Preliminary study to map Woodland Creation Potential to the east of the Malvern Hills

Final report to the Malvern Hills AONB Partnership

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Executive Summary

i. This project aimed to develop a methodology that could make a preliminary assessment of the potential of an area of land for new woodland creation. The project was initiated by the Malvern Hills Area of Outstanding Natural Beauty (AONB) Partnership as a means of refining previous national or regional woodland targeting projects at a local scale. The project area chosen comprised 80km² to the east of the Malvern Hills and is shown in Figure 1.

ii. Individual land parcels from OS Master Map were each assessed against a matrix based on five key themes and were given a value to indicate the level of constraint to new woodland creation judged to be present. The five themes used were:
   - Landscape Character
   - Biodiversity
   - Agriculture
   - Buffering
   - Connectivity

iii. The levels of indicative constraint are summarised as:
   - 1: No known constraints to new woodland creation in this location
   - 2: Possible constraints to new woodland creation in this location
   - 3: Major constraints to new woodland creation in this location

iv. A GIS was produced to display the level of constraint to new woodland creation judged to be present on each land parcel across the project area. The Woodland Creation Potential map is presented in this report along with key guiding principles for use of the map. The report also identifies further areas of work that could improve the evidence base and increase decision making confidence.

v. This study and subsequent revisions through the incorporation of additional data should be used to assist in planning and delivering new woodland creation that meets multi-functional objectives within the landscape.

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I. Original project brief

II. Habitat and land use categories mapped by the Worcestershire Habitat Inventory

III. Maps: these appear in the order to which they are referred in the report preceded by the Woodland Creation Potential maps.

Map

1 & 2 Woodland Creation Potential maps (one with and one without OS map base)
3 Worcestershire Landscape Character (Landscape Types)
4 Existing woodland within the study area
5 English Woodland Grant Schemes (past and current)
6 Forestry Commission Priority Places (for woodland creation and restoration)
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1. Background

1.1 Well sited and well-managed woodland is a good thing. The multiple benefits of woodland – including timber, carbon-neutral fuel, flood mitigation, mental and physical health, wildlife habitat etc – are increasingly well recognised. National drivers such as the recent report by the Independent Panel on Forestry advocate an increase in the area of England's woods and forests and enhanced levels of Government grant are currently available to help to meet such objectives. Woodland in Worcestershire covers 7.5% of the land area, slightly less than the England figure of 9.9%[1]. The Independent Panel on Forestry recommended to Government in 2012 that woodland cover in England is increased to 15% by 2060. This would involve a doubling of the woodland cover within the county. Government has accepted a national figure of 12% by 2060 as achievable[2].

1.2 At a local level the creation of new woodland within Worcestershire in appropriate locations is also regarded in a very positive light. Woodland creation is likely to be a major component of the forthcoming County Green Infrastructure Strategy and of attempts to accommodate new development and provide for people's green space needs as part of new development proposals.

1.3 An increase in woodland, or tree, cover will need to be achieved in different ways in different locations, depending on what is locally appropriate to the character of the landscape and the land that is available for planting. In this study the term 'woodland creation/planting' is used broadly and could refer to:

- Blocks of woodland
- Hedgerow or streamside trees
- Copses
- Linear belts

1.4 Much work has been done, nationally and regionally, and often at quite a broad scale, to identify areas where new woodland creation is desirable. The aim of this work, initiated by the Malvern Hills Area of Outstanding Natural Beauty Partnership, is to drill down to a finer grain of detail within an area to the east of the Malvern Hills and identify land which might be suitable for new woodland creation or conversely where there may be constraints to new woodland creation.

2. Project brief

2.1 The project brief as provided by the Malvern Hills AONB Partnership is in Appendix 1.

2.2 The overall aim of the project was to 'create a detailed picture of land suited to the creation of new woodland in a defined area to the east of the Malvern Hills'. This was intended to be a preliminary study aiming only to map areas with potential for new woodland creation, not to indicate areas where woodland creation should be targeted or to identify practical opportunities on the ground.

[1] National Forest Inventory Woodland Area Statistics: England (2011). Forestry Commission.

[2] Government Forestry and Woodlands Policy Statement (2013). Defra.

2.3 It is accepted that further work needs to be done to build on the information drawn together during this study, in particular to include and provide interpretation of data relating to the social and economic benefits of woodland. This is discussed in more detail in section 8 of this report.

2.4 The land comprising the full project study area - a total of 80km² - is shown in figure 1.

2.5 Completion of an initial pilot study within the project area was undertaken between November 2012 and January 2013 in order to:

- Propose and test a methodology for identifying land with potential suitability for new woodland creation
- Determine the length of time required to complete the mapping work over each 1km² of the project area
- Cost completion of the full project, based on the calculated timescale

2.6 The area chosen for the pilot, at Newland, is shown in figure 2. This totalled 288 hectares or 2.88km².

2.7 The study was hosted by Worcestershire County Council, which provided office space and use of GIS software as a contribution to the delivery of the project.

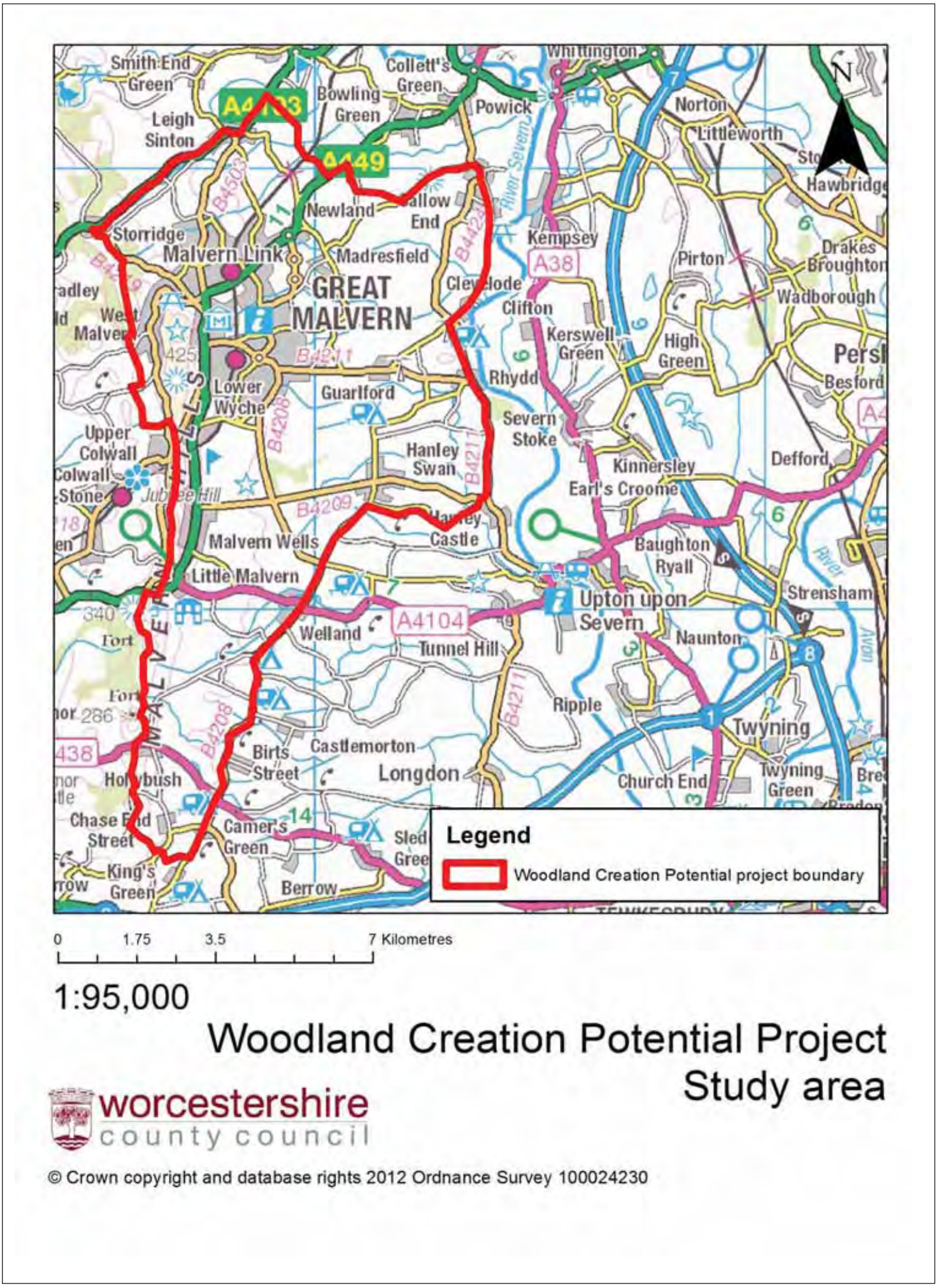

Figure 1. Project study area

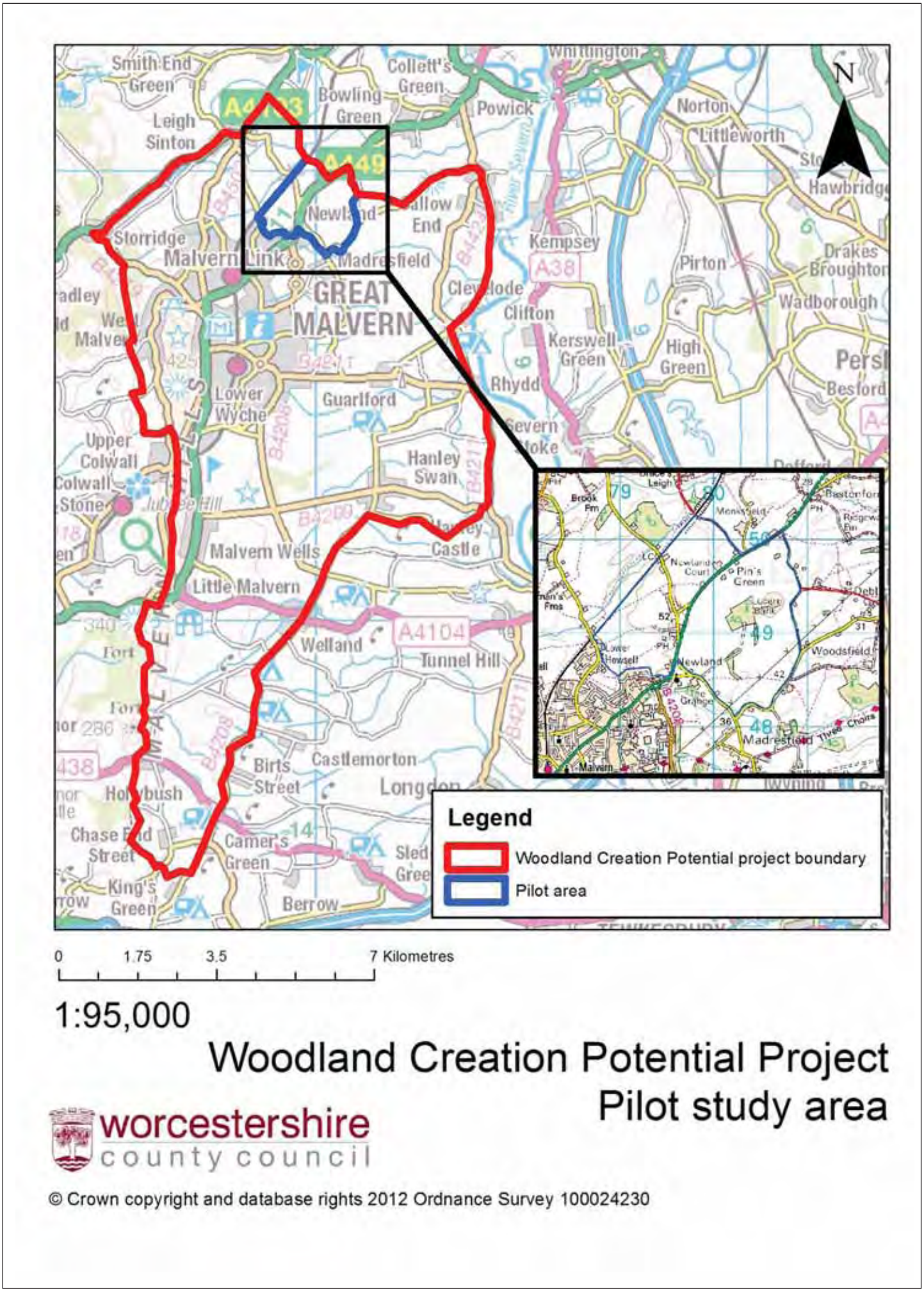

Figure 2. Pilot project area

3. Data sets used

3.1 The table shows the datasets used. These were compiled into an integrated Geographical Information System created for the purpose of the project.

Data	Description and origin
Worcestershire Landscape Character Assessment	Dataset of mapped Landscape Types found within the county as identified and described by Worcestershire County Council
Ancient Woodland Inventory	Inventory of ancient woodland sites (including Planted Ancient Woodland Sites) published by Natural England
National Forest Inventory 2011	Inventory of all woodland sites over 0.5ha published by Forestry Commission
Woodland Opportunity Map	Dataset identifying priority areas for woodland creation within the West Midlands, published by Forestry Commission in 2011.
Ancient Woodland Restoration Areas	Dataset identifying priority areas for the restoration of Plantations on Ancient Woodland Sites, published by Forestry Commission.
English Woodland Grant Scheme	Coverage of EWGS agreements 1994-2004 and 2005 onwards. Datasets published by Forestry Commission.
Priority Places for England	Forestry Commission woodland creation target areas based on levels of deprivation and public access to woodland
Environmental Stewardship schemes	Coverage of Entry Level and Higher Level schemes being delivered with agri-environment funding. Dataset published by Natural England.
Agricultural Land Classification	Mapping of agricultural land grades (quality) published by Natural England
Worcestershire Grassland Inventory Sites	Grassland Inventory dataset held by Worcestershire County Council
Sites of Special Scientific Interest	SSSI dataset published by Natural England
Worcestershire Local Sites	Local Sites dataset held by Worcestershire County Council
Worcestershire Habitat Inventory	Habitats and land use inventory database of Worcestershire created by Worcestershire County Council. Compiled on a field-by-field basis using aerial photograph interpretation (2005 set) and targeted ground truthing.
Biodiversity Action Plan priority habitats in the Malvern Hills AONB	Dataset of BAP habitat distribution within the Malvern Hills AONB, held by the Malvern Hills AONB Partnership

4. Historical context: Malvern Forest and Chase

A detailed account of the history of the Chase can be found in 'The Forest and Chase of Malvern' (Pamela Hurle, 2007)

4.1 The terms Forest and Chase have a legal basis and were never historically conferred to indicate vegetation or land use. To 'afforest' a geographical area was to place it under Forest Law and in control of the Crown, for the specific purpose of protecting the venison available to be hunted and the habitat within which the deer resided. A Forest was an area with exclusive hunting rights reserved for the monarch, whereas a Chase was forest land where the hunting rights had been granted to a subject, who became Lord of the Chase. William the Conqueror first afforested land around Malvern in the 1080s. This became a Chase in the early 1100s and remained so until the late 1400s, when it was returned to the Crown, and thus its status as a Forest, before being finally disafforested by Charles I.

4.2 Surviving documents and perambulation records indicate that at its largest extent in the late 16th Century 13 parishes had land within the bounds of Malvern Chase, but the exact boundary of the afforested area appears never to have been clearly defined or mapped, even by those with lordship over the Chase and with the judicial and economic interest for doing so. The parishes of Hanley Castle, Great Malvern, Little Malvern, Welland, Castlemorton, Birtsmorton, Berrow, Bromsberrow, Upton, Longdon, Leigh, Mathon and Colwall are all recorded to have been partially or wholly within the Chase and subject to Forest Law. The disafforestation survey of 1628 recorded the total size of the Chase at that time as 8,092 acres, the vast majority in the county of Worcestershire.

4.3 The Lord of the Chase of Malvern appointed a constable or chief forester who had his seat at Hanley. There were also other officials – such as foresters, stewards, parkers and bailiffs – whose role it was to uphold Forest Law. The chief forester had considerable powers, sitting in legal judgement over local inhabitants for transgressions ranging from cutting timber (the commoners were entitled to take only windfall timber) to being caught red-handed in the act of hunting deer. The over-riding motivation in the enforcement of Forest Law was the protection of the deer and its habitat. Inhabitants of the Chase were permitted to do nothing which might impede the free movement and grazing of deer within the forest.

4.4 It is clear from the surviving records that Malvern Chase was significantly wooded during the early period it was under Forest Law, although it is impossible to accurately quantify that woodland in acres or as a percentage of the total chase. Some large areas of woodland were legally cleared, such as the assart rights to 300 acres granted to the Bishop of Worcester in 1196, but the unauthorised clearance of woodland for any purpose was essentially outlawed for almost 600 years. Land that had been cleared prior to afforestation continued to be farmed. Communally managed open field arable farming was practiced and livestock were grazed on the 'waste' designated by each parish for that purpose.

4.5 During the latter part of the 16th Century, however, surviving documents indicate that the enforcement of Forest Law had become lax at Malvern. John Hornyold, one of the larger landowners within the chase, complained to the Queen's treasury that the commoners of

the chase were abusing their rights, and even some of the other large landowners were flouting the Forest Law, felling trees on a large scale for firewood, building timber and even for commercial purposes and so, according to Hornyold, quite changing the character of the area through woodland clearance and building. A reduction in deer numbers at this time was also noted and attributed largely to the loss of habitat and perhaps also poaching.

4.6 The eventual disafforestation decree of 1632 left one third of the Forest land within the ownership of the king: parts of this were disposed of through land grants to the bigger landowners and the remainder eventually sold off. The essence of the decree was that in return for losing commoners rights on this one third portion, the population were compensated by no longer being subject to Forest Law on the remaining two thirds. Over the coming centuries, illegal encroachment and legal enclosure would further eat away at both the remaining woodland and the land on which commoners rights could be exercised.

5. The study area - a modern narrative

This section provides a narrative of the full, 80km² study area.

5.1 Landscape Character and Sensitivity

Seven Landscape Types are present within the study area (Map 3). Tree cover character is one of six key elements that define landscape character (the others being geology, land use, settlement pattern, soil type and topography). The descriptions of each Landscape Type below appear in order of their extent within the study area, from greatest to least.

a) Principal Timbered Farmlands
   A wooded, lowland agricultural landscape encompassing much of the northern half of the study area. Tree cover provided by irregularly shaped woodlands, hedgerows and hedgerow trees creates an intimate landscape with filtered views, accentuated by historic piecemeal clearance of woodland for agriculture (assarting) and an organic pattern of enclosure.

b) Enclosed Commons
   Dominating the central third of the study area, this Landscape Type has a character defined by planned enclosure and the creation of an ordered pattern of hedgerows, roads and discrete blocks of woodland plantation.

c) Unenclosed Commons
   An open, unwooded, unenclosed landscape shaped in each locality by the activities of local commoners. This Landscape Type is present in the south of the study area across the commons of Castlemorton, Hollybed and Coomegreen, where land use today continues to be defined by rough grazing.

d) High Hills and Slopes
   An unenclosed 'highland' landscape with dramatic topography encompassing the summits and upper slopes of the Malvern Hills. A history of rough grazing has kept grassland short and reduced scrub encroachment. Secondary woodland growth on the

lower slopes has increased in recent times and is being controlled to protect the open landscape along the ridgeline of the hills. The nature of this landscape renders new woodland creation.

e) Settled Farmlands with Pastoral Land Use
Small areas of this Landscape Type are present along the south-eastern edge of the study area. This is a lowland agricultural landscape with the tree cover character provided by hedgerow and field trees rather than any extensive areas of woodland.

f) Principal Wooded Hills
An upstanding, wooded landscape, present along the north-western edge of the study area, with steeply undulating topography encompassing the eastern flanks of the Malvern Hills and then further north the hills around Abberley and Suckley. Large, irregularly shaped woodlands of ancient character, strong hedgelines and hedgerow trees provide a visually dominant pattern of tree cover.

g) Sandstone Estatelands
A very small area of this Landscape Type is present at the southern tip of the study area. This is an open, rolling landscape of mainly arable land use. Woodland is present in shelter belts and occasional planned and uniform plantations.

5.2 The sensitivity of each unit of landscape (Land Cover Parcels) within the county was assessed in 2008[3]. This work was undertaken with a view to describing to what extent different landscapes could accommodate change in the context of built development. Six landscape condition indicators were used for the sensitivity analysis, two of which relate to tree cover pattern and character. Future work to identify specific sites for new tree planting should take account of landscape sensitivity analysis at this scale.

Landscape sensitivity
Sensitivity is defined as the degree to which the Resilience of the landscape is influenced by its current Condition. Resilience is a measure of the endurance of landscape character, defined by the likelihood of change in relation to the degree to which landscape is able to tolerate that change. Condition is the degree to which the inherent landscape character is represented today on the ground. In drawing together these two important parameters, sensitivity is essentially the end-point of the (Landscape Character Assessment) analysis and evaluation phase and therefore probably the best objective marker for strategic planning.

Areas with high sensitivity would be most sensitive and least accommodating to change, on the basis of loss of landscape character; here presumption would be against development on landscape character grounds. Those with medium sensitivity have a moderate potential for accommodating change. Those with low sensitivity may be regarded as least sensitive to change and therefore most able to accommodate development.

Patton, J (2009) Sensitivity: Background and Methodology. Worcestershire County Council.

[3] Work undertaken by Jane Patton and Jess Allen, Landscape Officers at Worcestershire County Council

5.3 Existing woodland (Map 4)
The Ancient Woodland Inventory shows 180 hectares (ha) of ancient woodland within the study area, including Ancient Semi-Natural Woodland and Plantations on Ancient Wood Sites (PAWS). This represents 2.25% of the study area. There are approximately 550 hectares of woodland in total within the study area recorded on the 2011 National Forest Inventory (including ancient woodland), covering 6.9% of the study area.

5.4 Approximately 390 ha within the study area have received funding under the English Woodland Grant Scheme since 1994. This equates to 4.87% of the study area. (Map 5)

5.5 Forestry Commission have identified 'Priority Places for England' - areas of high priority for the targeting of new woodland planting - based on national indices of deprivation and current public access to woodland. A large part of the study area from Upper Welland northwards is included within this targeting. (Map 6)

5.6 Forestry Commission have also mapped target areas across England for PAWS restoration, where planting of new broadleaved, native woodland should follow the removal of conifers or other non-native species. The landscape immediately to the west of the study area, across the county border into Herefordshire, has been identified as just such a priority area. A very small part extends into the study area at Storridge. (Maps 7 and 8)

5.7 Agricultural land use (Map 9)
Approximately 85% of the agricultural land within the study area is classed as Grade 3. The remainder is split fairly evenly between Grade 2 (a small area around Leigh Sinton), Grade 4 (around the commons in the south of the study area) and Grade 5 (summits and upper slopes of the Malvern Hills). Grades 1, 2 and sub-Grade 3a are considered to be the best and most versatile agricultural land. Maps and/or datasets showing the sub-divided Grade 3 classification (3a and 3b), done following later surveys, are not readily available and do not have complete national coverage.

5.8 Agri-environment Schemes (Map 10)
Environmental Stewardship schemes cover 2,834 ha (28km^2) or 35% of the total study area. The Malvern Hills and the main Commons, totalling 977 hectares, are in Higher Level Stewardship (HLS); 25 hectares at Guarlford are in Organic Entry Level Stewardship; the remainder is split between Entry Level Stewardship (ELS) and ELS plus HLS schemes.

5.9 Protected or listed nature conservation sites (Map 11)
Local Wildlife or Geological Sites cover 540 hectares (6.75%) of the total study area across 30 individual sites. Sites of Special Scientific Interest cover 433 hectares (5.4%) of the study area. SSSIs include the Malvern Hills, Castlemorton Common, Grange Meadow, Aileshurst Coppice and Starling Bank.

5.10 Biodiversity Action Plan (BAP) habitat (Map 12)
Data from national habitat inventories, the Worcestershire Habitat Inventory and the results of field survey work were combined in a previous piece of work to produce a map of BAP habitats within the Malvern Hills AONB.

6. Assessing potential for new woodland creation

6.1 The project trialled methodology for identifying and mapping areas with potential for new woodland creation. The project was begun starting with a base assumption or hypothesis that *new woodland creation is appropriate in any location*. Analysis of the various data then attempted to prove or disprove this hypothesis for each individual land parcel (using OS Master Map polygons).

6.2 The methodology was informed by woodland prioritisation or mapping work carried out by others, notably the Woodland Opportunity Map (WOM) published by Forestry Commission[4]. Version 2 of the WOM, consisting of six maps, was released in 2007. The maps indicate broad regional priorities for woodland creation and ancient woodland restoration. (Map 13)

6.3 The WOM has a subtly different aim and end-use to this project, reflected by the scale at which that mapping was carried out. The WOM *prioritises* broad areas of landscape within which woodland creation is desirable rather than suggesting actual *potential* at a site-based scale. We hope that this project will complement the WOM by starting to provide a greater level of guidance at a local level for those considering new woodland creation.

6.4 The WOM is based on four key themes – landscape, biodiversity, cultural heritage and access – and uses a 1-Preferred, 2-Neutral, 3-Sensitive scoring system to indicate priorities for woodland creation:

Map	Preferred	Neutral	Sensitive
Landscape	Woodland creation will generally reinforce landscape character and is encouraged	Woodland creation could generally reinforce character, but there may be sensitivities	Woodland creation will **not** generally reinforce landscape character and could harm it
Biodiversity	Woodland creation will generally benefit biodiversity and is encouraged	Woodland creation could generally benefit biodiversity but there may be sensitivities	Woodland creation will generally **not** benefit biodiversity and could harm it
Cultural heritage	Woodland creation is likely to have minimal impact on historic features/landscapes but sensitivities may exist	Woodland creation could be accommodated, but sensitivities exist	Woodland creation will generally **not** fit with cultural heritage and could harm it
	Most preferred	**Preferred**	**Neutral**
Access	There is generally a lack of woodland access and CROW open access land. Woodland for access is encouraged	There is limited woodland access and/or CROW open access land	There is already some woodland access and/or CROW open access land

Table taken from *Guidance notes for Woodland Opportunities Map (WOM) version 2*. Forestry Commission, June 2007.

6.5 The WOM model of key themes and a scoring system was adapted for use by this project and an assessment matrix was produced to give a value to each land parcel which reflected the level of constraint on new woodland creation judged to be present:

4 http://www.forestry.gov.uk/westmidlands-woodlandopportunities

Themes used

- Is there over-riding **biodiversity** interest in the presence of Sites of Special Scientific Interest, Local (Wildlife or Geological) Sites or mapped (non-woodland) BAP habitat that would constrain new woodland creation

- Could new woodland creation potentially be employed to enhance **landscape** interest and if so what character of new woodland creation/tree planting could be appropriate based on the Landscape Character Assessment

- Is there over-riding **agricultural** interest in the presence of Agricultural Land Classification grades 1 or 2 that may discourage the loss of farmed land to new woodland creation

- Could new woodland creation be employed in **buffering**[5] core areas (SSSIs, Local Sites, BAP habitat) through the creation of zones of new woodland between the core area and surrounding land use, where this would not damage or otherwise compromise the biodiversity value of habitats present within the core area

- Could new woodland creation be employed in promoting **connectivity**[5] between existing habitats in the form of continuous linear wooded corridors or stepping stones of small woodlands, copses or hedgerow trees

Assessment matrix for potential for new woodland creation

	No known constraints	Possible constraints	Major constraints
Landscape	Woodland creation will strongly reinforce landscape character	Woodland creation could generally reinforce landscape character but there are sensitivities over type and cover of woodland	Woodland creation will not generally reinforce or would detract from landscape character
Biodiversity	Woodland creation will generally benefit or have neutral impact on existing biodiversity	Woodland creation may benefit biodiversity but restoration or creation of other priority habitats may take precedence	Woodland creation will generally not benefit biodiversity or may cause direct harm to sensitive sites or species
Agriculture	Woodland creation will not cause losses of highest quality best and most versatile agricultural land	Woodland creation may not cause losses of highest quality best and most versatile agricultural land but there may be over-riding local economic considerations	Woodland creation will cause losses of highest quality best and most versatile agricultural land

Table cont.

[5] Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., & Wynne, G.R. (2010) *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.

Buffering	Woodland creation within a buffer zone will protect or enhance core sites	Woodland creation within a buffer zone may be suitable but density and type of planting needs careful consideration depending on priority habitat present on core site	Woodland creation within a buffer zone will potentially damage the priority habitat present on core site
Connectivity	Woodland creation will enhance connectivity between core sites	Woodland creation may offer enhanced connectivity but density and type of planting needs careful consideration depending on priority habitat present on core sites	Woodland creation would be detrimental to connectivity between core sites containing other priority habitats

6.6 The assessment resulted in a value being applied to each land parcel within the project area as follows:

Woodland Creation Potential Value	**Description**
1	No currently known constraints to new woodland creation in this location
2	Possibly no constraints to new woodland creation in this location but other land use or the restoration or creation of other habitats may take priority
3	Major constraints apparent to new woodland creation in this location
4	Existing woodland
5	Applied to a small area of unknown quality grassland near Storridge for which no habitat quality data is known. Land is within Herefordshire therefore was not included within Worcestershire Habitat Inventory mapping. There may be constraints to new woodland creation if surveys reveal high value or potentially restorable grassland habitats.

It must be stressed that this project only flags attention to possible constraints: the legitimacy of these constraints will need to be investigated and confirmed or dismissed with further work including on-the-ground survey and landowner engagement.

6.7 Allocating values

6.7.1 A value of 1 was given to land parcels where obvious constraints to new woodland creation could not be immediately identified. Arable farmland of grade 3 or below, improved grassland, probably improved grassland and larger private gardens were included in this category.

6.7.2 A value of 2 was given to land parcels where possible constraints to new woodland creation were identified. This was predominantly grassland where the quality of the habitat

was undetermined but was thought to be possibly unimproved and Grade 2 agricultural land.

6.7.3 A value of 3 was given to land parcels where major constraints to new woodland creation could immediately be identified. This included all SSSIs, Local Sites and mapped (non-woodland) BAP (Priority) habitat such as lowland meadow, acid or calcareous grassland and traditional orchard.

6.7.4 A value of 4 was given to existing woodland. This included blocks of woodland, significant linear belts of trees and copses. The attribute table within the GIS states if the woodland is within a SSSI, a Local Site, appears on the Ancient Woodland Inventory or National Forest Inventory, was mapped by the Worcestershire Habitat Inventory or was identified during the project by aerial photograph interpretation.

6.7.5 A value of 5 was given to land parcels where land use or habitat quality could not be identified. In practice this applied to 24.65 hectares of land (0.3% of total project area).

6.8 The full list of habitat and land use categories mapped by the Worcestershire Habitat Inventory is shown in appendix 2.

7. Use of the Woodland Potential map in decision-making

7.1 Several previous maps have been published to indicate desirable locations for woodland planting in Worcestershire, completed as part of regional or national scale projects. They are consequently fairly broad brush in their spatial identification of areas where new woodland creation should be targeted. This has resulted in some anomalies at a local level – for example the Priority Places for England map produced by Forestry Commission (section 5.5), which on paper appears to incentivise the creation of new woodland within much of the Malvern Hills SSSI.

7.2 We hope this study will assist in planning and delivering multifunctional new woodland that is appropriate locally by identifying true potential at a much finer scale. The Woodland Potential map produced by the project, used in conjunction with other datasets – many represented in map form within the accompanying map booklet – can be a guide both to where new woodland might best be located and also indicate what form that tree cover and pattern might take in order to enhance local landscape character and biodiversity.

7.3 The following paragraphs summarise guiding principles under the headings of the five key themes used to develop the Woodland Potential map.

7.4 Landscape Type

Where no constraints to new woodland creation can be confirmed it will be necessary to determine the character of tree planting appropriate to the location. The Landscape Character Assessment for Worcestershire provides specific guidance for this.

Principal Timbered Farmlands

Tree pattern and cover is characterised by:

- Densely scattered hedgerow trees, predominantly oak
- Streamside tree cover
- Irregular-shaped or sinuous tracts of small ancient woodlands

Appropriate planting would include:

- Adding to and strengthening the hedgerow tree network to diversify age structure and increase cover
- Small-scale woodland planting of mixed, native broadleaves in an irregular pattern so that individual woodlands are dotted through the landscape and connected by strong hedgerow field boundaries
- Restoring and strengthening streamside tree cover

Inappropriate additions to tree cover would include:

- Large-scale planting to bring small ancient woodlands together into large blocks
- Geometric-pattern block planting

Enclosed Commons

Tree pattern and cover is characterised by:

- Woodland planting carried out in discrete 'plantation'-style geometric blocks
- Occasional hedgerow trees
- Streamside tree cover

Appropriate planting would include:

- Restoring and strengthening streamside tree cover
- Geometric blocks of woodland mirroring the straight lines of local roads and hedgerows

Inappropriate additions to tree cover would include:

- Dense planting of hedgerow trees
- Use of irregular, 'organic' patterns in woodland planting

Unenclosed Commons

Tree pattern and cover is characterised by:

- Lack of woodland
- Tree cover associated with common smallholdings and cottages
- Scrub and secondary woodland encroachment where grazing is inadequate

Appropriate planting would include:

- Scattered planting of single or small numbers of trees may be appropriate where focused around smallholdings and gardens

Inappropriate additions to tree cover would include:

- Any significant planting above single or small numbers of trees where this impacts on the sense of openness and wildness associated with common land

Settled Farmlands with Pastoral Land Use

Tree pattern and cover is characterised by:

- Individual trees scattered, sometimes densely, along hedgerows and streams

Appropriate planting would include:

- Adding to and strengthening the hedgerow tree network to diversify age structure and increase cover
- Restoring and strengthening streamside tree cover

Inappropriate additions to tree cover would include:

- Blocks of woodland planting

Principal Wooded Hills

Tree pattern and cover is characterised by:

- Large, irregularly shaped ancient woodlands, often interconnecting
- Wooded stream corridors, valleys and dingles
- Hedgerow trees

Appropriate planting would include:

- Adding to and strengthening the hedgerow tree network to diversify age structure and increase cover
- Restoring and strengthening streamside tree cover
- Restore broadleaved character of ancient woodlands alongside removal of conifer
- Large-scale native, broadleaved woodland planting to restore lost or weakened connections between existing blocks of woodland

Inappropriate additions to tree cover would include:

- Isolated, geometric blocks of woodland planting
- Use of non-native, non-broadleaved species

Sandstone Estatelands

Tree pattern and cover is characterised by:

- Woodland planting carried out in discrete 'plantation'-style geometric blocks
- Belts of screening trees, often non-native, quick-cropping species

Appropriate planting would include:

- Geometric blocks of woodland mirroring the straight lines of local roads and hedgerows
- Linear belts of trees
- Restoring and strengthening streamside tree cover

Inappropriate additions to tree cover would include:

- Dense planting of hedgerow trees
- Use of irregular, 'organic' patterns in woodland planting

7.5 Biodiversity

The Woodland Potential Map shows sites flagged as having major constraints to new woodland creation in red. All non-woodland Sites of Special Scientific Interest and Local Sites were given a value of 3 to indicate major constraints. BAP priority habitat mapped by local or national inventories was also included within the major constraints category. Priority habitat types present within the study area and mapped as having major constraints were lowland meadow, acid grassland, calcareous grassland and traditional orchard. Woodland creation on these sites is likely to significantly damage or destroy existing biodiversity interest.

7.6 Woodland SSSI's or Local Sites were given a value of 4 to indicate existing woodland, but the GIS attribute table states if there is a nature conservation designation or listing on that woodland.

7.7 The Woodland Potential Map can be used to identify land parcels mapped as having possible constraints to woodland creation (orange) that are located adjacent to sites with major constraints (red). Field survey should be undertaken to establish if the benefits of expanding the existing priority habitat onto adjacent land would outweigh those of new woodland creation, depending on achievable biodiversity value, practicality and resources.

7.8 Agriculture

Arable land, improved grassland and grassland mapped by the WHI as probably improved, designated as Grade 3 or below by the Agricultural Land Classification, was mapped as having no immediately apparent constraints to new woodland creation and appears light blue on the Woodland Potential Map. A small area of Grade 2 agricultural land, a mixture of arable and pasture, was mapped as having possible constraints to flag up that landowners in this location may be reluctant to lose their best land to woodland creation. This would need to be confirmed with individual landowner engagement.

7.9 Buffering

Buffer zones are defined by Lawton as areas that closely surround core areas (high value protected sites such as SSSIs and Local Sites), restoration areas (those intended to become core areas) and stepping stones and corridors between these, and which protect them from adverse impacts from the wider intensively managed environment. The existence of a buffer zone reduces the ‘edge effect’, that is the proportion of any habitat patch made less suitable for species due to negative impacts arising from surrounding land uses and penetrating into the core area. The larger the habitat patch the lesser in proportion will be the edge effect.

7.10 The establishment of buffer zones can therefore be used to insulate core areas from surrounding intensive agricultural or urban land use. Woodland will not always be the appropriate habitat with which to do this, dependent on the types of habitats present within the core area and whether these would suffer or be enhanced by being surrounded

on some or all sides by woodland, but there will be instances where woodland planting can play an important part in buffering. This would need to be determined by field survey on a site-by-site basis.

7.11 New woodland creation could be used to extend by buffering and therefore reduce the edge effect acting upon existing woodlands of high value – particularly small sites where the edge effect will be felt more keenly – where these sites are currently bordered by intensive agricultural land uses.

7.12 Connectivity

Features such as corridors and stepping stones improve the functional connectivity between core areas, promoting species movement across the landscape between habitat patches. Connections need not (and in many cases should not, for added biodiversity value) be comprised of a single, or the same, homogenous habitat. Again, woodland will have an important role to play either as a component of certain corridors or stepping stones between existing non-woodland core areas or as the majority component of new connections between existing woodland core areas.

7.13 Forestry Commission has identified 'Priority Places for England' where new woodland creation is desirable to address issues of derivation and lack of access to the countryside. Applications to the English Woodland Grant Scheme within these areas attract an additional grant contribution where permissive access will be provided for the public. Two thirds of the study area falls within a Priority Places for England area (although note comments in section 7.1), which should provide an incentive to landowners to consider establishing new woodland and gives local partners a basis to work with landowners in providing public access to woodland to contribute to Green Infrastructure objectives as well as designing new woodland creation to appropriately buffer and connect existing core areas.

8. Reduction of flood risk through woodland creation

8.1 Following completion of the preliminary mapping the resulting Woodland Creation Potential GIS layer was provided to the Environment Agency. The EA's Woodland for Water dataset was overlain onto part of the Woodland Creation Potential map, initially focusing on the pilot area at Newland. The Woodland for Water project identifies where new woodland creation could potentially reduce downstream flood risk within a catchment by increasing soil water retention and slowing surface run-off.

8.2 Two maps were supplied by the Environment Agency: Map 14 shows the Woodland for Water data only within the Newland pilot area; Map 15 combines the Woodland for Water and Woodland Creation Potential data within the pilot area.

8.3 Combining the datasets highlights two key future uses. (1) There are areas identified as having no immediate constraints to woodland creation where EA believe downstream flood risk could be reduced by woodland planting: these areas could therefore be targeted as priorities for landowner engagement regarding woodland creation. (2) There are areas identified as having possible constraints to woodland creation but where EA also believe

woodland planting could be beneficial in reducing flood risk: these areas could be used as a test case for how best to determine if predicted flood risk reduction benefits would outweigh the possible constraints identified or vice versa.

8.4 Discussions are now taking place with EA to overlay the Woodland for Water data over the whole of the Woodland Creation Potential study area. Once fully incorporated this dataset could comprise an important component to inform decision making regarding the locational targeting of woodland creation.

9. Further work

9.1 The initial focus of this Woodland Creation Potential project was the drivers for or constraints to new woodland creation that landscape, biodiversity and agriculture may present. There are a number of other datasets in addition to the Woodland for Water project that could be incorporated to improve the evidence base and increase decision making confidence. Some of these are described below.

9.2 Section 4.2 describes the landscape sensitivity analysis undertaken for Worcestershire with two of the analysis criteria being tree cover pattern and tree cover character. The GIS data could be queried to identify Land Cover Parcels assessed as being in medium or poor condition for these two criteria and where landscape resilience could be improved by addressing loss of tree cover. Appropriate new woodland creation could then be targeted in these locations to improve buffering and connectivity and to restore landscape character in line with the principles set out in section 7.1 for each area of landscape type.

9.3 Data on public access to woodland, actual physical accessibility of woodland and current and predicted future recreation needs would be a valuable addition to the project in helping to plan and deliver a wooded component of a functional Green Infrastructure within and around the study area, refining the targeting of new woodland creation to locations where access and recreation benefits can be achieved.

9.4 This study did not have the scope to consider where new woodland creation might have economic benefits, nor what type of woodland would be the most profitable option within any such identified location. A valuable additional area of work would involve a study of accessible markets, engagement with local landowners and analysis by experts of potential timber yield that could be obtained from potential sites within the study area.

9.5 Finally, data modelling the potential impacts of climate change on the study area could be interpreted, using as a basis projects such as the National Biodiversity Climate Change Vulnerability model developed by Natural England in 2012 (Map 16). Climate change may affect habitat quality and habitat fragmentation as well as impacting on the way in which we need to manage land to adapt to changing weather patterns and water availability. Well-located new woodland planting could help to mitigate some of the effects of climate change but may also present challenges, for example presenting the need to consider the species composition of new woodland required to ‘future-proof’ sites against predicted climatic changes.

Appendix I – original project brief

Project brief – Woodland creation opportunities East of the Malvern Hills

Introduction

Well sited and well-managed woodland is a good thing. The multiple benefits of woodland – including timber, carbon-neutral fuel, flood mitigation, mental and physical health, wildlife habitat etc – are increasingly well recognised. National drivers such as the recent Independent Panel report on Forestry advocate an increase in the area of England's woods and forests and enhanced levels of Government grant are now available to help to meet such objectives.

At a local level within Worcestershire the creation of new woodland in appropriate locations is also regarded in a very positive light. Woodland creation is likely to be a major component of the County Green Infrastructure[1] Strategy and of attempts to accommodate new development and provide for people's green space needs as part of new development proposals in South Worcestershire.

Much work has been done, often at quite a broad scale, to identify areas which might be suitable for woodland creation. The aim of this work is to build on this by drilling down to a finer grain of detail.

Aim

To create a detailed picture of land suited to the creation of new woodland in a defined area to the East of the Malvern Hills (see Map in Appendix A).

Methodology

I. Establish a 'system' for prioritising/scoring land suited for woodland creation within the study area, for example, land that is currently unproductive or of low productivity, land that is in close proximity to suitable habitats, land that will link to other desirable habitats and will not have a detrimental impact on other important wildlife sites or landscape character (this system to be agreed with the Project Manager at the start of the project)

[1] 'Green Infrastructure is a strategically planned and delivered network comprising the broadest range of high quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering those ecological services and quality of life benefits required by the communities it serves and needed to underpin sustainability. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types.

Green Infrastructure includes established green spaces and new sites and should thread through and surround the built environment and connect the urban area to its wider rural hinterland. Consequently it needs to be delivered at all spatial scales from sub-regional to local neighbourhood levels, accommodating both accessible natural green spaces within local communities and often much larger sites in the urban fringe and wider countryside.'

II. Interrogate and analyse a variety of extant data sets relevant to the study area (see Table 1).
III. Map new woodland creation opportunities at a scale (field scale?) to be agreed[2], based on I and II above
IV. Prioritise and justify all woodland creation opportunities identified in III above.

Exclusions

The successful contractor is not expected to:

- Identify or comment on desirable woodland composition or types, other than by identifying specific environmental factors which may be particularly relevant, e.g. wet/waterlogged areas, steep ground etc.
- Consider any 'practical' factors relating to whether new woodland could actually be created in identified locations, for example, land ownership, land availability etc.

Outputs

The key output from the project will be a report complete with maps and technical appendices setting out the desirable locations for woodland creation within the defined study area. The report should also prioritise and justify woodland creation in these locations as well as explaining why other locations within the study area are not appropriate. Stand alone maps in Arcview and PDF formats should also be created.

Paul Esrich

Malvern Hills AONB Partnership Manager

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[2] Pilot work should be carried out at the start of the project to identify an acceptable scale.

Appendix II – habitat and land use categories mapped by the Worcestershire Habitat Inventory

The table below lists the habitat and land use categories as mapped by the Worcestershire Habitat Inventory. The land use data was captured using the Integrated Habitat System (IHS) first developed by Somerset Environmental Records Centre. A very broad range of habitat and land use types are mapped by the WHI. The table summarises firstly the relationship between the WHI land use categories and the Section 41 list of UK Priority Habitats (which broadly corresponds to the old UK BAP list) as defined by the Natural Environment and Rural Communities Act 2006. The table secondly shows the value that, based on criteria within the **biodiversity** theme, would be given to each category of habitat and land use for the purpose of defining potential suitability for new woodland creation.

WHI habitat/land use category	**Relationship to UK Priority Habitat definition**	**Indicative new woodland creation score based on biodiversity criteria**
Acid grassland	WHI mapped habitat could be priority habitat but data is old or condition of the resource uncertain	Major constraints – score 3
Arable and horticulture	No	No known constraints – score 1
Arable headland or uncultivated strip	Could include the priority habitat 'Arable field margins'	No known constraints – score 1
Bracken	No	Possible constraints – score 2 (likely to occur as part of a lowland heathland and acid grassland mosaic)
Broadleaved woodland	Could include the priority habitat 'Lowland mixed deciduous woodland'	Existing woodland – score 4
Broadleaved, mixed and yew woodland	Could include the priority habitat 'Lowland mixed deciduous woodland' or 'Lowland beech and yew woodland'	Existing woodland – score 4
Built up areas and gardens	No	No known constraints – score 1
Calcareous grassland	Believed to be the priority habitat 'lowland calcareous grassland'	Major constraints – score 3
Coarse, neutral grassland	No	Possible constraints – score 2
Coniferous woodland	No	Existing woodland – score 4
Fen, marsh and swamp	Believed to include priority habitat either 'Coastal and floodplain grazing marsh' or 'Lowland fen'	Major constraints – score 3
Grass strip	No	No known constraints – score 1
Grassland, possibly unimproved	Could include degraded lowland meadow habitat	Possible constraints – score 2
Grassland, probably improved	No	No known constraints – score 1
Improved grassland	No	No known constraints – score 1
Intensively managed orchards	No	No known constraints – score 1

Lowland dry acid grassland	Believed to be the priority habitat 'lowland dry acid grassland'	Major constraints – score 3
Lowland meadows	Believed to be the priority habitat 'Lowland meadows'	Major constraints – score 3
MG5 lowland meadow	Believed to be the priority habitat 'Lowland meadows' MG5 community	Major constraints – score 3
Mixed woodland	Could include the priority habitat 'Lowland mixed deciduous woodland'	Existing woodland – score 4
Natural rock exposure	Believed to be the priority habitat 'Inland rock outcrop and scree'	Unsuitable for planting
Neutral grassland	Could include degraded lowland meadow habitat	Possible constraints – score 2
Quarry	Could include the priority habitat 'Inland rock outcrop and scree'	Unsuitable for planting
Scrub woodland	No	Existing woodland – score 4
Standing open water and canals	Could include the priority habitats 'Eutrophic standing waters' and 'Ponds'	Unsuitable for planting
Traditional apple orchard	Believed to be the priority habitat 'Traditional orchard'	Major constraints – score 3
Traditional mixed orchard	Believed to be the priority habitat 'Traditional orchard'	Major constraints – score 3
Traditional orchard, unknown species	Believed to be the priority habitat 'Traditional orchard'	Major constraints – score 3
Transport corridor	No	Unsuitable for planting
Upland bracken community	No	Possible constraints – score 2 (likely to occur as part of a lowland heathland and acid grassland mosaic)
Wet woodland	Believed to be the priority habitat 'Wet woodland'	Existing woodland – score 4
Whole field fallow	No	No known constraints – score 1

Appendix III – maps accompanying the report

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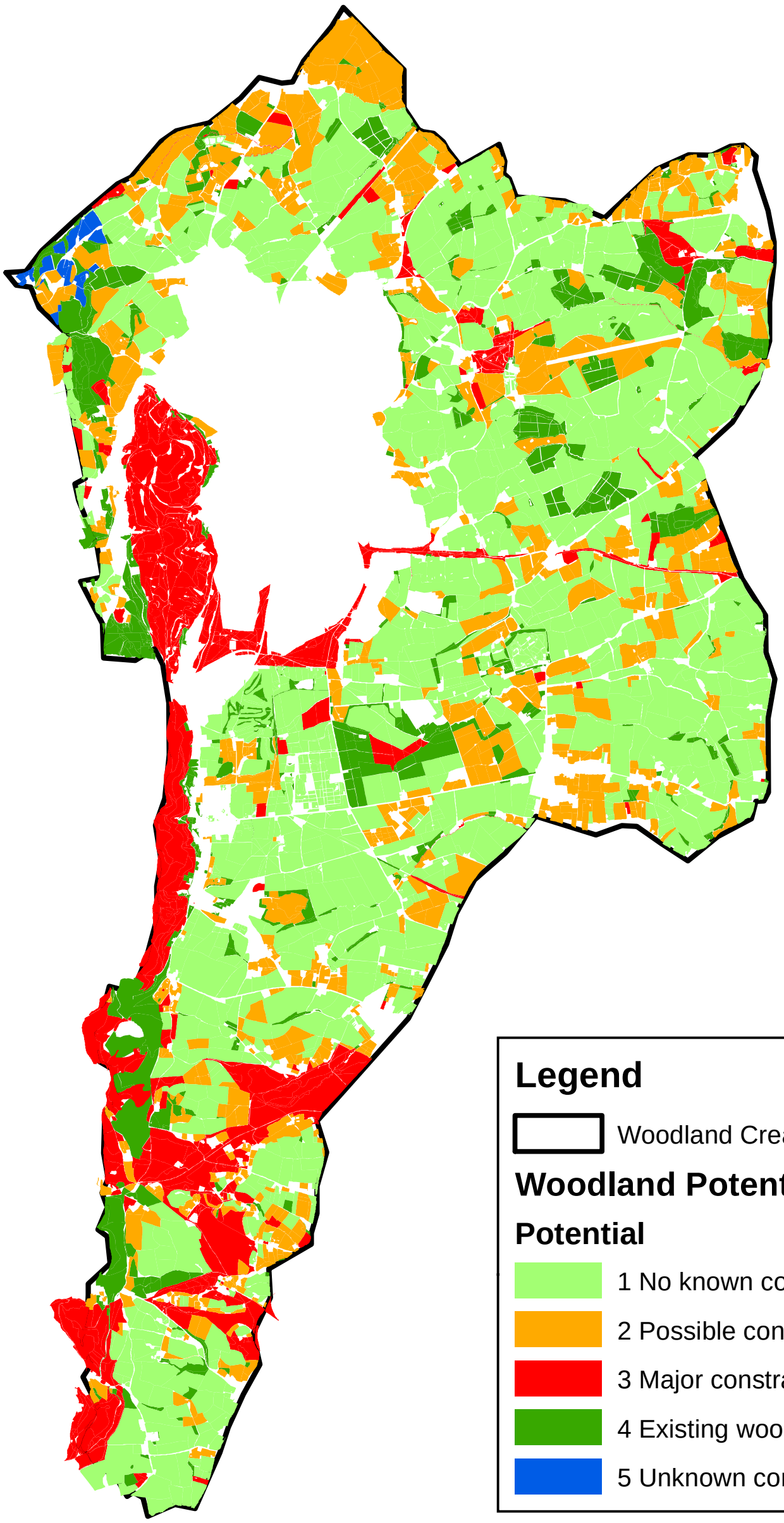

Legend

Woodland Creation Potential project boundary

Woodland Potential

Potential

- 1 No known constraints
- 2 Possible constraints
- 3 Major constraints
- 4 Existing woodland
- 5 Unknown constraints (Herefordshire)

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Map

worcestershire county council

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Map 1

N

Legend

Woodland Creation Potential project boundary

Woodland Potential

Potential

- 1 No known constraints
- 2 Possible constraints
- 3 Major constraints
- 4 Existing woodland
- 5 Unknown constraints (Herefordshire)

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Map

worcestershire county council

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Map 2

N

Legend

Woodland Creation Potential project boundary

LCA_Landscape_Description_Units

Landscape Types

- Enclosed Commons
- Estate Farmlands
- Forest Smallholdings and Dwellings
- High Hills and Slopes
- Limestone Estatelands
- Principal Settled Farmlands
- Principal Timbered Farmlands
- Principal Village Farmlands
- Principal Wooded Hills
- Riverside Meadows
- Sandstone Estatelands
- Settled Farmlands on River Terrace
- Settled Farmlands with Pastoral Land Use
- Timbered Pastures
- Timbered Plateau Farmlands
- Unenclosed Commons
- Urban
- Village Claylands
- Village Farmlands with Orchards
- Wet Pasture Meadows
- Wooded Estatelands
- Wooded Forest
- Wooded Hills and Farmlands

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Landscape Types in study area

worcestershire county council

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Map 3

N

Legend

- Woodland Creation Potential project boundary
- Ancient Woodland Inventory
- Broadleaved
- Coniferous
- Mixed
- Coppice
- Coppice with standards
- Shrub
- Felled
- Ground prepared for planting
- Young trees

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Existing woodland in study area

worcestershire county council

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Map 4

N

Legend

Woodland Creation Potential project boundary

FCPRODUCT_E_EWGS_GRANTS 2005-

FCPRODUCT_E_WGS3 1994-2004

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
EWGS coverage in study area

worcestershire county council

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Map 5

N

Legend

Woodland Creation Potential project boundary

Forestry Commission - Priority Places for England

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Forestry Commission Priority Places

worcestershire county council

Map 6

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N

Legend

- Woodland Creation Potential project boundary
- Ancient Woodland Inventory
- Broadleaved
- Coniferous
- Mixed
- Coppice
- Coppice with standards
- Shrub
- Felled
- Ground prepared for planting
- Young trees
- Ancient_Woodland_Restoration_areas

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Ancient Woodland Restoration Areas

worcestershire county council

Map 7

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N

Legend

- Woodland Creation Potential project boundary
- Ancient_Woodland_Restoration_areas
- Forestry Commission - Priority Places for England
- Ancient_Woodland_Landscapes

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Forestry Commission target areas
for woodland creation or restoration

worcestershire county council

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Map 8

N

Legend

- Woodland Creation Potential project boundary
- Grade 1 agricultural land
- Grade 2 agricultural land
- Grade 3a and 3b agricultural land
- Grade 4 agricultural land
- Grade 5 agricultural land
- Non-agricultural
- Urban

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project Agricultural Land Classification

worcestershire county council

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Map 9

N

Legend

Woodland Creation Potential project boundary

Environmental Stewardship schemes

SCHEME

- Entry Level Stewardship
- Entry Level plus Higher Level Stewardship
- Higher Level Stewardship
- Organic Entry Level Stewardship
- Organic Entry Level plus Higher Level Stewardship

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Environmental Stewardship Schemes

worcestershire county council

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Map 10

N

Legend

- Woodland Creation Potential project boundary
- Worcestershire Local Wildlife or Geological Sites
- Worcestershire Sites of Special Scientific Interest

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
Nature conservation sites

worcestershire county council

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Map 11

N

Legend

Woodland Creation Potential project boundary

Malvern Hills AONB BAP Habitats

HABITAT

- Acid Grassland
- Broadleaved, mixed and yew woodland
- Calcareous Grassland
- Improved Grassland
- Neutral Grassland
- Traditional Orchard
- Standing open water and canals

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project BAP habitats in Malvern Hills AONB

worcestershire county council

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Map 12

N

Legend

Woodland Creation Potential project boundary

Woodland Opportunity Mapping West Midlands

Priority

1

2

3

Urban

0 1 2 4 Kilometres

1:55,000

Woodland Creation Potential Project
FC Woodland Opportunities Map

worcestershire county council

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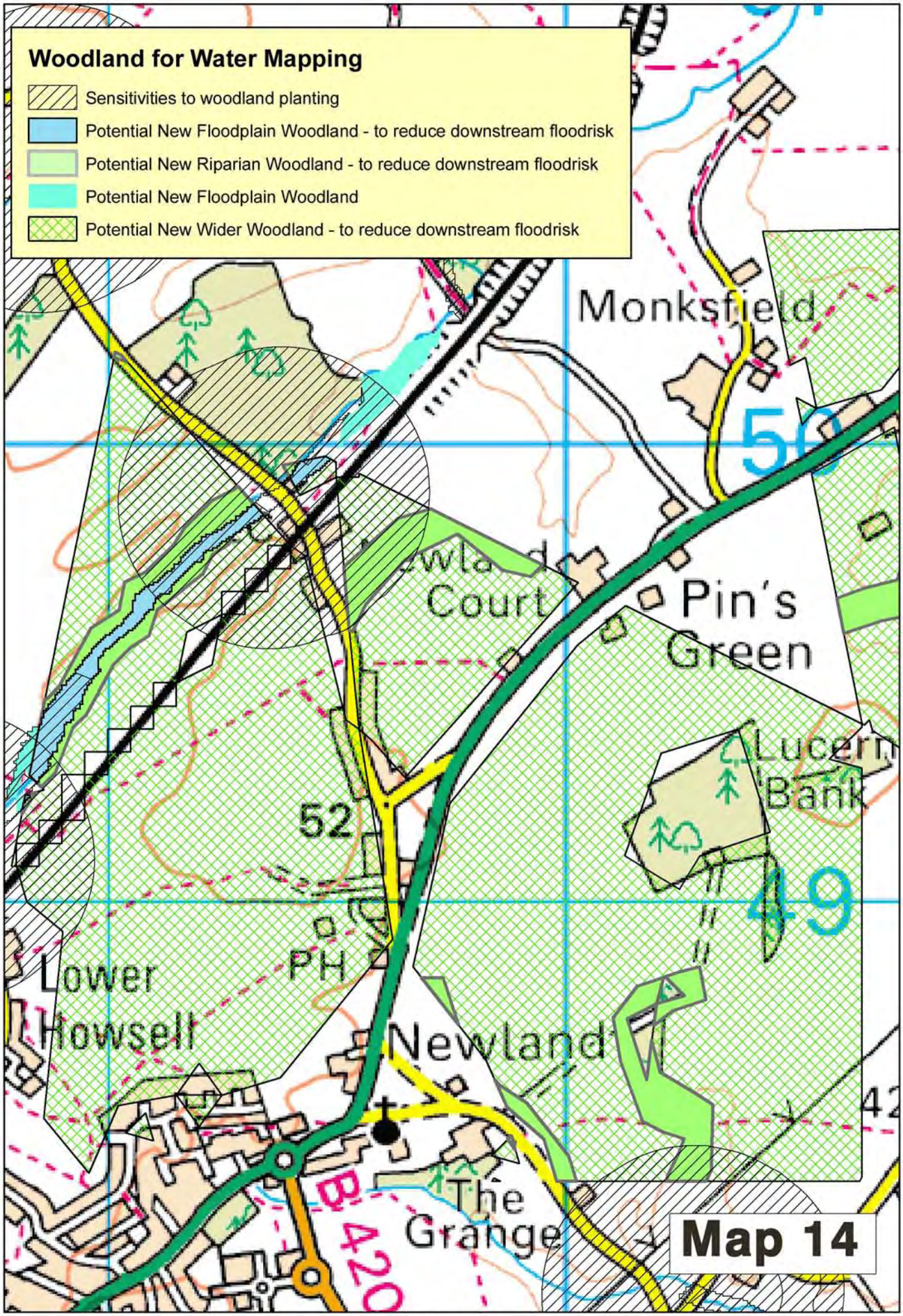
Map 13



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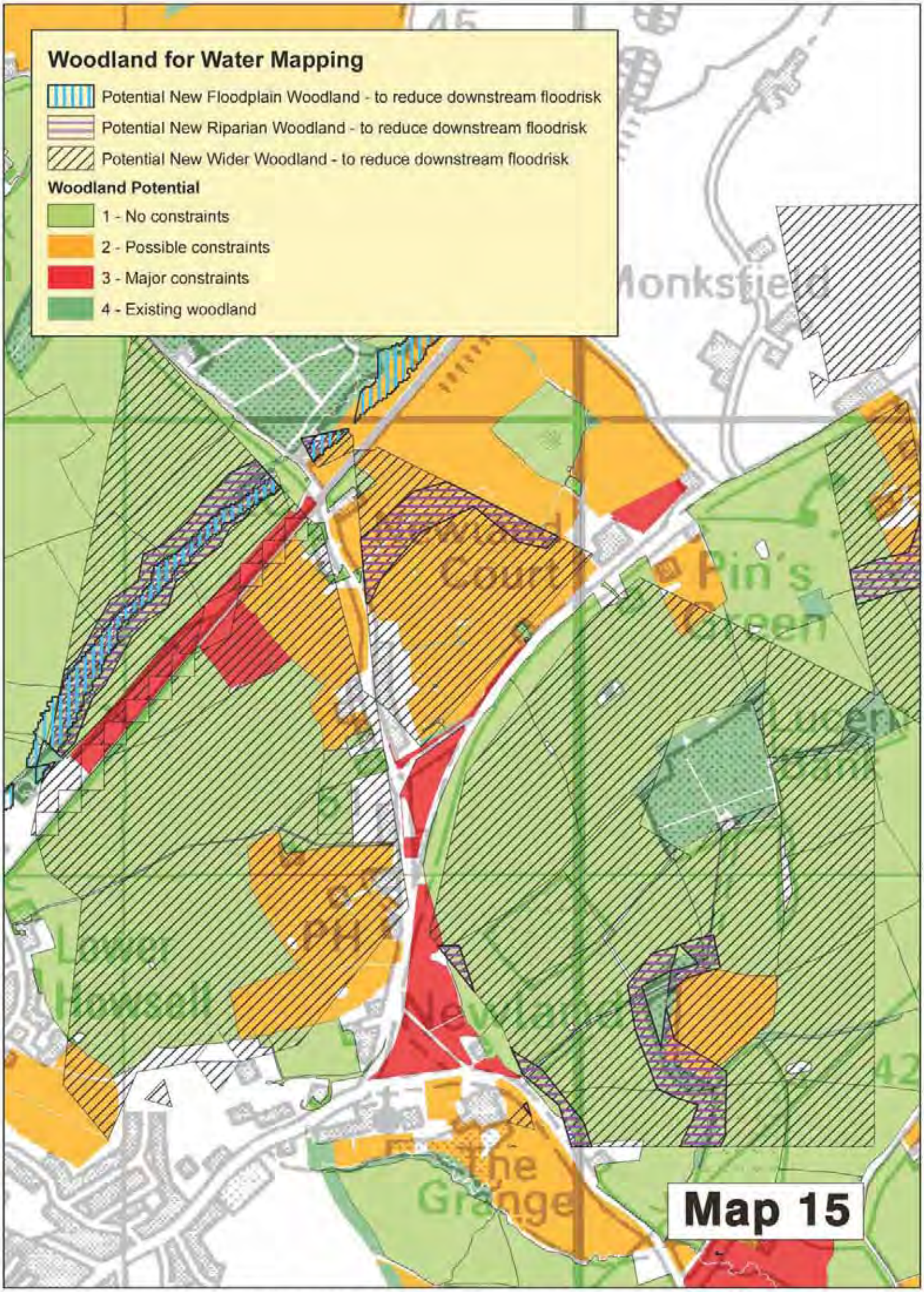

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N

Legend

Woodland Creation Potential study area boundary

Climate Change Vulnerability

Green - least vulnerable

Red - most vulnerable

0 0.5 1 2 3 4 Kilometres

1:55,000

Woodland Creation Potential Project
Climate Change Vulnerability
(National biodiversity climate change vulnerability model - Natural England)

worcestershire county council

Map 16

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