

The Hartlepool Hedgerow Survey

A random survey of the hedgerows
in the borough of Hartlepool

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Funded by



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1. Executive Summary

1.1 Objectives of, and reasons for conducting, the survey

- To execute a random survey of 200 hedgerows in the borough of Hartlepool, following the standardised method in the Hedgerow Survey Handbook (Defra, 2007), in order to gain baseline information on the extent, character, condition and management requirements of the hedgerows in Hartlepool, a borough for which there is no baseline information
- To recruit and train a minimum of 20 volunteers in the survey method and involve them in the field survey, creating a surveyor resource for future hedgerow surveys
- To tag a minimum of 50 young hedgerow trees to increase the number of isolated hedgerow trees across the borough
- To raise awareness of the importance of hedgerows amongst landowners and the general public

1.2 Summary of results

- A total of 175 hedgerows were surveyed, equating to a total length of 41.53km. Some hedgerows had more than one 30m section surveyed due to the variation in character along their length, meaning the total number of 30m sections surveyed was 183.
- 86% of the hedgerows surveyed were shrubby hedgerows, most were adjacent to either arable or pastoral farmland, and 23% contained isolated hedgerow trees. Hawthorn was the most prevalent woody species (recorded in 97% of the hedgerows), followed by Dog-rose, Bramble, Elder and Blackthorn; the most common isolated tree species was Ash (56%). Just under half of the hedgerows (42%) were dominated by one species, whilst the remaining 58% were mixed hedgerows, and over a quarter of the hedgerows (27%) were species-rich (they contained four or more woody species in the 30m survey section). Only 5% (8) of the hedgerows were in favourable condition, and the majority of the remaining 95% failed the condition assessment at least on basal canopy height, and often other attributes as well, in particular integrity and size.
- 23 volunteers were trained in the Hedgerow Survey Handbook method, and a total of 33.5 volunteer days were contributed to the survey.
- 50 young trees were tagged during the survey.
- Awareness of the importance of hedgerows for wildlife and of hedgerow management was raised amongst the landowners who participated in the survey through the provision of leaflets from Hedgeline and a copy of the Natural England DVD 'A Cut Above the Rest'. Articles promoting the survey and summarising the results have been published in the local press and on both the Tees Valley Biodiversity Partnership (TVBP) and Wildflower Ark websites in order to raise awareness amongst the wider public.
- The survey provides valuable baseline data on the extent, character, condition and management requirements of the hedgerows in the borough of Hartlepool. Information on the extent of hedgerows will allow the TVBP to target areas in need of hedgerow planting in order to promote connectivity of habitats. Knowing the character of the hedgerows will ensure that future planting and management is carried out in keeping with local character. Information on the condition of the hedgerows, and the management needed to maintain/improve this condition, will allow the TVBP to target appropriate hedgerow management, in particular through stewardship schemes.

2. Introduction

Hedgerows are a key component in the landscape of Britain. They provide a valuable habitat for wildlife in farmland, and serve as wildlife corridors connecting habitats that may otherwise be isolated (Hedgelink, 2008-2010). Consequently, hedgerows are a priority habitat in both the national Biodiversity Action Plan (BAP) and the local Tees Valley BAP.

The Tees Valley BAP, coordinated by the Tees Valley Biodiversity Partnership (TVBP), covers the boroughs of Hartlepool, Middlesbrough, Redcar & Cleveland and Stockton-on-Tees in north-east England. Its Hedgerows Habitat Action Plan has been written to ensure that national targets for hedgerow conservation are delivered on a local level; the vision statement of the local action plan is 'to increase the proportion of hedgerows in favourable ecological condition and to protect and manage hedgerows to maximise their value for wildlife' (Tees Valley Hedgerows HAP, 2009). The targets of this HAP are:

- 1 Complete information on the extent and character of hedgerows and hedgerow trees.
- 2 Maintain the existing network of hedgerows, and increase the proportion of hedgerows in favourable ecological condition.
- 3 Extend the existing network of hedgerows in keeping with local character.

In order to reach targets two and three, target one must first be met i.e. data on the extent, character, condition and management requirements of the hedgerows in the Tees Valley must be collected. Once collected, this data will allow the TVBP to target the management of existing hedgerows appropriately to ensure that they either remain in, or come into, favourable condition, and that their value to wildlife is maintained and, where appropriate, enhanced. The data will also enable areas in need of new hedgerow planting to be identified to increase habitat connectivity across the area, and ensure that this planting is carried out in keeping with the local hedgerow character.

Baseline data on the extent and character of hedgerows in two of the four boroughs of the Tees Valley (Stockton and Redcar & Cleveland) was gathered between 2005 and 2007 through two projects funded by the Heritage Lottery Fund. A pilot survey of hedgerows in Hartlepool was carried out as part of a Masters research project in 2008 covering a small part of the borough, but no extensive baseline information on hedgerows has been collected for Hartlepool, the only other borough (along with Stockton and Redcar & Cleveland) in the Tees Valley with an extensive rural area.

The Hartlepool Hedgerow Survey (conducted during the summer and autumn of 2010) aimed to collect baseline data on the extent, character, condition and management requirements of 200 hedgerows within the borough, by executing a random survey following the standardised method in the Hedgerow Survey Handbook (Defra, 2007). Volunteers were to be recruited and trained in the survey method, and involved in carrying out hedgerow surveys. During the survey, a minimum of 50 potential hedgerow trees were to be tagged across the borough. The survey also aimed to increase awareness of the importance of hedgerows amongst landowners and the general public through the provision of information on hedgerows and their management to landowners, and the publication of a series of articles in the local press promoting the survey and summarising the results.

3. Methodology

3.1 Definition of a hedgerow

The Hedgerow Survey Handbook defines a hedgerow as: 'any boundary line of trees or shrubs over 20m long and less than 5m wide between major woody stems at the base' (page 10, Defra, 2007).

The end points of a hedgerow are defined (page 11 of the Hedgerow Survey Handbook, Defra, 2007) as:

1. any point of connection between two, or more, hedgerows or to other features e.g. fences, walls, ditches, roads
2. the point at which a hedgerow stops and there is a gap of more than 20m to the next hedgerow (e.g. where the hedgerow ends in the middle of a field)
3. the point at which the hedgerow links to a woodland or other semi-natural habitat such as a pond.'

3.2 Determining the extent of hedgerows

The rural area of the borough of Hartlepool covers 60 1km grid squares. These 60 grid squares were examined on both the Ordnance Survey map (Ordnance and Survey Explorer Map Sheet 306, 1:25,000) and aerial photographs to establish the general density of hedgerows across the rural area of the borough. Each of the 60 1km grid squares were then examined individually to assess their hedgerow network. Squares with a poor hedgerow network relative to the general hedgerow network were noted (with the exception of squares with a large area of another habitat, for example a large area of woodland).

3.3 Selection of hedgerows to survey

23 of the 60 1km grid squares (including those with at least part of their area inside the borough boundary, but excluding those entirely within the urban area of the borough) were randomly-selected from across the borough using a computerised random number generator. A further four 1km grid squares were selected as a contingency. Figure 1 shows the location of the randomly-selected grid squares.

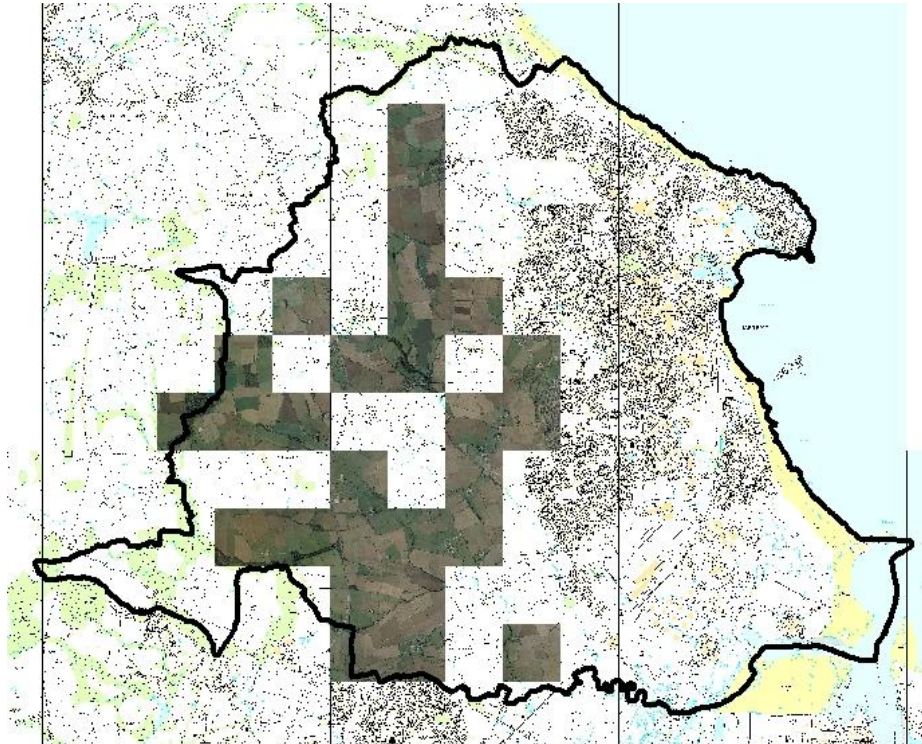


Figure 1. Distribution of the 27 randomly-selected 1km grid squares in the borough of Hartlepool. Map reproduced under Ordnance Survey Licence number 100040318.

Up to nine hedgerows were selected from each of the 23 1km grid squares, by laying a 3x3 grid (with a selection point in the centre of each of the nine cells) over each selected grid square on the 1:25,000 OS map for Middlesbrough and Hartlepool (Ordnance and Survey Explorer Map Sheet 306). The field boundary nearest to each of the nine selection points within each grid square was selected for survey. This field boundary was cross-referenced on aerial photographs to verify that it was a hedgerow; if not then the next nearest field boundary to the selection point was chosen, and so on, until a hedgerow was located. It was not always possible to select nine hedgerows from each square due to the low frequency of hedgerows in that square. The four contingency grid squares were used, in turn, until 239 hedgerows had been selected for survey. This over-selection ensured there would still be 200 hedgerows available to survey should permissions be refused for some hedgerows.

A GIS shapefile of the hedgerows selected to survey was created, and the hedgerows were numbered according to the grid square that they were in and the selection point by which they were identified (from the south-west to the north-east corner). For example, for the grid square NZ4628, the hedgerow in the bottom left cell was given the number 4628001, and the hedgerow in the top right cell was given the number 4628009.

3.4 Selection of end points and sides of hedgerows

The selection point used to identify each hedgerow was also used to determine the end of each hedgerow from which to start the survey. Hedgerows identified by odd-numbered selection points were to be surveyed starting at the end furthest from the selection point, and hedgerows identified by even-numbered selection points were to be surveyed starting at the end nearest to the selection point. Similarly, Side A of a hedgerow was determined to be the side furthest from the selection point for a hedgerow identified by an odd-numbered selection

point, and the side nearest to the selection point for a hedgerow identified by an even-numbered selection point, and vice versa for Side B.

3.5 Determination of ownership and acquirement of access permission

Ownership for the hedgerows selected for survey was determined using the electoral roll and telephone book, Nature on the Map (Natural England, 2010), and the local knowledge of staff in the Countryside Section of Hartlepool Borough Council (in a few cases, where staff worked regularly with the landowners). A letter was sent to each landowner informing them of the survey (see Appendix 1), and was followed-up with a telephone call to answer any questions landowners may have about the survey and seek their permission to survey the selected hedgerows on their farm. Farmers were also asked if they were willing for potential hedgerow trees to be tagged on their land. Permission was gained to survey over 200 hedgerows.

3.6 Field survey preparation

A survey map for each farm for which permission to survey had been granted was prepared showing the location and numbers of the hedgerows to be surveyed. Each map was filed in a survey pack containing sufficient hedgerow survey forms for that farm. The landowner was re-contacted in the survey season to arrange a convenient time for the survey to take place. It was not possible to agree a convenient time with every landowner, which led to fewer hedgerows being surveyed than the target of 200.

A risk assessment was carried out prior to commencing field surveying (see Appendix 2).

3.7 Recruitment and training of surveyors

23 volunteers were recruited through Hartlepool Borough Council, Hartlepool Natural History Society and Tees Valley Wildlife Trust, and were trained in the standard hedgerow survey method detailed in the Hedgerow Survey Handbook by Jessica Harrison, a professional field surveyor with extensive hedgerow surveying experience. The volunteers were also trained in hedgerow woody species identification and health and safety issues relating to field surveying and working on farmland. All volunteers were given a copy of the summary guide to completion of the field survey forms (taken from Chapter 5 in the Hedgerow Survey Handbook), a woody species identification sheet, and a hand-out on health and safety.

3.8 The field survey

The hedgerow field survey was carried out in accordance with the field survey method detailed in the Hedgerow Survey Handbook (see Appendix 3). Due to resource constraints, only 'Part A - Essential Elements' was covered. Data was collected for one side of each hedgerow (wherever possible this was Side A, see section 3.4 above), and for parts 7-17 of the survey form data was collected from a 30m section. This 30m section was selected, using a measuring tape, as the second 30m section from the end point of the hedgerow at which the survey was to start (see section 3.4 above).

On some occasions, a hedgerow needed to be split into survey units, due to factors such as a change in hedgerow-type for more than 20m, or a notable change in hedgerow height for more than 20m. In such cases, the second 30m section for each survey unit was surveyed, always starting from the end of the survey unit nearest to the end point of the hedgerow at which the survey started. The start point of this second 30m section was marked on the field survey map, as were any alterations to the location or length of a hedgerow, for example if a hedgerow contained a gap longer than 20m, causing it to end earlier than originally anticipated. These changes were altered on the shapefile at the end of the field survey.

During the field survey, 50 young trees with the potential to grow into mature hedgerow trees were tagged, using tags provided by the Tree Council.

3.9 Quality Assurance

Field surveying was carried out by a professional field surveyor (Jessica Harrison), with the assistance of volunteer surveyors. Volunteers rarely worked unaccompanied, and when they did they were always on the same farm at the same time as the professional surveyor, ensuring that any survey problems encountered by a volunteer could be dealt with immediately. A sample of all surveys completed by an unaccompanied volunteer was checked by the professional surveyor to ensure survey standards were maintained.

3.10 Data collation and distribution

Once all field surveys were completed, a copy of the survey forms for each farm was sent to the landowner, with a request for the data to be entered onto the online survey database at <https://secure.fera.defra.gov.uk/hedgerow>. Permission was granted for all data to be entered onto the database, and this data entry was carried out by the Conservation Assistant at Tees Valley Wildlife Trust. The data was also entered onto a GIS database by ERIC (Environmental Records Information Centre North East) and attached to the hedgerow shapefile created at the start of the survey. The GIS shapefile is held by the Wildflower Ark, ERIC and the TVBP.

3.11 Assessment of management requirements

A brief assessment of the management requirements of all hedgerows surveyed was made following advice detailed in the Hedgerow Survey Handbook (page 16, Defra, 2007), and from Hedgelink, a national hedgerow partnership. This management assessment was added to the GIS shapefile.

4. Results

4.1 Extent of hedgerows in the borough of Hartlepool

The desktop survey to determine the extent of hedgerows in Hartlepool found a poor hedgerow network within 18 of the 60 1km grid squares examined. These grid squares are shown in Figure 2.

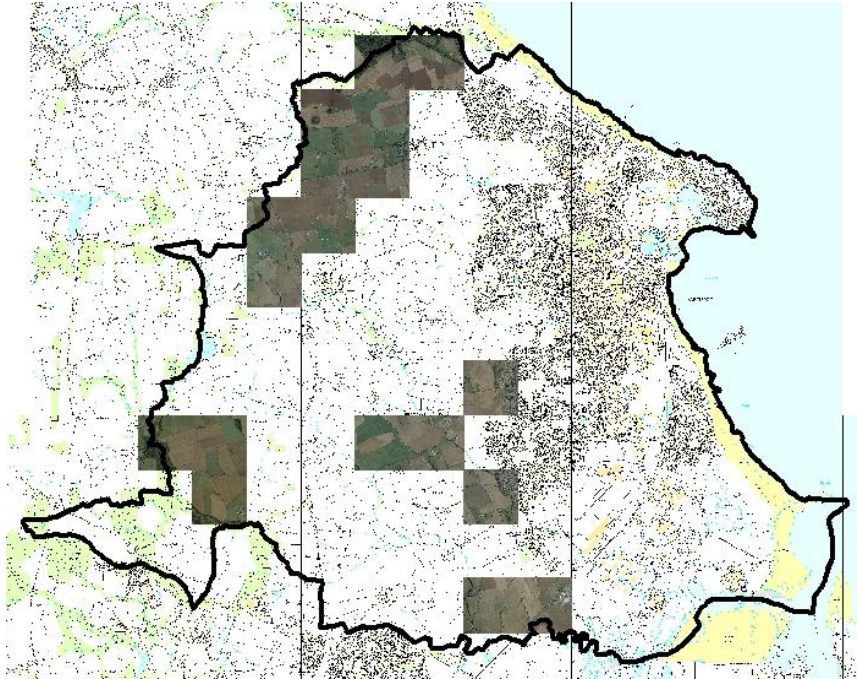


Figure 2. Distribution of 1km grid squares with a poor hedgerow network. Map reproduced under Ordnance Survey Licence number 100040318.

A total of 175 hedgerows were surveyed throughout the borough of Hartlepool, equating to a total length of 41.53km. The distribution of the hedgerows surveyed can be seen in Figure 3. Some hedgerows had more than one 30m sections surveyed due to the variation in character along their length, and so the total number of 30m sections surveyed was 183. The average number of connections with other hedgerows was 2.

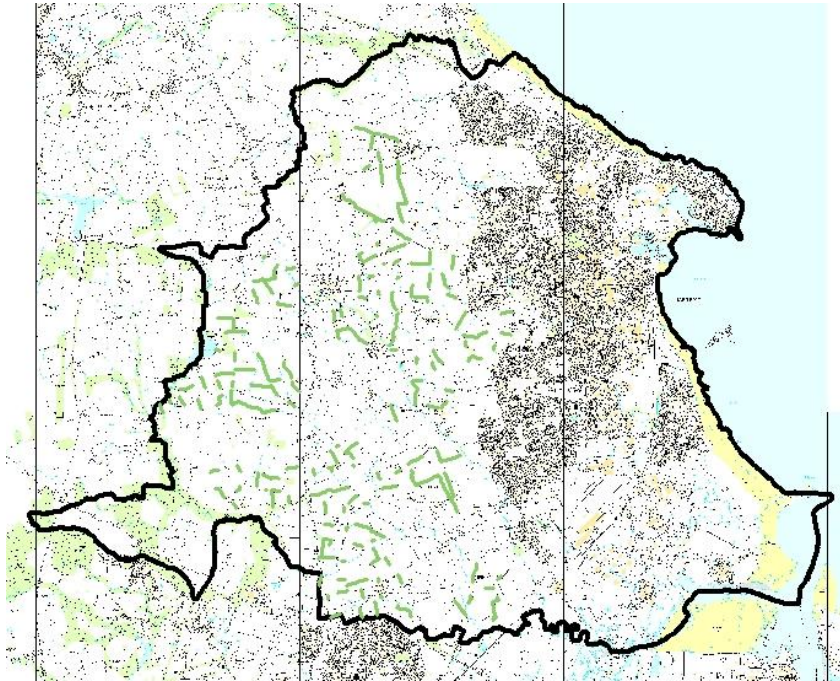


Figure 3. Distribution of hedgerows surveyed in the borough of Hartlepool. Map reproduced under Ordnance Survey Licence number 100040318.

4.2 Character of hedgerows in the borough of Hartlepool

4.2.1 Hedgerow types and shapes

The majority of the hedgerows surveyed (86%) were shrubby hedgerows, with only 9% being shrubby hedgerows with trees and 5% being a line of trees.

In terms of hedgerow shape, over a third (37%) were recorded as 'trimmed and dense', and just under a third (30%) were 'untrimmed'. Very few were 'tall and leggy' (5%), 'intensively managed' (3%), 'untrimmed with outgrowth' (3%), or 'recently planted' (2%), and none were recorded as having been recently coppiced or recently laid. The remaining 20% were recorded as 'other', usually because the hedgerow shape fell between two categories. The percentage of different hedgerow shapes recorded (incorporating a breakdown of the 'other' category) is shown in Figure 4.

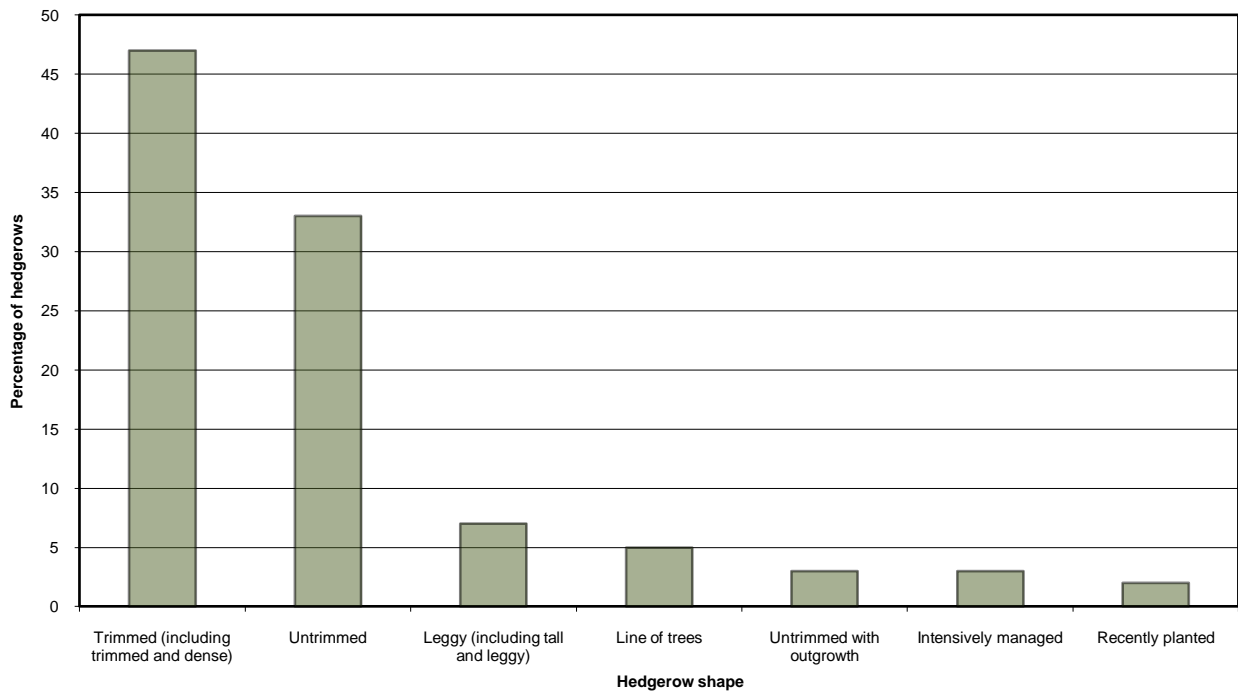


Figure 4. Percentage of hedgerows with different hedgerow shapes.

4.2.2 Species composition and species-richness

In total, 31 woody species were recorded in the hedgerows surveyed. Figure 5 shows the percentage of hedgerows in which each woody species was recorded.

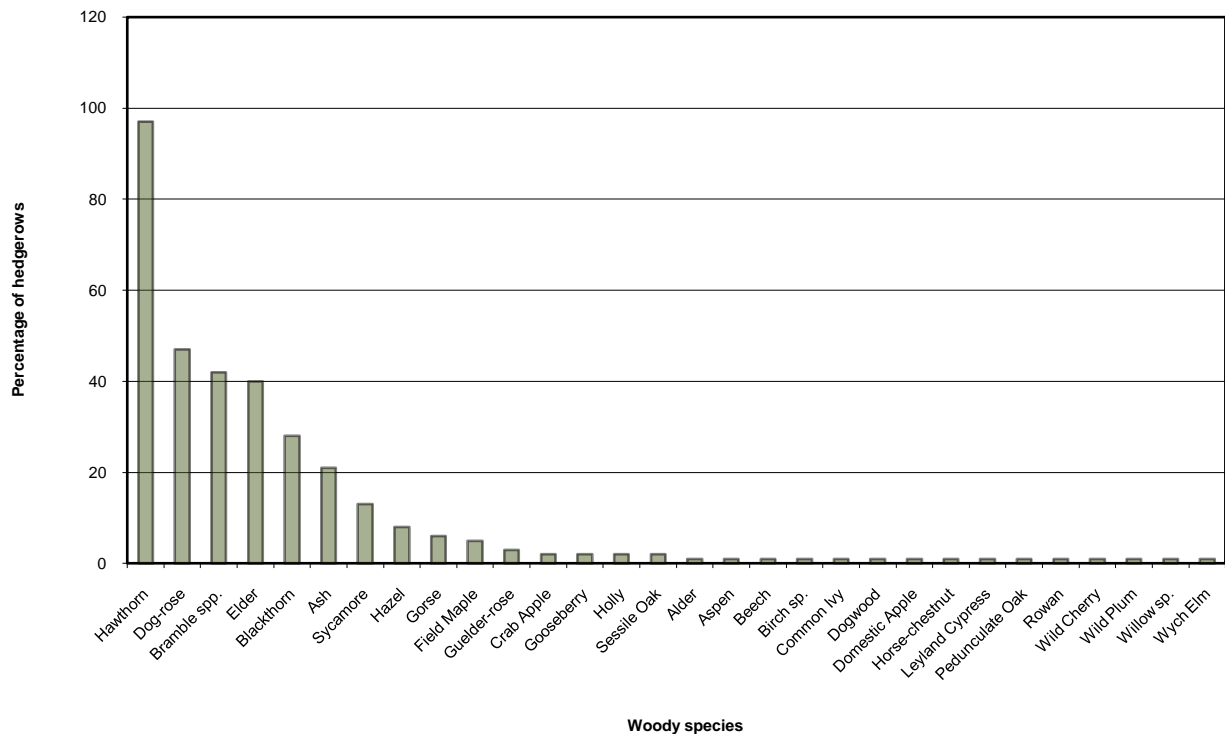


Figure 5. Percentage of hedgerows in which each woody species was recorded.

All of the hedgerows surveyed comprised more than 80% native species (including Sycamore (*Acer pseudoplatanus*) and archaeophytes), and 93% had a composition of more than 80% native species (excluding Sycamore and archaeophytes).

Almost half of the hedgerows (42%) were composed predominantly (i.e. more than 80%) of only one species (40% of the hedgerows contained more than 80% Hawthorn (*Crataegus monogyna*), 1% contained more than 80% Blackthorn (*Prunus spinosa*), and 1% contained more than 80% Elder (*Sambucus nigra*)), whilst the remaining 58% of the hedgerows had a mixed species composition. Figure 6 illustrates the proportion of hedgerows containing different numbers of native woody species (including Sycamore). Of the 175 hedgerows surveyed, a total of 49 hedgerows (27%) were recorded as being species-rich (defined as having four or more native woody species per 30m section for northern England).

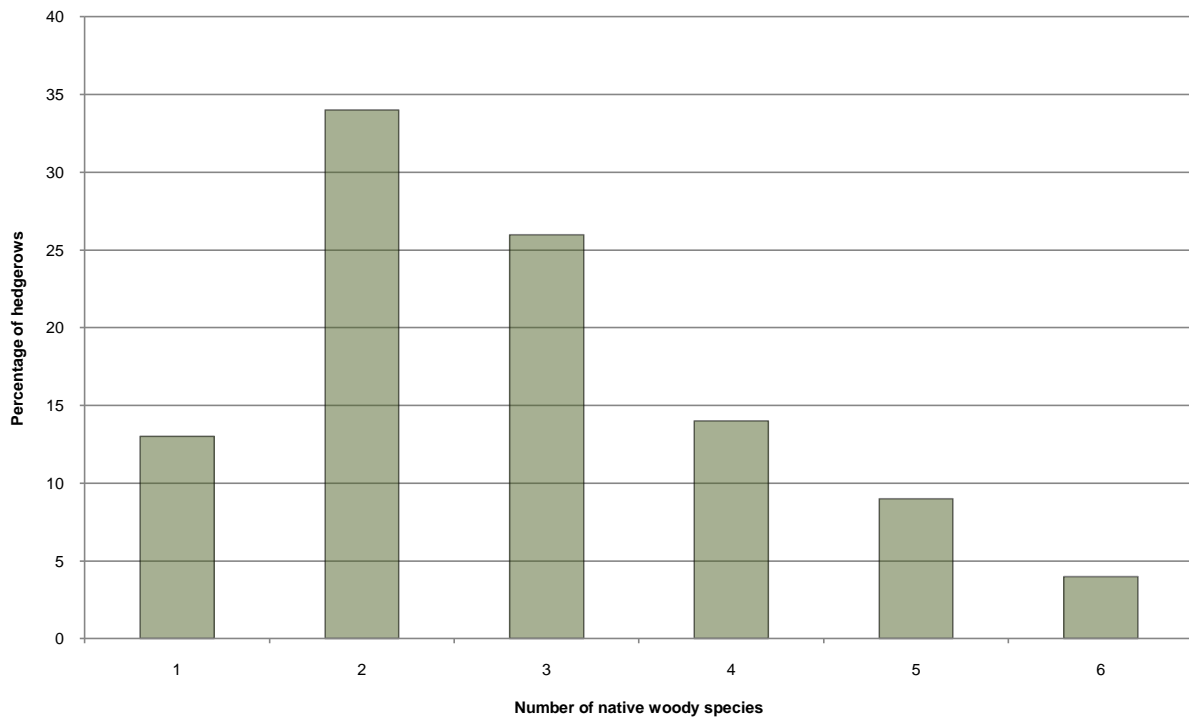


Figure 6. The proportion of hedgerows containing different numbers of native woody species.

4.2.3 Isolated hedgerow trees

A total of 76 isolated hedgerow trees were recorded in 23% of the hedgerows. Figure 7 shows the species of hedgerow tree recorded along with their relative proportions of the total 76.

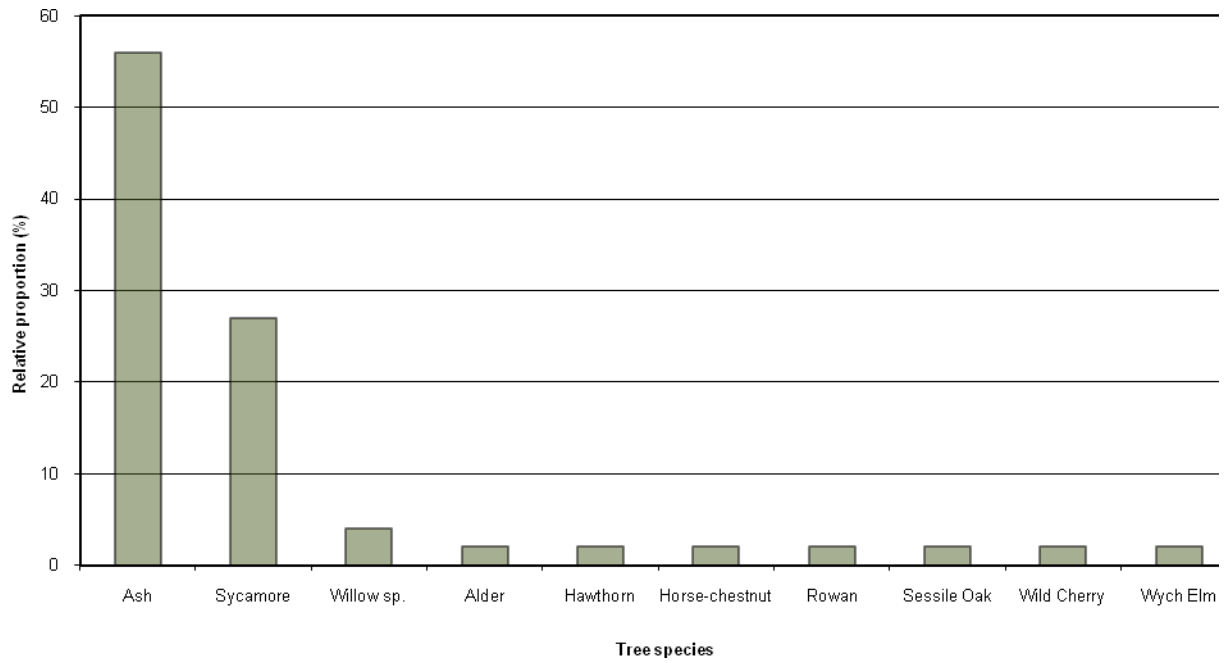


Figure 7. Relative proportions of the total number of isolated hedgerow trees of each tree species recorded.

Veteran trees were not specifically recorded during this survey, though two isolated hedgerow trees were recorded with a diameter at breast height (DBH) >100cm. Figure 8 shows the proportions of isolated hedgerow trees in each size category.

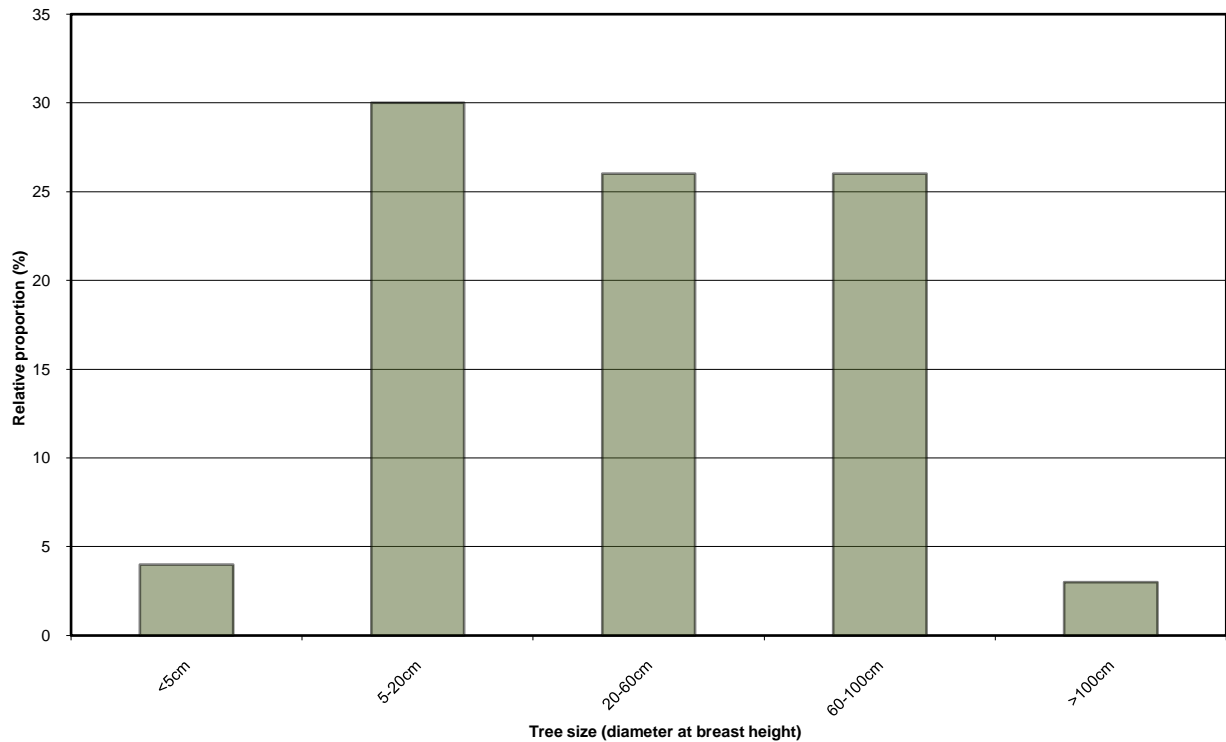


Figure 8. Proportion of isolated hedgerow trees recorded in each size category.

4.2.4 Adjacent land-use

Over three-quarters of the hedgerows were adjacent to arable land (47%) or grassland (33%); the remainder were next to built features (25%), woodland (1%) or 'other' (2%). Some hedgerows were adjacent to more than one land-use, for example improved grassland and a footpath. Figure 9 shows a full breakdown of the percentage of hedgerows surveyed next to each land-use category.

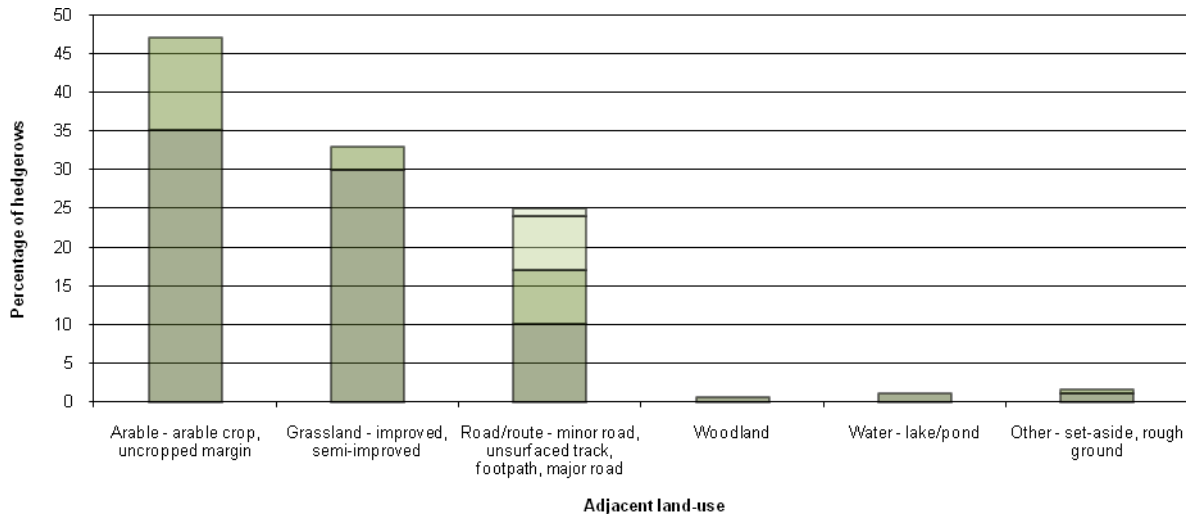


Figure 9. Percentage of hedgerows next to each land-use category.

4.3 Condition of hedgerows in the borough of Hartlepool

Of the 175 hedgerows surveyed, eight (5%) were in favourable condition (i.e. they met the thresholds for all condition attributes with the exception of nutrient enrichment). Table 1 shows the proportion of hedgerows in favourable condition for each attribute. The condition assessment criteria can be found in Appendix 4.

Attribute	Proportion in favourable condition (%)
Recently introduced species	99
Herbaceous vegetation cover	99
Undisturbed ground	97
Nutrient enrichment	95
Dimensions	74
Gaps	71
Basal canopy height	11

Table 1. Proportion of hedgerows in favourable condition for each attribute.

Of the eight hedgerows in favourable condition, four were adjacent to grassland, one was adjacent to improved grassland and arable land, one was adjacent to arable land, one was adjacent to a major road, and one was adjacent to an unsurfaced track. All of the hedgerows in favourable condition were recorded as being 'trimmed and dense', and were between 1.75m and 2.75m in height, 1.5m and 3.0m in width, and 3.0m and 7.5m in cross-sectional area.

4.4 Management requirements of the hedgerows in the borough of Hartlepool

The management requirements of all hedgerows surveyed is listed on the GIS shapefile produced during the survey, which is available from the Wildflower Ark.

5. Conclusion

5.1 Evaluation of results

The hedgerow network of Hartlepool is extensive, covering the majority of the borough. Some areas have a poorer hedgerow network than others, but these areas are in the minority.

The survey data collected shows that most attributes of a hedgerow's character are similar across the borough: the majority are shrubby hedgerows that are adjacent to either arable or pastoral farmland and have occasional isolated hedgerow trees, most of which are approaching maturity or are mature (the number of young trees is low). Hawthorn is the most ubiquitous woody species, being present in virtually all of the hedgerows, alongside Dog-rose (*Rosa canina*), Bramble (*Rubus spp.*), Elder and Blackthorn, with Ash (*Fraxinus excelsior*) the most frequent isolated tree species. However, just under half of the hedgerows are dominated by one species, whilst the remainder have a mixed woody species composition, almost half of which are species-rich.

Very few (only eight hedgerows, or 5% of the total surveyed) of the hedgerows surveyed are in favourable condition. The majority (95%) fail under the basal canopy height attribute, though many also fail on integrity and size. Although current management was not recorded during this survey, the condition assessment (along with the hedgerow shapes recorded, an indicator of current management) demonstrates that many hedgerows have been neglected to some extent, probably because they are no longer needed as stock barriers. Conversely, some have been over-managed. Of the eight hedgerows found to be in favourable condition, most are adjacent to either grassland or a road/route, and all are trimmed and dense and of a modest, easily-managed size. This suggests that low impact from farming, the need for an intact hedgerow for stock, and regular management are all factors conducive to a hedgerow being in favourable condition.

In order to achieve favourable condition, many hedgerows are in need of coppicing or laying, or gapping-up. Some hedgerows, however, could achieve favourable condition with more easily achievable management, for example a change in cutting regime or the installation of margins next to the hedgerow.

5.2 Outcomes of the survey

The outcomes of the Hartlepool Hedgerow Survey, and the contribution they make towards national and local Hedgerow Action Plan targets, are as follows:

- Information was gathered on the extent of hedgerows across the borough, highlighting areas in need of hedgerow planting that can be targeted by the TVBP, contributing to national targets 1 and 8, and local targets 1, 2 and 3.
- Information was gathered on the character of hedgerows in the borough of Hartlepool, allowing the TVBP to coordinate future hedgerow management and planting in keeping with the local character of hedgerows, contributing to national target 3, and local targets 1 and 3.
- Information was gathered on the condition of the hedgerows in Hartlepool, and the management required to maintain and/or improve their condition, contributing to national targets 4 and 5, and local target 2.
- 50 young trees were tagged, contributing to national target 7.
- 23 volunteer surveyors were trained in the hedgerow survey method, providing a valuable surveyor resource for future surveys.

- Awareness was raised (amongst landowners and the general public) about the importance of hedgerows and their management needs. Several articles promoting the survey and summarising the results were published in the local press, in local and national biodiversity and wildlife publications, and on the Tees Valley Biodiversity Partnership (TVBP) and Wildflower Ark websites. A summary of the results of the hedgerow survey was sent to all farmers that had participated, along with several information leaflets and a copy of the Natural England DVD 'A Cut Above the Rest', available from Hedgelink.

5.3 The next step

To progress the Hedgerows Action Plan in the borough of Hartlepool, management needs to be carried out on most of the hedgerows surveyed in order to bring them into favourable condition. Initially, it will be possible for the TVBP to coordinate a slight increase in the number of hedgerows in favourable condition through management under Entry Level Stewardship (ELS), by targeting hedgerows failing under the undisturbed ground, herbaceous vegetation, and dimensions attributes. However, most of the hedgerows require management (coppicing, laying, gapping-up) that is not funded through ELS. Whilst a small number of hedgerows may be managed under Higher Level Stewardship, most will not and so to achieve a significant increase in the number of hedgerows in favourable condition, an alternative means of funding these labour-intensive procedures must be found. It may be possible to develop a separate hedgerow management grant, as has been successfully done in County Durham. This grant (the Field Boundary Restoration Grant) is available every year to landowners across the county, and provides financial assistance to restore a hedgerow through coppicing, laying or planting, and providing protective fencing where necessary (<http://www.durhambiodiversity.org.uk/hedgerowpartnership.htm>). The TVBP can assess the feasibility of establishing such a funding source in order to manage hedgerows across the Tees Valley, and in particular in the borough of Hartlepool.

In addition to carrying out hedgerow management, the number of young hedgerow trees needs increasing, which can be carried out through ELS.

5.4 Assessment of how the borough of Hartlepool is meeting targets for the national and local Hedgerows HAP

Section 5.2 outlines the work that the Hartlepool Hedgerow Survey has contributed to both the local and national Hedgerow Action Plans.

With the collection of baseline data for hedgerows in Hartlepool, Target 1 of the local HAP is nearly complete; the only borough without information is Middlesbrough, a predominantly urban area. The TVBP can now work towards reaching Targets 2 and 3 by using the data collected for the boroughs of Hartlepool, Redcar & Cleveland and Stockton to ensure that the existing network of hedgerows is maintained and extended appropriately (Target 2), and that the number of hedgerows in favourable condition increases through the targeting of appropriate management (Target 3). The intention of the TVBP is to make a similar assessment of the management requirements of the hedgerows in the boroughs of Stockton and Redcar & Cleveland to that made during this survey, in order to be able to target management appropriately in these boroughs too.

Work towards Target 3 of the local HAP was carried out in 2010, with the planting of 1.675km of new hedgerow in the borough of Hartlepool, along with 83 trees. Across the Tees Valley, a further 1.613km was planted, with 80 trees. The planting was carried out with funding from the Tree Council's 'Real Hedge Fund'.

The management of, at present, 87.325km of hedgerow under hedgerow options in ELS in the borough of Hartlepool is contributing to local Target 2 (pers comm. Ruth Jackson, Tees Valley Team, Natural England, 28th January 2011).

By working towards, and monitoring progress on, all three local HAP targets, the borough of Hartlepool is contributing to national Targets 1-5 and 8. Tree-tagging schemes are an action in the local HAP, and are carried out when resources allow, thus contributing towards national Target 7.

5.5 Assessment of the practicality of using the procedures for local surveys set out in the Hedgerow Survey Handbook

The Hedgerow Survey Handbook provides a thorough guide to all aspects of completing a local hedgerow survey, from determining the initial objectives, through executing the survey efficiently and competently, to analysing and disseminating the data. Table 2 on page 17 of the handbook is particularly useful during the planning phase of a survey to ensure that all considerations are met.

However, although no two surveys are ever the same, information on the timeframes of previous surveys would be helpful in order to ensure that sufficient time was allowed during the planning phase of a survey for all other aspects of the survey. In particular, the time it takes to find and contact landowners, and liaise with them as necessary, was underestimated during the Hartlepool Hedgerow Survey, yet it is a key component to ensuring that the survey is completed as easily and efficiently as possible.

During the field survey, clarification was needed on how to record adjacent land-use for a hedgerow when there are two or more types, for example a hedgerow may often be bordered by an unsurfaced track or an uncropped margin for a distance of 5m from the centre of the hedgerow, but the rest of the field may be arable.

5.6 Limitations of the online survey database

The analysis tools within the online survey database are still in development and are in need of some refinement. Whilst assessing survey data for the Hartlepool Hedgerow Survey, the figure given for the percentage of hedgerows surveyed that were species-richness was found to be incorrect. The database provides a table of all hedgerows surveyed along with the number of species recorded in each hedgerow, and from this table calculates the percentage of hedgerows surveyed that are species-rich. However, species are included in this count that do not contribute towards species-richness, notably climbers and non-native species.

There are some datasets missing on the analysis that would be useful. These are:

- figures for the number of hedgerows with different associated features, as recorded under Section 8 of the field survey form;
- figures for the total percentages of each species recorded, as recorded under Section 17 of the field survey form;
- a means of over viewing all of the data collected, rather than having to view the information for just one hedgerow at a time.

6. Information Sources

Defra (2007). Hedgerow Survey Handbook: A standard procedure for local surveys in the UK, 2nd Edition. Prepared on behalf of the Steering Group for the UK Biodiversity Action Plan for Hedgerows. Pub: Defra, London.

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Natural England (2010). Entry Level Stewardship: Environmental Stewardship handbook, 3rd Edition (NE226). Pub: Natural England.

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Stace, C. A. (2010). New Flora of the British Isles, 3rd Edition. Pub: Cambridge University Press.

Tees Valley Biodiversity Partnership (2009). Hedgerows Habitat Action Plan. Pub: TVBP. Available at <http://www.teesvalleybiodiversity.org.uk/pdfs/test%20hedgerows.pdf>. Accessed April 2010 through to January 2011.

7. Appendices

Appendix 1: Letter to landowners

10th June 2010

Dear

'Hartlepool Hedgerow Survey'

The Wildflower Ark is an independent organisation based at Nature's World in Acklam (a registered charity). Our work includes local plant and habitat surveys, and growing and selling local native wildflowers.

We are currently working on the above project, funded by Defra and in partnership with Hartlepool Borough Council and the Tees Valley Biodiversity Partnership, with the aim of finding out more information on the hedgerows within the borough of Hartlepool. We hope that our work will help to determine the species composition and extent of these hedges and show patterns of local character. Hedgerows are a UK priority habitat and have their own action plan within the Local Biodiversity Action Plan. Over the last five years, the Wildflower Ark has conducted hedgerow surveys across the boroughs of Stockton-on-Tees and Redcar and Cleveland, but there is currently little known about the hedgerows in Hartlepool. This 10-month project aims to address that knowledge gap and the information gathered will be used through the Biodiversity Action Plan process.

Over the past few weeks, we have randomly selected 200 hedgerows across the borough of Hartlepool to survey, all of which are now marked on a map from which we think that there are some on your farm.

We are writing to request your permission to visit you to discuss these hedgerows and the possibility of us looking at them. Hedgerows that we look at will be recorded using a standardised hedgerow survey form which collects information such as the average height and width of the hedgerow, whether or not it contains hedgerow trees, and the shrubby species within the hedgerow. A copy of all information relating to your farm will be sent to you and will only be passed to others with your consent.

We will follow up this letter with a telephone call in the next couple of weeks to arrange a meeting at your convenience.

Yours sincerely,

Jessica Harrison

Project Co-ordinator

Appendix 2: Risk Assessment

Risk Assessment for the Hartlepool Hedgerow Survey, 2010-2011

Written by Jessica Harrison, professional field surveyor at the Wildflower Ark, on 21st June 2010

Potential Hazard	Persons Affected	Action(s) taken to reduce risk
<u>Working outdoors</u>		
Adverse weather conditions	All surveyors	Appropriate clothing and footwear should be worn at all times
Sunburn		Surveying should be postponed if weather is too hostile for safety
Dehydration		Sunblock should be worn as appropriate
Allergies		Water should be carried at all times
Injuries, including stings and bites		Medication to prevent relevant allergies, e.g. Hayfever, should be carried at all times and taken as appropriate
		A First Aid Kit should be carried at all times and an up-to-date Tetanus jab is advised
<u>Lone Working</u>		
Isolation when working alone	Professional surveyors	Survey work to be done in pairs wherever possible. If working alone, a mobile phone is to be carried at all times, and the location and timing of the survey is to be communicated to colleagues in the office.
<u>Roadside Surveying</u>		
Lack of visibility to traffic	Professional surveyors	High-visibility clothing should be worn at all times
Proximity to traffic		Surveying should be carried out from a footpath or roadverge wherever possible, and warning signs should be located at a suitable distance from the place of survey to warn traffic
<u>Flora</u>		
Injury from plants	All surveyors	Avoid close contact with plants, in particular those with sharp thorns (such as Blackthorn) and those that are toxic to humans (such as Giant Hogweed and Bracken - the spores of which are carcinogenic)

<u>Water bodies</u>		
Steep banks/slippery surfaces	All surveyors	Take care when surveying hedgerows with ditches or close to ponds and avoid walking on steep sides and/or slippery ground
Water-borne diseases		Avoid contact with water, which may carry diseases such as Weil's Disease (Leptospirosis). Cover all cuts with waterproof plasters as a precaution and if contact is made with water wash the area immediately.
<u>Working on farmland</u>		
Livestock	All surveyors	Check with the landowner if there is livestock in any of the fields requiring access and avoid these fields wherever possible (hedgerows may need to be surveyed on another day)
		Treat all livestock with caution and avoid startling them
		Take care if working in an area recently-visited by sheep or deer to cover all bare skin to minimise the risk of a tick attaching
Machinery		Keep clear of all machinery
Hazardous buildings		Keep clear of all farm buildings, especially those containing unstable structures such as stacked hay bales
Uneven terrain		Take care when walking over farmland and avoid uneven ground, and crossing ditches and streams
Fences and gates		Keep clear of electric fencing and cross all fencing at a crossing point
		If necessary to climb a gate, do so at the hinge end
Predator and pest control		Check with the landowner if there is any predator or pest control on the farm and keep clear of these areas
		Avoid any area where a shoot is occurring
	Do not touch any areas where poison has been laid down	
Chemical hazards	Check with the landowner if there is any spraying occurring at the time of survey	
	Check with the landowner if there has been any recent spraying and avoid these areas	
General farmland hazards	Follow any instructions given by the farmer	

Appendix 3: Field Survey Form

Local Hedgerow Field Survey Form												
PART A - ESSENTIAL ASSESSMENTS (To be completed for all local hedgerow surveys)												
TITLE OF SURVEY:												
Grid Ref	100km Letters or numbers	Easting					Northing					
		10km	1km	100m	10m	1m	10km	1km	100m	10m	1m	

Date								Hedgerow No	
Surveyor(s):								Side Surveyed - Both Y/N	
								Side A	N E S W
								Side B	N E S W

WHOLE HEDGEROW		
1 - NAME OF LANDOWNER/CONTACT DETAILS		
Name:	Address	Tel:
1a - Permission granted to enter details onto database YES/NO		
1b - Permission granted to publish ownership information (if relevant) YES/NO		

2 - SURVEY TIMES AND WEATHER/OTHER CONDITIONS THAT MAY AFFECT THE SURVEY		
2a - Start time:	2b - Finish time:	2c - Weather:
2d - Were there any difficulties in surveying the hedgerows? If so please describe.		YES NO
Difficulty(ies):		

3 - HEDGEROW TYPE		
3a - Shrubby hedgerow	3b - Line of trees	3c - Shrubby with line of trees

4 - LENGTH (m) - between nodes or intersections with other hedgerows, to nearest 5m	
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5 - CONNECTIONS - total number of other hedgerows connected to each end of the hedgerow	End 1	End 2	Total

6 - EXTENT OF SURVEY	6a - Whole hedgerow	6b - 30m Section(s)	

WHOLE HEDGEROW OR 30m SURVEY SECTION (Sections 7-16)							
7 - ADJACENT LAND USE							
		Side A	Side B			Side A	Side B
7a - Arable	Arable crop			7e - Road/Route	Major Road		
	Uncropped margin				Minor Road		
7b - Grass	Improved				Track (unsurfaced)		
	Semi-improved				Footpath		
	Unimproved				Rail		
7c - Woodland	Young				Canal		
	Semi-mature			7f - Water	River		
	Mature				Stream		
7d - Other					Lake/pond		

8 - ASSOCIATED FEATURES – See also Part B section 18			
	Side A	Side B	
8a - Bank - Height (in metres) to nearest 25cm			8f - Ditch - internal - Dry (tick)
8b - Average herb vegetation height (cm) to nearest 5cm			8g - Ditch - internal - Wet (tick)
8c - Fence (tick)			
8d - Ditch - external - Dry (tick)			
8e - Ditch - external - Wet (tick)			

9 - UNDISTURBED GROUND (measured from the centreline of the hedgerow)		Side A	Side B
9a - Average width of undisturbed ground (m) to nearest 50cm*			
9b - Average width of perennial herbaceous vegetation (m) to nearest 50cm*			
NB * mark N/A or road etc if a road or built feature or hedge is adjacent to grassland or woodland			

10 – NUTRIENT ENRICHMENT GROUND FLORA INDICATOR SPECIES								
Estimate % cover of each species within a 2m wide band alongside the hedgerow (to nearest 5%)								
10a – Nettles	Side A	Side B	10b - Cleavers	Side A	Side B	10c - Docks	Side A	Side B

11 - RECENTLY INTRODUCED, NON-NATIVE SPECIES			
11a - RECENTLY INTRODUCED, NON-NATIVE GROUND FLORA SPECIES			
	Species	Side A	Side B
% cover of introduced species in the hedge-bottom (to nearest 5% or enter just the name if <5%)			
11b - RECENTLY INTRODUCED, NON-NATIVE WOODY SPECIES			
	Species	Side A	Side B
% cover of introduced species in the shrub layer (to nearest 5% or enter just the name if <5%)			

16 – NOTES – Whole hedgerow or 30m survey section
16a - Fauna (evidence of)
16b - Features (including evidence of recent planting)
16c - Photograph numbers (and locate on map)

30m SURVEY SECTION ONLY

17 - WOODY SPECIES IN 30m SURVEY SECTION ONLY – Add any others, including non-natives.					
Species	Shrubs % cover	Trees No.	Species	Shrubs % cover	Trees No.
Alder, common (<i>Alnus glutinosa</i>)			Plum, wild (<i>Prunus domestica</i>)		
Apple, crab (<i>Malus sylvestris</i>)			Poplar, black (<i>Populus nigra betulifolia</i>)		
Ash (<i>Fraxinus excelsior</i>)			Privet, wild (<i>Ligustrum vulgare</i>)		
Aspen (<i>Populus tremula</i>)			Rose, dog- (<i>Rosa canina</i>)		
Beech (<i>Fagus sylvatica</i>)			Rose, field- (<i>Rosa arvensis</i>)		
Birch, downy (<i>Betula pubescens</i>)			Rose (<i>Rosa</i> sp.)		
Birch, silver (<i>Betula pendula</i>)			Rowan (<i>Sorbus aucuparia</i>)		
Blackthorn (<i>Prunus spinosa</i>)			Spindle (<i>Euonymus europaeus</i>)		
Broom (<i>Cytisus scoparius</i>)			Sycamore (<i>Acer pseudoplatanus</i>)		
Buckthorn (<i>Rhamnus cathartica</i>)			Wayfaring-tree (<i>Viburnum lantana</i>)		
Cherry, wild (<i>Prunus avium</i>)			Willow, grey (<i>Salix cinerea</i>)		
Dogwood (<i>Cornus sanguinea</i>)			Willow, goat (<i>Salix caprea</i>)		
Elder (<i>Sambucus nigra</i>)					
Elm, English (<i>Ulmus procera</i>)					
Elm, wych (<i>Ulmus glabra</i>)					
Elm, (<i>Ulmus</i> sp.)					
Gorse (<i>Ulex europaeus</i>)					
Gorse, western (<i>Ulex gallii</i>)					
Guelder rose (<i>Viburnum opulus</i>)					
Hawthorn (<i>Crataegus</i> sp.)					
Hazel (<i>Corylus avellana</i>)					
Holly (<i>Ilex aquifolium</i>)					
Hornbeam (<i>Carpinus betulus</i>)					
Lime, large-leaved (<i>Tilia platyphyllos</i>)					
Lime, small-leaved (<i>Tilia cordata</i>)					
Maple, field (<i>Acer campestre</i>)			Bramble (<i>Rubus fruticosus</i> agg.)		
Oak, pedunculate (<i>Quercus robur</i>)			Honeysuckle (<i>Lonicera periclymenum</i>)		
Oak, sessile (<i>Quercus petraea</i>)			Ivy (<i>Hedera helix</i>)		
Pear (<i>Pyrus communis</i> sensu lato)			Traveller's-joy (<i>Clematis vitalba</i>)		
Pine, Scots (<i>Pinus sylvestris</i>)			% Gaps/access openings		

Appendix 4: Hedgerow Favourable Condition Attributes

Attribute	Threshold	Method
Undisturbed ground and perennial herbaceous vegetation cover	Undisturbed ground (at least 2m). Automatically favourable if borders grassland.	Estimate average width of undisturbed (uncultivated) ground from the centre-line of the hedgerow.
	Herbaceous vegetation (at least 1m)	Estimate average width of perennial herbaceous vegetation between the centre-line of the hedgerow and the adjacent disturbed ground.
Nutrient enrichment	No suitable thresholds have been developed, but should be less than 20% combined cover of nettles, cleavers and docks	Estimate percentage cover of nettles, cleavers and docks within a 2m band alongside the hedgerow.
Recently introduced, non-native species	Non-native herbaceous species (maximum 10%)	Estimate cover of all non-native herbaceous species as percentage of area of 2m band extending from centre-line of hedgerow.
	Non-native woody species (maximum 10%)	Estimate cover of all non-native woody species as percentage of area of vertical face of hedgerow.
Size	Height (at least 1m)	Measure 'average' height excluding bank.
	Width (at least 1.5m)	Measure 'average' width at widest point of hedgerow canopy, shoot tip to shoot tip.
	Cross-sectional area (minimum 3m ²)	Take the 'average' height and width for the hedgerow, and multiply
Integrity/continuity	<10% gaps	Estimate total length of gaps present as a percentage of total hedgerow length or 30m section (as appropriate)
	No gaps >5m wide	Record if any gaps are >5m wide excluding access points
	Base of canopy less than 0.5m above ground for shrubby hedgerows	Estimate 'average' height from the base of the hedgerow to the lowest leafy growth.

Table reproduced from the Hedgerow Survey Handbook (page 133, Defra, 2007).