that they do not trim hedgerows at all, eight cut every two years, three every three years and four every 4-6 years.

Table 9. Frequency of hedgerow cutting carried out by questionnaire respondents

Frequency of hedgerow cutting	Number of respondents
Annually	17 (50%)
Every 2-years	8 (23.5%)
Every 3-years	3 (8.8%)
Every 4-6 years	4 (11.7)
Not cut	2 (5.8%)

Timing of hedge cutting
The majority of hedge cutting is carried out in January and February (16 landowners or 47%). Operations were also carried out by some landowners in September / October (13 landowners or 38%) and November / December (12 landowners or 35%). Five landowners (14.7%) reported carrying out hedge cutting work during July and August.

Uncultivated width around arable fields
17 landowners (50%) reported that their holdings consisted of only grass fields. Of the remainder who responded to this question eight landowners (23.5%) stated that they maintained the minimum required 2m uncultivated width from the centre of the hedge, five (14.7%) left 2.5-3m width and three (8.8%) left 4-6m. Data was not collected on whether these wider margins were as a result of entry into the Environmental Stewardship schemes, although it would be possible to research this using publicly available data.

Management of hedge bottom
11 landowners (32%) stated that they always or sometimes used spot spraying to control weeds at the base of the hedge, with 20 (58.8%) seldom or never doing this.

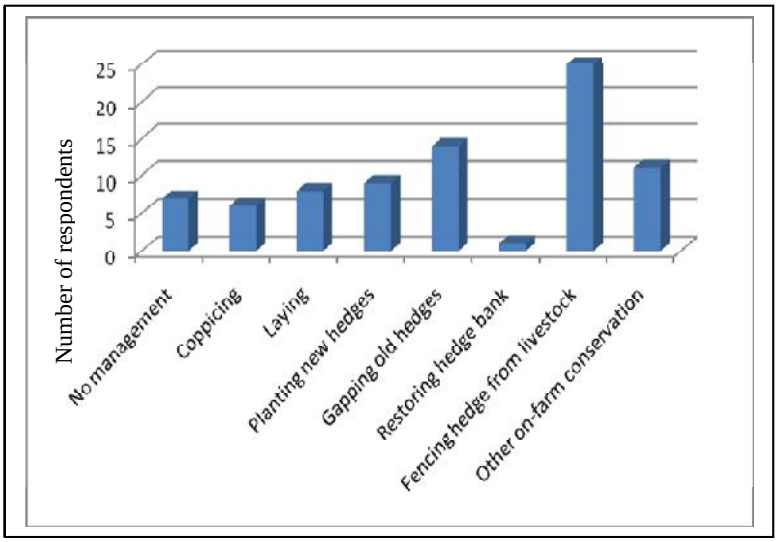
16 landowners (47%) said that they controlled the vegetation at the base of their hedgerows by mowing, with 17 (50%)seldom or never doing this.

18 landowners (52.9%) stated that all or some of their hedgerows were fenced off from livestock where applicable, with 13 (38%) saying that none of their hedgerows were fenced.

Management undertaken in the last five years, with and without subsidy
The most prevalent form of hedgerow conservation management undertaken by landowners within the last 5 year period was fencing the hedgerow to protect it from livestock (25 respondents or 73.5%), although the discrepancy between this answer and the data provided for the question above was noted! 14 landowners (41%) had also undertaken work to gap up older hedges and 9 (26%) had planted new hedges.

Table 10. Hedgerow management undertaken in the last five years by questionnaire respondents

Hedgerow management undertaken in the last 5 years	Number of respondents agreeing
No management	7 (20.5%)
Coppicing	6 (17.6%)
Laying	8 (23.5%)
Planting new hedges	9 (26.4%)
Gapping old hedges	14 (41.1%)
Restoring hedge bank	1 (2.9%)
Fencing hedge from livestock	25 (73.5%)
Other on-farm conservation	11 (32.3)



24 of the landowners (70.5%) reported undertaking hedgerow management or other farm conservation work without the support of grant funding. Eight (23.5%) had received grant funding to carry out work. It should be noted that the majority of those who had received grant funding reported that they had also carried out additional management work at their own expense. This still leaves a large proportion of landowners who have carried out hedgerow conservation work entirely without any grant support.

Likelihood of carrying out further management

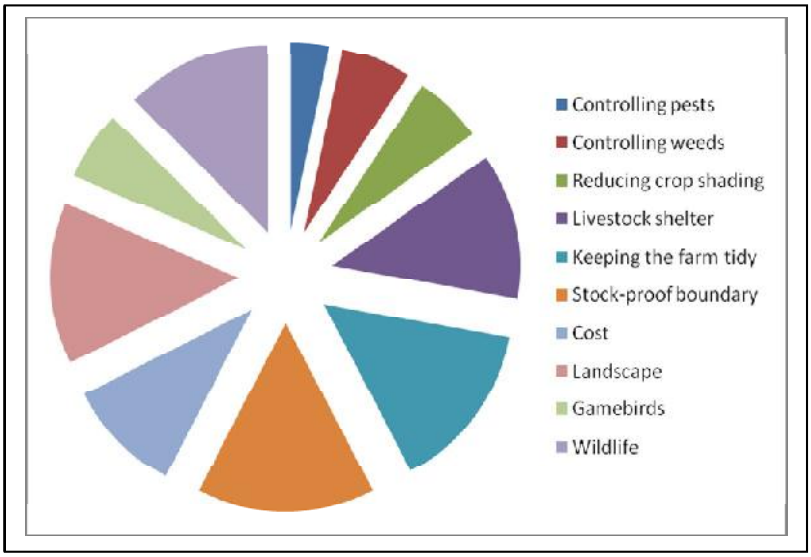
23 landowners (67.6%) felt that greater availability of financial assistance and skilled labour would mean they would be more likely to carry out hedgerow management activity in the future such as fencing, hedge laying and coppicing. 10 (29%) felt that more assistance would make no difference to whether they carried out this work. One landowner did not answer this question.

Influences on hedgerow management

The most popular answer, given by 23 landowners, was to maintain a stock-proof boundary. This was followed by keeping the farm looking tidy (22) and maintaining or improving the appearance of the local landscape (21). Providing a source of shelter for livestock and providing wildlife habitat were both felt to be important by 19 respondents.

Table 11. Factors influencing the hedgerow Management of questionnaire respondents

Factors influencing hedgerow management	Number of respondents agreeing
Controlling pests	5 (14.7%)
Controlling weeds	9 (26.4%)
Reducing crop shading	9 (26.4%)
Livestock shelter	19 (55.8%)
Keeping the farm tidy	22 (64.7%)
Stock-proof boundary	23 (67.6%)
Cost	15 (44.1%)
Landscape	21 (61.7%)
Game birds	9 (26.4%)
Wildlife	19 (55.8%)



Better advice on hedgerow management

21 landowners (61.7%) felt they needed better advice and information to improve their hedgerow management, 13 (38%) did not. All landowners returning the questionnaire were invited to the training event regardless!

7. Hedgerow Management for Biodiversity – a training event

At the end of the project a training event was held at Mathon in Herefordshire delivered by staff from the Farming and Wildlife Advisory Group with the support of the Malvern Hills AONB Partnership and Natural England. 21 local landowners attended and heard presentations on the design and results of this hedgerow survey project, good hedgerow management for biodiversity and hedgerow management under the Environmental Stewardship schemes. Discussion at the end of the event, led by the farmers present, focused on:

- The correct (best practice) timing and frequency of hedgerow cutting;
- The best species to use when gapping up sections of hedge that fell within the canopy area of isolated hedgerows trees and where hedgerow plants were therefore competing with the tree for water and light; and
- The local distinctiveness of fruit trees in Herefordshire and Worcestershire hedgerows.

8. Conclusions and recommendations

Species richness and hedgerow origins

The project found that 53.9% of hedgerows surveyed contained 5 or more woody species and can be classed as species-rich. The species richness of the hedges surveyed broadly conformed to what would be expected based on the hedgerow origins (i.e. when looking at assarted hedgerows compared to late enclosure hedgerows).

Section 5.2 discussed the difficulty in placing in one category hedges in which a lack of management has resulted in some of the shrubs becoming tall and over mature. This issue is likely to be of significance when seeking to give advice on restorative or new management. Two things may guide a decision in these cases: considering the character of the hedgerows in that area in terms of their origins; and looking at whether the hedge has ever been laid and making an estimate of when this last occurred. An older hedgerow will very likely show evidence of laying at some point along its length. This may last have occurred recently enough that the stems of the shrubs are suitable for laying again. However, it is likely that with more neglected hedges other restorative work and in-fill planting will be needed before the hedge can be considered for laying. Where management has been abandoned for some considerable time and or it is considered that the hedge has never been laid and is by nature tall and mature, a decision must be made as to whether the hedge now has more landscape and wildlife value left as it is, or whether it is desirable to take more drastic action, e.g. coppicing, to ultimately obtain a lower hedgerow. It may be that certain larger stems, unsuitable for laying, can be left in place and be considered and managed as hedgerow trees, whilst younger stems in-between are laid. Guidance on making this assessment and placing hedgerows on a management cycle scale, ultimately to guide a management decision has been produced by the Hedgelink Partnership (Adams, 2003).

Considering the origins of a hedgerow is vital when providing landscape and hedgerow management and restoration guidance to landowners. New management should be done with these origins in mind. Gapping up an old hedgerow or carrying out new hedgerow planting should also be considered in relation to the hedgerow origins of the area and an appropriate mix of species used that provides benefit to native wildlife whilst reflecting the species composition of other hedgerows in the area.

Condition assessment

26 or 45.6% of the 57 surveyed hedgerows with a shrubby component (i.e. excluding lines of trees) passed the condition assessment criteria for all six of the following attributes: minimum dimension of 3m²; integrity/ continuity of the hedge maintained with no gaps greater than 5m or 10% of total length; basal canopy height of 0.5m or less; undisturbed ground of at least 2m from the base of the hedge; herbaceous vegetation cover of at least 1m from the base of the hedge; no more than 10% cover of recently introduced species. A further 23 hedgerows (40%) met five of the six condition assessment criteria. For those hedgerows failing to meet all of the condition assessment criteria the most common reason was because the base of the canopy was more than 0.5m from ground level, in other words the hedge was becoming leggy.

Hedgerow deterioration and loss

In arable areas hedgerows are often becoming gappy through neglect and are not being replenished. In areas of permanent pasture hedgerows were frequently becoming leggy, exacerbated by the basal growth being eaten by livestock. Subsequent livestock intrusion into the base of the hedge is resulting in soil compaction and erosion and the hedge becoming increasingly gappy. The primary purpose of a hedge is to provide a stock proof field boundary and the best way of maintaining this is through a cycle of gapping up and hedge laying. Support needs to be given to train people in this skill and to assist landowners in financing this type of management.

Timing and frequency of management

50% of landowners reported via the questionnaire that they were still flailing or cutting their hedgerows every year, despite often being aware that this was not best practice for maintaining or enhancing biodiversity interest. Discussions taking place at the hedgerow management event highlighted that landowners are still in some cases unclear as to the recommended frequency of hedgerow cutting and would value clear advice on this. Experience elsewhere in the county has shown that inappropriate management or management that does not follow current best practice can often be attributed to a lack of communication or understanding between landowner and contractor as to what is required. Contractors are understandably reluctant to reduce their income through reduced frequency of cutting and will often be working to an inflexible timescale to cut the hedgerows of several landholdings. Consideration needs to be given to educating not only landowners but also local contractors.

Hedgerow trees

195 hedgerow trees were recorded during the survey. Where hedgerow shrubs were tall and over mature then young trees could be found but the vast majority of isolated hedgerow trees were mature or veteran. 30 trees recorded fell within the size guide given within the Hedgerow Survey Handbook as being ancient for their species and a total of 41 trees were given a condition assessment during the survey as being of particular interest. Encouraging the establishment of isolated hedgerow trees can be problematic as they present an additional time and resource burden to the landowner in managing them and managing around them when cutting the hedgerow. Trees in arable field hedgerows will (if best practice is followed) involve taking an area of crop below the drip line out of cultivation. Trees in pasture field hedgerows may need fencing, initially to protect them from browsing livestock and later to protect them from the effects of poaching, soil compaction and nutrient enrichment. However, hedgerow trees are an important element of the landscape character in many parts of the AONB and where landowners are willing or can be supported to establish such trees practical assistance should be given for them to do so.

Meeting Local or National Habitat Action Plan targets and actions

In summary, the project contributed towards meeting or has provided data towards assessing the following local and national HAP targets or actions for hedgerows:

Local HAP actions

This project fulfilled an action within the Worcestershire Hedgerows HAP to run a training event on hedgerow management, biodiversity and surveying.

National HAP targets

The project has provided data towards monitoring the numbers of isolated hedgerow trees and veteran trees (UK Hedgerows HAP target 2). The two survey squares within the project area considered to be of most interest for their number of isolated and veteran hedgerow trees are Alfrick and Castlemorton.

The project has provided data towards establishing a baseline for monitoring the species-richness of hedgerows (UK Hedgerows HAP target 3). The survey area found to contain the most species-rich hedgerows was Alfrick.

The project has provided data towards assessing the condition of our hedgerows (UK Hedgerows HAP target 4).

References and further information

Adams, N (2003). *The Hedgerow Management Cycle.* Hedgelink. Available from www.hedgelink.org.uk.

Bray, C (2004). *A new look at the Landscapes of Worcestershire.* Worcestershire County Council.

Carter, S., Jenkinson, L., Fine, R., Houlston, I (2006). *Gloucestershire Landscape Character Assessment.* LDA Design.

Crowther, S. (forthcoming). *Worcestershire Historic Landscape Characterisation Project: Malvern Hills Area of Outstanding Natural Beauty.* Worcestershire Historic Environment & Archaeology Service.

Defra (2007). *Hedgerow Survey Handbook: A standard procedure for local surveys in the UK.* Defra, London.

Herefordshire Archaeology (2004). *Herefordshire Historic Landscape Character Assessment.* Herefordshire Council.

Hoyle, J (2006). *Historic Landscape Characterisation*. Gloucestershire County Council Archaeology Service.

Malvern Hills AONB Partnership (2009). *Malvern Hills Area of Outstanding Natural Beauty: Management Plan 2009-2014.* Malvern Hills AONB Unit.

Warnock, S (2002). *Herefordshire Landscape Character Assessment.* Herefordshire Council.

The national Landscape Character Network:
http://www.landscapecharacter.org.uk/

The online Worcestershire Landscape Character Assessment:
http://www.worcestershire.gov.uk/cms/environment-and-planning/landscape-character-assessment.aspx

Information on the Gloucestershire Landscape Character Assessment:
http://www.gloucestershire.gov.uk/index.cfm?articleid=13187

The national Historic Landscape Characterisation programme:
http://www.english-heritage.org.uk/server/show/nav.1293

Information on the Worcestershire Historic Landscape Characterisation:
http://www.worcestershire.gov.uk/cms/environment-and-planning/archaeology/information-and-advice/rural-historic-environment/hlc.aspx

Veteran Trees Initiative specialist survey method:
http://www.treeworks.co.uk/downloads/SSM_HandBook.pdf

Worcestershire Ancient Tree Project:
http://www.wbrc.org.uk/atp/index.htm

Appendix 1

Landscape Character, Historic Landscape Character and Landscape Sensitivity

1km Grid Square	LDU reference number	Landscape Type features	LDU profile landscape and ecological features	LCP reference number	LCP Sensitivity Assessment (Worcestershire only)	Enclosure pattern features of HLC types present
SO7352	MH06.2 and 6.3 Alfrick	**Principal Wooded Hills** Large, irregularly shaped, interconnecting blocks of ancient woodlands Assarted pattern of woodland clearance Wooded streamlines and hedged fields Hedgerow trees present are often mature or veteran	Pastoral land use Strong ancient woodland character, with large discrete interlocking blocks Hazel prominent in hedgerows Loss of organic field pattern Good tree cover but few hedgerow trees Neglected boundaries	MH06.2a	LCP in overall moderate condition Semi-regular neglected boundaries Dominance of hazel in hedges Some loss and fragmentation of hedges but no fencing additions Good tree cover MEDIUM SENSITIVITY	***Piecemeal enclosure:*** Small irregular fields with S and dog-leg boundaries and often evidence of ridge and furrow. More regular enclosure pattern than assarts and lacking small scattered woods ***Parliamentary enclosure:*** Regular rectangular field boundaries resulting from planned enclosure ***Planned private enclosure:*** Formal, private enclosure agreements with straight, rectilinear boundaries. Laid out with less precision than parliamentary enclosure ***Field amalgamation:*** Large irregular fields with sinuous boundaries where mechanisation has resulted in field boundary removal. May contain relict elements of former boundaries ***Modern subdivision*** Older field patterns have been disrupted and reorganised to subdivide the landscape for modern land uses.
				MH06.3a	LCP in overall good condition Hedges in moderate condition with no losses or inappropriate additions Enclosure pattern, tree cover pattern and tree cover character all in good condition with no losses and no inappropriate additions. HIGH SENSITIVITY	
	MH05 Suckley Hills		Pastoral land use Strong ancient woodland character, with large discrete interlocking blocks	MH05i	LCP in overall good condition Hedgerows unmanaged, semi-regular pattern in small to medium size fields	

			Mixed species hedgerows Piecemeal enclosure pattern Mostly intact field pattern declining in places Fences replace hedges in areas of residential development Locally poor age structure of hedgerow trees		Minimal hedge loss but some addition of fences where gardens intrude into landscape Dominance of hazel in hedgerows Good tree cover HIGH SENSITIVITY	
1km Grid Square	**LDU reference number**	**Landscape Type features**	**LDU profile landscape and ecological features**	**LCP reference number**	**LCP Sensitivity Assessment (Worcestershire only)**	**Enclosure pattern features of HLC types present**
SO7443	MV-WFE-03 Colwall	**Principal Timbered Farmlands** Wooded, agricultural landscape Densely scattered hedgerow oaks Organic pattern of hedged fields Assarted pattern of woodland clearance	Predominantly pastoral land use Small to medium scale organic field pattern Relic ancient woodland Densely scattered hedgerow oaks Good species and age variation of trees Hedgerow condition deteriorating in places			***Enclosure of common arable fields:*** Minimal insertion of boundaries along headlands that developed from common arable strip-field farming. Long, broad, sinuous boundaries in sub-geometric patchwork ***Adaptation of earlier enclosure system:*** Often found adjacent to the HLC type above and is characterised by the further subdivision of strip-field origin sinuous enclosure by the insertion of straight boundaries. The earlier enclosure pattern can still also be seen

	MV-WFE-03 Colwall Stone		Mixed, mainly pastoral farming Small to medium scale organic field pattern Poorly represented relic ancient woodland Densely scattered hedgerow oaks Native tree species being replaced with exotics Gardens disrupt rural landscape character			
1km Grid Square	**LDU reference number**	**Landscape Type features**	**LDU profile landscape and ecological features**	**LCP reference number**	**LCP Sensitivity Assessment (Worcestershire only)**	**Enclosure pattern features of HLC types present**
SO7140	MV-FSD-01 Wellington Heath	**Forest Smallholdings and Dwellings** Small pastoral fields Tall, mature hedges Scattered hedgerow trees	Matrix of narrow lanes, cottages, orchards and paddocks Small fields with rough grazing or orchards Densely scattered hedgerow and garden trees Occasional woodland remnants Generally good condition of boundaries Some loss of hedges			***Small compass enclosure – modified grid system:*** Geometric, often small, enclosure with straight boundaries. Fields may join at various angles as a consequence of multiple landownership ***Recent degradation of historic character through boundary loss:*** Sinuous boundaries have been removed and few survive. Loss due to arable intensification or other land use change.

			Prominent horsiculture Suburban encroachment into landscape			
	LV-SFA-02 Beggar's Ash	**Settled Farmlands on River Terraces** Settled agricultural landscape Fields bounded by hedgerows Absence of woodland Tree cover concentrated along watercourses Hedgerow trees becoming reduced in number Sub-regular early enclosure pattern	Intensive orchard cultivation Little or no woodland Tree cover mainly confined to hedgerow trees Prograssive loss, degradation and fragmentation of hedges Some loss of hedges has increased field size Ongoing loss of boundary trees			
	MV-WHW-04 Bradlow Hills	**Principal Wooded Hills** Large, irregularly shaped,	Increasing intensive arable land use replacing pasture Large discrete or interlocking blocks of ancient woodland			

		interconnecting blocks of ancient woodlands Assarted pattern of woodland clearance Wooded streamlines and hedged fields Hedgerow trees often mature or veteran	Piecemeal enclosure pattern Significant loss of hedgerow trees Poor hedgerow condition			
1km Grid Square	**LDU reference number**	**Landscape Type features**	**LDU profile landscape and ecological features**	**LCP reference number**	**LCP Sensitivity Assessment (Worcestershire only)**	**Enclosure pattern features of HLC types present**
SO7241	MV-WHW-04 Bradlow Hills	**Principal Wooded Hills** Large, irregularly shaped, interconnecting blocks of ancient woodlands Assarted pattern of woodland clearance Wooded streamlines and hedged fields	Increasing intensive arable land use replacing pasture Large discrete or interlocking blocks of ancient woodland Piecemeal enclosure pattern Significant loss of hedgerow trees Poor hedgerow condition			***Small compass enclosure – estate division:*** Reconfiguration of existing enclosure through gradual insertion of straight boundaries to subdivide more sinuous enclosure. Underlying regularity over a wide area suggests single estate ownership

		Hedgerow trees often mature or veteran				
1km Grid Square	**LDU reference number**	**Landscape Type features**	**LDU profile landscape and ecological features**	**LCP reference number**	**LCP Sensitivity Assessment (Worcestershire only)**	**Enclosure pattern features of HLC types present**
SO7436	MV-WHF-01 Eastnor	**Wooded Hills and Farmlands** Discrete blocks of woodland Large hedged fields Hedgerows linking woodland blocks	Mixed land use Large, discrete blocks of ancient woodland Prominent ornamental designed tree planting Previous field enclosure pattern has largely been lost Significant loss of hedges and hedgerow trees Poor hedgerow condition Introduction of fences			***Small compass enclosure – estate division:*** Reconfiguration of existing enclosure through gradual insertion of straight boundaries to subdivide more sinuous enclosure. Underlying regularity over a wide area suggests single estate ownership ***Small compass enclosure – reconfiguration of former wood pasture:*** Sinuous boundaries forming sub-geometric enclosures subdivided by patches of woodland. Some boundaries may be old woodland edges
	MV-WHF-02 Bronsil	**Wooded Hills and Farmlands** Discrete blocks of woodland Large hedged fields Hedgerows linking woodland blocks	Mixed land use Large, discrete blocks of ancient woodland Prominent ornamental designed tree planting Plantations have diluted ancient woodland character Declining hedgerows with some loss of hedgerow trees Some loss of traditional enclosure pattern			

1km Grid Square	LDU reference number	Landscape Type	LDU profile landscape and ecological features	LCP reference number	LCP Sensitivity Assessment (Worcestershire only)	Enclosure pattern features of HLC types present
SO7841	MW26.2 Three Counties Showground	**Encosed Commons** Ordered pattern of large hedged fields Estate plantations Significant tree cover along watercourses	Ordered pattern of large late-enclosure fields Field pattern becoming fragmanted due to amenity land uses Some plantation woodlands Predominently thorn hedgerows Poor representation of tree cover	MW26.2a	LCP in overall good condition Some loss of hedges and some fragmentation Some tree cover with no significant loss No fence additions Geometric thorn hedges generally unmanaged MEDIUM SENSITIVITY	***Parliamentary enclosure:*** Regular rectangular field boundaries resulting from planned enclosure
				MW26.2b	LCP in overall moderate condition Some garden hedge and fence intrusion and some sub-division of fields with fences Poor tree cover with high losses Geometric thorn hedges generally unmanaged with some loss LOW SENSITIVITY	
	MW25 Marlbank		Geometric field pattern becoming fragmented Pastoral land use	MW25a	LCP in overall moderate condition Some fields broken up by addition of fences	

			Predominently thorn hedges Poor representation of tree cover with thinly scattered hedgerow trees Hedgerows over-managed and gappy		Regularly managed geometric thorn hedges with some loss Poor tree cover Some amenity planting MEDIUM SENSITIVITY	
1km Grid Square	**LDU reference number**	**Landscape Type features**	**LDU profile landscape and ecological features**	**LCP reference number**	**LCP Sensitivity Assessment (Worcestershire only)**	**Enclosure pattern features of HLC types present**
SO7840	MW25 Marlbank	**Encosed Commons** Ordered pattern of large hedged fields Estate plantations Significant tree cover along watercourses	Geometric field pattern becoming fragmented Pastoral land use Predominently thorn hedgerows Poor representation of tree cover with thinly scattered hedgerow trees Hedgerows over-managed and gappy Loss and deterioration of hedgerows due to increasing arable land use	MW25a	LCP in overall moderate condition Some fields broken up by addition of fences Regularly managed geometric thorn hedges with some loss Poor tree cover Some amenity planting MEDIUM SENSITIVITY	***Parliamentary enclosure:*** Regular rectangular field boundaries resulting from planned enclosure ***Field amalgamation:*** Large irregular fields with sinuous boundaries where mechanisation has resulted in field boundary removal. May contain relict elements of former boundaries
				MW25c	LCP in overall moderate condition Moderate loss of hedges No fencing additions Average tree cover	

					MEDIUM SENSITIVITY	
				MW25d	LCP in overall poor condition Encroachment of fenced gardens with lots of exotic tree cover Geometric elm hedges, intensively managed and high loss LOW SENSITIVITY	
				MW25e	LCP in overall moderate condition Neglected, regular-pattern elm hedges with some loss Some addition of conifer and exotic tree cover MEDIUM SENSITIVITY	
	MW23 Little Malvern		Pastoral land use Geometric field pattern Tree cover poorly represented with thinly scattered hedgerow and streamside trees Elm prominent in hedgerows Some boundary and field pattern loss through increasing arable land use	MW23a	LCP in overall moderate condition Some loss of hedgerows Some sub-division of fields with fences MEDIUM SENSITIVITY	

1km Grid Square	LDU reference number	Landscape Type features	LDU profile landscape and ecological features	LCP reference number	LCP Sensitivity Assessment (Worcestershire only)	Enclosure pattern features of HLC types present
SO7838	MW24 Castlemorton Common	**Unenclosed Commons** Lack of enclosure Rough grazing Settlement around perimeter of common Scattered tree cover	Unsettled, unwooded landscape Extensive areas of rough grazing Frequent enclosure, settlement and small scale pastoral fields around perimeter of common Localised tree cover along streams and in association with settlement	MW24c	LCP in overall good condition No enclosure No tree cover HIGH SENSITIVITY	***Parliamentary enclosure:*** Regular rectangular field boundaries resulting from planned enclosure ***Field amalgamation:*** Large irregular fields with sinuous boundaries where mechanisation has resulted in field boundary removal. May contain relict elements of former boundaries
				MW24b	LCP in overall good condition. Some loss of unenclosed character through the addition of hedges or fences. MEDIUM SENSITIVITY	
	MW19.1 Newlands and West Castlemorton	**Settled Farmlands with Pastoral Land Use** Small scale, settled pastoral landscape with increasing arable cultivation Tree cover of hedgerow and streamside trees Sub-regular enclosure pattern	Pastoral land use Small scale field pattern Thinly scattered hedgerow and streamside trees Localised poor condition of hedgerows and loss of hedgerow trees	MW19.1a	LCP in overall moderate condition Minimal loss of hedges and no fencing additions Managed, semi-regular elm hedges Good tree cover HIGH SENSITIVITY	
				MW19.1b	LCP in overall moderate condition Managed elm hedges with some loss	

					Good tree cover HIGH SENSITIVITY	
	MW22 Hollybed Common	**Unenclosed Commons** Lack of enclosure Rough grazing Settlement around perimeter of common Scattered tree cover	Unsettled, unwooded landscape Extensive areas of rough grazing Frequent enclosure, settlement and small scale pastoral fields scattered around the perimeter of the common Localised horsiculture	MW22a	LCP in overall good condition. No loss of unenclosed character. HIGH SENSITIVITY	
				MW22b	LCP in overall good condition Neglected, semi-regular elm hedges on borders HIGH SENSITIVITY	

Appendix 2

Veteran Tree Location Maps and Survey Forms

Appendix 3

Hedgerow Management Questionnaire

Hedgerow Management Survey

Please fill in as much as you are able

malvernhills Area of Outstanding Natural Beauty

1

Title: Initial: Surname:

Address:

Postcode: Tel. no:

Section 1: Your fields and hedgerows - Description

2 What is the total size of your holding? ha

What proportion of your field boundaries are hedgerows? Below 25% ☐ 25-49% ☐ 50-74% ☐ 75-99% ☐ 100% ☐

3 **Field size** - please give approximate size of your fields. Smallest ha Largest ha Typical ha

4 Please give the approximate proportion of the following in your hedgerows.

These should add to 100%

Hawthorn % Hazel % Blackthorn %

Beech % Other woody species % Gaps* %

5 Which of the following species are commonly found/occur frequently in your hedges? *Tick as many as occur.*

Honey-suckle ☐ Hedge bindweed ☐ Clematis ☐ Wild rose ☐ Bramble ☐ Wild privet ☐ Dogwood ☐ Spindle ☐ Elder ☐ Ash ☐ Oak ☐ Field maple ☐ Elm ☐

6 Which of the following descriptions best describes the hedge bottoms on your farm? *Please choose one only.*

Most are dominated by arable weeds such as cleavers or sterile brome ☐

Most are dominated by coarse grasses and weeds such as nettles or thistles ☐

Most are dominated by grasses, with wildflowers ☐

Section 2: Hedgerow management - What do you do?

7 How often do you trim most of your hedges? Yearly ☐ Every 2 years ☐ Every 3 years ☐ Every 4-6 years ☐ Not trimmed ☐

8 During which months do you usually trim your hedges?

	July Aug	Sept Oct	Nov Dec	Jan Feb
Hedges adjacent to arable fields	☐	☐	☐	☐
Hedges adjacent to grass fields	☐	☐	☐	☐
Hedges adjacent to farm tracks	☐	☐	☐	☐

9 What is the typical width left uncultivated around any arable fields on your farm between the crop and base of hedge (including your compulsory cross compliance 2metre strip) metres

10 Please indicate how often you manage your hedgerows in the ways listed below.

	Always	Sometimes	Seldom	Never
I control weeds in hedgerow bottoms by spot spraying	☐	☐	☐	☐
I mow the vegetation at the base of the hedge	☐	☐	☐	☐
I fence off hedges to exclude livestock	☐	☐	☐	☐

Section 3: Conservation of biodiversity

11 Within the last 5 years have you undertaken any of the following, either with or without grant/subsidy?

	No	Yes with grant	Yes without grant
Coppicing	☐	☐	☐
Laying	☐	☐	☐
New hedge planting	☐	☐	☐
Planting to fill gaps	☐	☐	☐
Hedge-bank restoration	☐	☐	☐
Fencing to exclude livestock	☐	☐	☐
Conservation operations excluding hedgerows	☐	☐	☐

12 How likely are you to carry out similar hedgerow operations in the future?

	Very likely	Likely	Unlikely	Definitely not
Under current conditions and arrangements	☐	☐	☐	☐
If more grant aid was available	☐	☐	☐	☐
If skilled labour was more readily available	☐	☐	☐	☐

Section 4: Hedgerow management - What influences you?

13 How important are the following factors in determining the way you manage your hedges?

		Very important	Important	Some importance	Not important
Agricultural needs and costs	Controlling pests	☐	☐	☐	☐
	Controlling weeds	☐	☐	☐	☐
	Reducing shading of crops	☐	☐	☐	☐
	Providing shelter for livestock	☐	☐	☐	☐
	Keeping the farm tidy	☐	☐	☐	☐
	Providing a stock proof field boundary	☐	☐	☐	☐
	Cost of trimming and maintenance	☐	☐	☐	☐
Conservation	Maintaining/improving the appearance of the local landscape	☐	☐	☐	☐
	Maintaining/improving habitats for gamebirds	☐	☐	☐	☐
	Maintaining/improving habitats for wildlife	☐	☐	☐	☐
Advice	Advice from agricultural consultant	☐	☐	☐	☐
	Advice from conservation adviser/environmental groups	☐	☐	☐	☐

Would you welcome further advice on hedgerow management? Yes ☐ No ☐

14 How strongly do you agree or disagree with the following statements?

	Strongly agree	Agree	Neither	Disagree	Strongly disagree
Good hedgerows are a valuable asset on a farm	☐	☐	☐	☐	☐
Hedgerows are an obstacle to efficient farming	☐	☐	☐	☐	☐
I need better information to improve my hedgerow management	☐	☐	☐	☐	☐

Thank you for completing this questionnaire. Please return it to:

Worcestershire County Council, Rebecca Lashley, PEP, County Hall, Spetchley Road, Worcester, WR5 2ZD

We are grateful to ADAS for allowing us to adapt this questionnaire from the project '*Hedgerow Management – A study of farmers' and contractors' attitudes*', 2000.

Appendix 4

Ground Flora Species List

List of ground flora recorded during the survey either present in the hedge bottom or within 1m of the hedge bottom. Five plants were not identified to species level.

Annual meadow grass	Foxglove	Red clover
Bearded couch	Garlic mustard	Red dead nettle
Bent *sp*	Goosefoot *sp*	Redshank
Bird's foot trefoil	Greater plantain	Ribwort plantain
Black briony	Ground ivy	Rosebay willowherb
Black medic	Hedge bedstraw	Rough hawkbit
Bracken	Hedge bindweed	Sedge *sp*
Bramble	Hedge garlic	Self heal
Broad-leaved willowherb	Hedge woundwort	Slender speedwell
Burnet saxifrage	Hemlock	Soft rush
Chickweed	Herb robert	Spear thistle
Cleavers	Himalayan balsam	Sterile brome
Cocksfoot	Hogweed	Sweet vernal grass
Common dog violet	Ivy	Timothy
Common mouse ear	Knotgrass	Tufted vetch
Common vetch	Ladies bedstraw	Wall barley
Couch	Lesser stitchwort	Wavy bitter cress
Cow parsley	Long stalked cranesbill	Wavy hair grass
Creeping buttercup	Lords and ladies	White clover
Creeping cinquefoil	Marsh bedstraw	Wood avens
Creeping soft grass	Meadow buttercup	Yarrow
Creeping thistle	Meadow foxtail	Yorkshire fog
Crested dog's tail	Meadow vetchling	
Daisy	Meadowsweet	
Dandelion *sp*	Nettle	
Dock *sp*	Nipplewort	
Dog's mercury	Pendulous sedge	
False brome	Perennial rye grass	
False oat-grass	Perforated St Johns wort	
Fat hen	Pineapple weed	
Field bindweed		
Field horsetail		
Field pansy		