



Question 8: How far is it possible to provide an assessment of the condition, and changes in condition, of ancient and/or species-rich hedgerows using CS2000 observations?

Colin Barr & Sandrine Petit

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- November 2002

DUE FINISH DATE:

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DEFINITIONS

- ‘Condition’ – no *a priori* judgement is made about what is meant by condition since the definition of this term forms part of the research question.
- ‘Ancient and/or species-rich hedgerows’ (ASRH) – as defined in the UK national Biodiversity Action Plan, Ancient hedgerows are those that were in existence before the Enclosure Acts (1720 to 1840) and tend to be those which support the greatest diversity of plants and animals. Species-rich hedgerows are taken to be those which contain five or more native woody species on average in a 30 metre length, or four or more species in northern England, upland Wales and Scotland. policy context statement

The following policy context statement has been drafted and presented at the May 2002 workshop.

- 1 The Habitat Action Plan for Ancient and/or Species-rich Hedgerows (ASRH HAP) includes a target of achieving the *favourable* condition of 25% (c. 47,500 km) of species-rich and ancient hedges by the year 2000, and of 50% (c. 95,000 km) by 2005. The HAP says that the majority of hedges are likely to need some management in the long term and if left for more than about 10 years there is a major risk that they will either change beyond a recoverable state or become so open that they cease to be hedges.
- 2 The HAP also includes a number of proposed actions which relate to the *favourable management* of hedgerows
- 3 At the ASRH Steering Group (SG) meeting on 22 April 1999, members suggested that it would be difficult to obtain a standard definition for the term '*favourable management*' because this could vary according to the function of the hedge, the species in it, and the species for whose benefit it was being managed. Instead, it was concluded that information was needed to assess the conservation status of hedgerows and, especially, to consider the 'favourable condition' of hedgerows as a precursor to recommending favourable management.
- 4 As the definition of favourable condition was a prerequisite to this FOCUS question, CEH took the initiative of organising workshops and consultations with experts. This resulted in a set of recommendations to the ASRH SG prepared jointly by CEH and English Nature (see Annex 3)

SCIENCE OUTPUTS

Task 1: Towards a definition of favourable condition

Background

- 5 An authoritative statement as to what is meant by ‘favourable condition’ was seen central to this FOCUS question.
- 6 At its eighth meeting, on 29 October 2001, the ASRH SG decided to set up a sub-group (chaired by the Rural Development Service) to consider the definition of ‘favourable condition’ of hedgerows.
- 7 On 19 June 2002, we sent a letter to each member of the ASRH SG inviting comments on an earlier meeting paper, ‘*The favourable conservation status of hedgerows and the availability of relevant information from Countryside Survey 2000*’ (Annexe 1). This paper had been presented to the group at its fifth meeting in September 1999 but had not been discussed in any detail nor had any other feedback been received subsequent to that meeting. It contained not only information on CS2000 but also some discussion of the issues surrounding favourable management and favourable condition of hedgerows.
- 8 By the end-of-July deadline, only three responses had been received to the invitation to comment (from DEFRA London, DEFRA Bristol and English Nature). Only one of these sets of comments contained any significant contribution to the debate on favourable condition.
- 9 A meeting of the ASRH SG was scheduled for 10th September 2002 but was postponed because revisions of the hedgerow regulations (to have been a major discussion item at the meeting) had not been completed.
- 10 This postponement also further delayed the setting up of the ‘Favourable Condition Sub-group’ because the organisers of the sub-group, the RDS, felt that a meeting should take place after discussion of our ‘favourable conservation status’ paper at the Steering Group meeting.
- 11 In an attempt to achieve some momentum, and to fulfil FOCUS obligations, CEH has set up a meeting of interested ASRH SG members and acknowledged hedgerow experts to take place on 14th November 2002 in London.

The November 2002 FOCUS workshop

- 12 The aim of the workshop was **to produce a draft definition of ‘favourable condition’** in the context of the UK HAP, taking into account issues such as: definitions of hedgerows (and particularly Ancient and/or Species-rich Hedgerows); landscape and scale; the current purpose of conserving hedgerows, and; the ability to monitor favourable condition.
- 13 The list attendees is given in Annex 2. Attendees were invited to read a number of background papers and other material:
 - the UK Biodiversity Action Plan for Ancient and/or Species-rich Hedgerows (available at <http://www.ukbap.org.uk/asp/UKPlans.asp?UKListID=7>)
 - the EU Habitats Directive (available which can be found at <http://www.ecnc.nl/doc/europe/legislat/habidire.html>)
 - Objective setting and condition monitoring within woodland Sites of Special Scientific Interest (English Nature, report 472).

- Discussion paper to the UK BAP Steering Group on “Favourable conservation status of hedgerows and the availability of relevant information from Countryside Survey 2000” (Annex 1).
- 14 Following background presentations by English Nature and CEH, three working groups were formed. They were challenged to reach a definition of favourable condition and, if unable to do this completely, to at least note the points and issues that arose during the attempt. The rapporteurs gave feedback from each of the working groups and Dr Jon Marshall attempted to draw together common themes, listed below. After a period of discussion, the chair, Dr Andrew Stott, made a summary statement. Presenters and rapporteurs provided material to CEH and this has been used in compiling a full report (Barr & Petit, 2003 presented to the ASRH SG as document HSG46).
- 15 A large number of points arose about which there was common agreement. Some of the more generic ones are:
- It is difficult to establish a single definition of favourable condition because (a) hedge management is cyclical and hedges may be in different stages of development and (b) different types of hedge may suit different types of species.
 - There was a measure of agreement that favourable condition must apply to the woody component (the hedge) and to associated features such as hedgerow trees, banks, buffer strips, streams and other associated features (see hedge definition in the introduction).
 - Although it is conceptually more easy to think of the condition of a network of hedges, where a range of types occur which would seem likely to benefit wildlife diversity, this is not a practical approach because the preferred condition of individual hedges is what is required for management purposes (and as indicated in the BAP, anyway).
 - Perversely, it is easier to describe what condition a hedge should not be in (including threats to its survival and long-term sustainability, and to the species present than it is to describe what condition a hedge should be in. We should consider looking at threats or impacts as way of getting at criteria. Threats include over-management, under-management, disturbance (e.g. grazing), eutrophication and invasive/alien species introductions. If not used directly to inform on condition, they may be recorded separately to inform an assessment of future prospects of the feature.
 - The concept of favourable condition is being discussed in a ‘biodiversity’ context and so, somewhat contentiously, aspects of aesthetics and appearance must assume lesser importance.
 - Although it may be possible to arrive at a generally acceptable broad definition of favourable condition, exceptions due to local character and local distinctiveness, are very important
 - Continuity, both vertical and horizontal, are desirable attributes of a hedge, allowing maximum potential for hedgerows to be used as corridors. Large volume hedges are preferable to smaller ones. A minimum height and width could form the basis of a definition (notwithstanding regional variation, eg coppicing in East Anglia, and stages in management cycle, eg laying). Allowance must be made for ‘good management’ eg coppicing and laying.
 - Whatever definition is derived, it must be practical and pragmatic in terms of survey and monitoring; criteria must be simple and easily measurable; there should be thorough field testing of any proposed monitoring methods.

16 A first attempt of a definition could therefore be:

‘A hedgerow, or network of hedgerows, is in favourable condition when it is wider and higher than certain minimum and specified dimensions, more or less continuous both vertically and horizontally and not threatened. A hedge may still be in good condition if these conditions do not apply but the hedge has been recently laid or coppiced (such that the above definition will apply again in due course) or where regional distinctiveness means that a modification to this definition is required (in which case acceptable differences should be stated)’

Agreeing on attributes and targets for measuring the condition of hedgerows

In order to take forward the conclusions prepared by CEH after the FOCUS workshop, it was suggested by English Nature to hold a further workshop before the next SG meeting to consider the matter further.

- 17 A meeting of the favourable condition sub-group was held on the 16 April 2003. The objectives were to (i) review the hedgerow attributes which could be used to assess their condition, and (ii) whenever possible, attach a quantitative target for such attributes.
- 18 The sub-group consisted of Colin Barr (CEH, chair), Sandrine Petit (CEH), Simon Allday (Defra), Rob Wolton (EN), David Smallshire (RDS/Defra), Heather Robertson (EN) and Clare Burrows (CCW), Jane Goodwin (Defra).
- 19 It was first agreed that attributes
- must be relevant to HAP hedgerows, need not necessarily be relevant to all hedgerows
 - be applicable across the UK
 - allow any hedgerow to be assessed in isolation
 - provide a snapshot of condition at any one time. Trends should not be needed to allocate condition category though can be identified from repeat recording
 - allow consistent, measurable recording over much of the year. Should pick up main problems and threats, but will not necessarily identify subtle and complex issues or trends
- 20 A preliminary list of potential hedgerow attributes had been prepared by English Nature as a basis for discussion. Proposed attributes were related to the size, structure, species composition, connectivity, regeneration potential and quality indicators of hedgerows.
- 21 The outcome of discussions were translated by English Nature and CEH into a recommendation paper HSG48 presented in Annex 3. They can be summarised as follows:

(i) Agreement was reached for the following attributes and targets:

- Width of the woody component of the hedgerow at ground level should be at least 1m, unless recently managed / established.
- Width of the semi-natural flora layer should be at least 1.5 m on at least one side from midline.
- Height should be at least 1m from the base of the stems of the woody plants. There should be no regional exceptions.
- Gappiness should be less than 10%, both horizontally and vertically.

- If trees are present, they should present a balanced age structure at the landscape level (see targets of Merthyr committee, 1955)
- There should be at least 5 woody species (or 4 in the North of England), with the exception of regional distinctive hedgerows, e.g. gorse hedge.
- There should be no negative indicators at the hedgerow base. These negative indicators include some plant species, e.g. indicators of eutrophication such as nettles *Urtica dioica*, cleavers *Galium aparine* and *Bromus sterilis* when their abundance is above a threshold (to be decided). They also include the occurrence of bare trampling ground and bark damage.

(ii) It was agreed that the following possible attributes should not be used, at least at the moment:

- Length of the hedge as it is not related to its condition
- Quality indicators, at least for the time being, as it is difficult to rely on a single species. It may, however, be possible to use a set of indicator species.

- 22 The recommendations derived from the FOCUS workshop and from the meeting of the hedgerow condition sub-group (HSG48, see Annex 3) were presented at the last meeting of the ASRH SG, on the 20th May 03. It covered attributes for individual hedgerows and network attributes. The ASRH SG welcomed the work that had been done and agreed that members of the favourable condition sub-group should further refine and test the attributes presented in HSG48.

Task 2: How far is it possible to provide an assessment of the condition of ASRH using CS2000 information

- 23 The attributes proposed in the previous section have been revisited after the hedgerow condition sub-group meeting in order to assess to what extent CS2000 information could be used in evaluating the condition of ASRH. Summary results are presented in Table 8.1
- 24 It should be noted that we also looked at which information will become available via regional surveys using the protocols presented in the Hedgerow Survey Handbook prepared on behalf of the ASRH SG.
- 25 This analysis reveals that CS can provide quantitative estimates for most of the attributes. A notable exception is width estimate, both of the woody component and of the herbaceous layer. Measuring width does not pose methodological problems and, if these attributes were to be chosen in the final definition of ASRH condition, they could be easily incorporated in revised CS protocols.
- 26 The CS methodology also provides data at a 1 km square level, which enables to describe the network of hedges in which individual hedges are embedded. The inclusion of landscape-level attributes has been the subject of several discussions during the meetings described above. It is suggested that CS data could be used to estimate network connectivity as well as the diversity of hedgerow at a 1 km square level.
- 27 The identification of positive or negative indicator plant species - and the threshold cover at which they become indicative - is likely to require further analysis of the CS vegetation database.

Table 8.1: Attributes and the availability of data from Countryside Survey and from surveys which will follow the Hedgerow Survey Handbook. In italics, data that could potentially be derived from Countryside Survey.

Attribute	Countryside Survey	Hedgerow Survey Handbook
(i) Agreed		
Width of woody component at ground level	-	Average width at base in 4 classes: 0.1-1m; 1.1-2m; 2.1-4m; >4.1m
Surface area of herbaceous layer	-	Width of verge on each side in 3 classes (< 1m; 1-2 m; > 2m.
Gappiness	Unfilled gaps > or < 10%	Integrity – gaps (Significant or Minor)
Height	4 classes: < 1m; 1-2 m; 2-3 m ; > 3m high	Average height in 4 classes: 0.1-1m; 1.1-2m; 2.1-4m; >4.1m
Number of woody species	30 m plots (D plots) for woody species	Woody species per 30 m
Indicator plant species (nettles, cleavers, ...)	10 m plots (H plots) include herbaceous species % cover (5% steps)	Ground flora in 2 quadrats of 1*2m, cover using domin scale.
Bare trampled ground	Bare ground % cover (but no information on the cause)	Bare ground cover in quadrat
(ii) Potential additions		
Connectivity	<i>Connectedness of network up to 1 km square level</i>	Number and nature of connection of individual hedgerow
Hedgerow diversity	<i>Diversity of network up to 1 km square level</i>	-

A pilot study will be undertaken to assess the viability of (a) identifying ancient and/or species-rich hedgerows in CS sample squares and (b) assessing their condition. Based on the results of the pilot study, a realistic cost for completing the work for all sample squares (and making national and regional estimates) will be identified.

- 28 This phase of the project was dependent on reaching a consensus on the definition of favourable condition and more precisely on the attributes and threshold values used to assess the condition of ASRH.
- 29 Because of delays in defining the term 'favourable condition', the pilot study has therefore not taken place yet.
- 30 Members of the favourable condition sub-group are organising at the end of July a field testing workshop of the list of attributes agreed at their previous meeting. It is expected that this workshop will help develop and refine the attributes and thresholds presented to the ASRH SG.
- 31 During the workshop, special attention will be paid to the current CS methodology and how this could be revised to meet the requirements of the hedgerow condition assessment.

SUMMARY

- 32 CEH has recognised the importance to this question of being able to define 'favourable condition' (of hedgerows) and, in the absence of progress by the ASRH SG, has taken the initiative through canvassing views from Steering Group members and by organising a meeting in November 02.
- 33 Since then, CEH's contribution has mainly focused on reaching a consensus on which attributes should form the basis of the assessment of the condition of hedgerows, along with other members of the SG. This work has led to final recommendations that were presented to the ASRH SG on the 20th May 03 (HSG48, see Annex 3).
- 34 It appears that CS can provide quantitative estimates for most of the attributes that were in the recommendations. A notable exception is width estimate, although this attribute could be easily incorporated in revised CS protocols.
- 35 A field testing of the attributes and threshold recommended to the ASRH SG will take place in July – this will enable to suggest and test modifications of the current CS methodology for describing hedgerows.

FURTHER WORK AND RECOMMENDED CHANGES TO CS METHODS

- 36 The protocols for describing hedgerows will have to be amended in order to provide the information necessary to assess their condition. It appears already clearly that next CS will include width measurements. These can be recorded consistently.
- 37 However, the list of attributes that will allow the assessment of favourable condition is not finalised yet as (i) we await for lessons from the field testing of attributes we advised to the ASRH SG and (ii) we envisage to continue to work closely and advise the ASRH SG as to addition of attributes that could be included in the next CS survey. This process should ensure that the next CS will report on the favourable condition of hedgerows.
- 38 The CS database could be explored to refine our general knowledge about the response of species indicative of specific threats or pressures (e.g. eutrophication). This would mainly involve the calibration of species cover against the intensity of such threats to answer questions such as from which cover are nettles indicative of eutrophication. Such analysis could lead to the inclusion of a number of indicative species in the assessment of the favourable condition of hedgerows, as discussed in several meetings.
- 39 The issue of assessing the condition of a whole hedgerow network, rather than the condition of an individual hedge was discussed repeatedly during the different meetings. If not directly used in the assessment, indices such as the network connectivity and the diversity of attributes present in a hedgerow network could at least give information about the context of the hedgerows that are being assessed.

ANNEX 1 –PAPER ON FAVOURABLE CONSERVATION STATUS

Colin Barr

Discussion paper to the Ancient and/or Species-rich Hedgerows BAP Steering Group

THE FAVOURABLE CONSERVATION STATUS OF HEDGEROWS AND THE AVAILABILITY OF RELEVANT INFORMATION FROM COUNTRYSIDE SURVEY 2000

Background

1. The Biodiversity Action Plan for Ancient and/or Species-rich Hedgerows includes a target of achieving the *favourable management* of 25% (c. 47,500 km) of species-rich and ancient hedges by the year 2000, and of 50% (c. 95,000 km) by 2005. The BAP says that the majority of hedges are likely to need some management in the long term and if left for more than about 10 years there is a major risk that they will either change beyond a recoverable state or become so open that they cease to be hedges.
2. The BAP also includes a number of proposed actions which relate to the *favourable management* of hedgerows
3. At the BAP Steering Group meeting on 22 April 1999, members suggested that it would be difficult to obtain a standard definition for the term '*favourable management*' because this could vary according to the function of the hedge, the species in it, and the species for whose benefit it was being managed. ITE was requested to "look at the conservation status of relict hedges and provide a further paper on favourable conservation status [of hedgerows], and the information which can be derived from CS2000". This paper fulfils these requirements.
4. While it is recognised that hedges which are in favourable condition (status) need not necessarily be in favourable management (and so may be declining in quality), this paper concentrates on favourable management which is likely to lead to favourable condition.

Relict hedgerows and hedgerow sustainability

5. The term 'relict hedgerow' has achieved added prominence since the publication of a report on the changes in length of hedgerows in GB in 1991 (Barr *et al.* 1991) in which it was reported that a substantial length of field boundary surveyed in 1990, which had previously (1984) been classified as 'hedge' no longer fitted the Countryside Survey (CS) definition of a hedge and was considered to be 'relict'.
6. The CS definition of a 'hedge' (as a field boundary) is:

... a more or less continuous line of woody vegetation that has been subject to a regime of cutting in order to maintain a linear shape. When hedge management is abandoned and the overall natural shape of the component tree species is regained, or when the bottom 2m (or less) of the feature is not more or less continuous, then the feature can no longer be described as a hedge (and might be considered as, for example, a scattered line of shrubs or trees).

Arguably, a better definition could now be constructed but, for a programme of monitoring, it is not acceptable to change definitions between surveys (as this may compromise the detection of real change).

7. The CS definition of 'line of relict hedgerow' is:

... usually a line of shrubs showing where a hedge has once been (see definition of hedge; should be used in addition to codes on the forestry page)

Thus, this concept fits with dictionary definitions of relict, "a surviving trace", and is not a type of hedgerow.

8. Where a 'hedge' has changed to another (relict hedgerow) type of boundary eg a line of scattered shrubs or a line of trees, this is not automatically a 'bad thing' from a nature conservation or biodiversity perspective. Such features may add to the diversity of the landscape and provide alternative habitats, shelter and food resources for a range of wildlife. However, in terms of hedgerow sustainability, it raises the question of balance in different features in the countryside, and whether too many hedgerows are being 'lost'.
9. The foregoing is strongly related to one particular survey methodology (Countryside Survey). The Steering Group may wish to adopt a much broader definition of 'hedgerow' and to include any lines of trees and scattered shrubs which comprise field boundaries (ie distinguishing between a tightly-defined 'hedge' and a more loosely defined 'hedgerow'). If that were to be the case, then the role of the group (in fostering a wider variety of boundary types) becomes more opaque, especially in relation to favourable management.

Favourable management and favourable condition

10. As stated above, at the BAP Steering Group meeting on 22 April 1999, it was concluded that favourable management could vary according to the function of the hedge, the species in it, and the species for whose benefit it was being managed. However, while some specific purpose of a hedgerow may, in a limited number of cases, have an impact on its management, it is arguable that the remit of a Biodiversity Action Plan Steering Group should be to encourage the management of hedges (a) to ensure that the hedgerows are themselves sustainable and (b) to achieve maximum biodiversity within and around the hedgerow.
11. The first of these objectives (to retain the hedgerow) requires at least periodic active management such as trimming and occasional laying to ensure the intrinsic survival of the hedge.
12. The second aim (to achieve maximum biodiversity) is likely to dictate the finer detail of hedgerow management: how cutting is performed; how often and when; and the management of adjacent features. On the basis of 'diversity begetting diversity', there must be an argument for their being hedgerows under a range of different management conditions at any one time, in any one spatial unit. Whether that spatial unit should be at the management unit (farm) level, or at some other scale, will depend on the species occupying the habitat (and could be the basis of some important landscape ecological research).
13. There is no universally agreed best practice for managing ancient an/or species-rich hedgerows. However, the existing scientific and management literature suggests that the following might be important considerations when managing any hedgerow for biodiversity (ie for a variety of plants and animal species):
 - hedgerows should be continuous (any break in the hedgerow should be gapped-up, not simply filled with a fence).
 - a variety of hedgerow conditions (in different stages of management) is desirable in any landscape unit (eg farm).
 - notwithstanding the above, hedgerows should be large (in volume), wide, dense, and vertically continuous from ground level to top (as well as horizontally continuous).
 - trimming/cutting should be carried out at times of least disturbance to nesting birds and to avoid removal of food sources, and should not be carried out every year.
 - hedgerows should provide a connected network, as far as is possible, in any landscape and should link other habitats.

- associated features (such as banks, ditches, trees) should be maintained to provide habitat diversity.
14. More specifically, the Sub-group formed to consider regional/local survey methodology has suggested that favourable condition means any hedgerow where the trees and shrubs are 90% or more continuous both at or near its top (unless recently coppiced) and at its base. If the trees and shrubs are not 90% or more continuous at the base, then there must be a total width of at least two metres of rough herbage consisting of native species at the hedge bottom for it to be considered to be in favourable condition.
 15. This is a broad definition and is designed to avoid placing any value judgements on different types of management or hedge function, and in recognition of the fact that no one hedge condition is suitable for all types of biodiversity.

Information from Countryside Survey 2000

16. In whatever way favourable management is defined, CS2000 provides a source of at least some of the information necessary to judge whether favourable management is taking place.
17. Table 1 includes a list of the management factors that are mentioned above and to what extent they are recorded as part of CS methodology.
18. It is concluded that most of the indicators of favourable management mentioned above, can be assessed using the CS methodology.

Preliminary conclusions

19. It is suggested that in context of the BAP targets, the principal aim must be to ensure that hedgerows are sustained and that the Countryside Survey definition of a hedge, and the similar definition devised by the Survey Sub-group, more or less reflect this. Once these definitions are no longer applicable, then the feature is unlikely to be recoverable as a hedge (even through restoration) without considerable cost. **Thus the definition of favourable management might be as simple as 'management which ensures the long-term survival of a hedgerow'.**
20. Within this higher-level definition, it is suggested that there needs to be monitoring of the composition of the hedgerow network to ensure adequate diversity (while still reflecting regional character) and connectedness of the individual hedgerows and their adjacent habitats.
21. Both of these broad objectives can be achieved at the national and major regional level using Countryside Survey data. More targeted, county-based surveys (or any new survey initiative of that type) should be capable of providing similar, additional information at the local/regional scale.

Reference

Barr, C.J., Howard, D.C., Bunce, R.G.H., Gillespie, M.K. and Hallam, C.J. (1991) *Changes in Hedgerows in Britain between 1984 and 1990*. Report to DOE. Merlewood Research Station, Grange over Sands. Institute of Terrestrial Ecology.

Table 1

Favourable management state	Countryside Survey records in sample squares
<i>(1) Ancient and/or species-rich hedgerow sustainability</i>	
Hedge present	Length of all hedgerows measured and described
Cut/trimmed	Recorded for all hedges
Species-rich	All hedgerows recorded in terms of species-dominance or as 'mixed' 30 m hedgerow plots record woody species present.
<i>(2) Biodiversity</i>	
Hedgerow diversity by holding/ other landscape unit	Can be derived from CS data and other, contextual data.
Linear continuity (no gaps)	'Gappiness' of all hedgerows is recorded in 2 categories (> and < 10%)
Vertical continuity	Measured in 30 m plots.
Variety of height categories	Height of all hedgerows is recorded in 4 classes (divided at 1, 2 & 3 m)
High volume	Can be computed from (a) height measured (as above) for all hedgerows and (b) width measured in 30 m plots.
'Connectedness' of hedgerow network	Can be derived using GIS analysis of CS spatial data
Adjacent features	Can be derived using GIS analysis of CS spatial data
Timing of cutting	Not measured in CS2000.

ANNEX 2 : attendance at the FOCUS meeting on 14th November 2002

Allday Simon	DEFRA		Simon.Allday@defra.gsi.gov.uk
Alston Sam	RDS		Sam.Alston@defra.gsi.gov.uk
Barr Colin	CEH		cjb@ceh.ac.uk
Bickmore	Catherine	CBA	CBickmore@aol.com
Britt Chris	ADAS		Chris.Britt@adas.co.uk
Burrows	Clare	CCW	C.Burrows@ccw.gov.uk
Churchward	Jean	ADAS	Jean.Churchward@adas.co.uk
Congreve	Alina	Kings	Alina@congreve.prestel.co.uk
Cummins	Roger	CEH	rpcu@ceh.ac.uk
Isted Rebecca		EN	rebecca.isted@english-nature.org.uk
Jackson Janet	North'ton		janet.jackson@northampton.ac.uk
Marshall	Jon	MAL	jon.marshall@agroecol.co.uk
Millsopp	Carol	DARD	Carol.Millsopp@dardni.gov.uk
Oreszczyn	Sue	OU	S.M.Oreszczyn@open.ac.uk
Petit Sandrine		CEH	spet@ceh.ac.uk
Robertson	Heather	EN	heather.robertson@english-nature.org.uk
Seymour	Tony	FWAG	tony.seymour@fwag.org.uk
Smallshire	David	RDS	david.smallshire@defra.gsi.gov.uk
Stott Andy	DEFRA		Andrew.Stott@defra.gsi.gov.uk
Strachan	Ian	JNCC	ian.strachan@jncc.gov.uk
Winspear	Richard	RSPB	richard.winspear@rspb.org.uk
Wolton Rob	EN		robert.wolton@english-nature.org.uk

Also invited:

Bartram	Hannah	RSPB	hannah.bartram@rspb.org.uk
Bolton Chris	RDS		Chris.Bolton@defra.gsi.gov.uk
Cane Stephen	DEFRA		Stephen.Cane@defra.gsi.gov.uk
Cooper Alan	Ulster		a.cooper@ulst.ac.uk
Dover John	Stafford		J.W.Dover@staffs.ac.uk
Hepburn	Lynda	(Private)	lynda@lyndahepburn.freemove.co.uk
Hooper Alan	RDS		Alan.hooper@defra.gsi.gov.uk
Kirby Keith	EN		keith.kirby@english-nature.org.uk
Lane Andy	OU		A.B.Lane@open.ac.uk,
Mackintosh	Jane	SNH	JANE.MACKINTOSH@snh.gov.uk
McCollin	Duncan	North'ton	duncan.mccollin@northampton.ac.uk
Meharg Mike	EHS		mike.meharg@doeni.gov.uk
Smith Mike	SNH		MIKE.SMITH@snh.gov.uk
Somper Carol	CA		Carol.Somper@countryside.gov.uk
Sparks Tim	CEH		ths@ceh.ac.uk
Spencer Sophie	CPRE		sophies@cpre.org.uk
Yeo Marcus	JNCC		marcus.yeo@jncc.gov.uk

CONDITION ASSESSMENT OF ANCIENT AND/ OR SPECIES-RICH HEDGEROWS: PROGRESS REPORT ON THE DEFINITION OF FAVOURABLE CONDITION

*Heather Robertson, Sandrine Petit, Colin Barr and Rob Wolton
May 2003*

Introduction

The set of revised targets in the Ancient and/or species-rich hedgerows Action Plan (HAP) includes one to achieve the favourable condition for 25% (c. 47,500 km) of species-rich and ancient hedgerows by the year 2000, and for 50% (c. 95,000 km) by 2005.

The Centre for Ecology and Hydrology invited key players (including those suggested at the Steering Group's meeting in October 2001) to a one-day workshop in London on 14 November 2002 to produce a draft definition of 'favourable condition' in the context of the UK HAP, taking into account issues such as: definitions of hedgerows (and particularly Ancient and/or Species-rich Hedgerows); landscape and scale; the current purpose of conserving hedgerows, and; the ability to monitor favourable condition. Details on the workshop format, attendance and main outcomes were given in the document HSG 46 prepared by CEH and distributed in February 2003 to the Steering Group members.

The HAP Steering Group decided at the meeting on 25 February 2003 to ask a sub-group to put together proposals on hedgerow condition that could be considered at the next full Steering Group meeting on 20 May 2003. At the invitation of Defra, the sub-group met on 16 April and this document is the sub-group's first progress report to the Steering Group.

Members attending the sub-group were:

Colin Barr CEH (chair)	Simon Allday Defra
Sandrine Petit CEH	Jane Goodwin, Defra
Rob Wolton EN	David Smallshire RDS/Defra
Heather Robertson EN	
Clare Burrows CCW	

The progress report sets out the definition of a hedgerow, conservation objectives against which to assess condition, attributes that seem most promising in defining favourable condition and which are possible to measure, along with indicative thresholds. The availability of Countryside Survey data types that match the chosen attributes are identified and recommendations are made for next steps, including testing the definition.

Definition of a hedgerow

Following the definition developed by the Local Surveys sub-group of the HAP Steering Group, a hedgerow is defined as any boundary line of trees or shrubs over 20m long and less than 5m wide,

provided that at one time the trees or shrubs were more or less continuous. As stipulated in the HAP, where such lines of trees or shrubs are associated with features such as banks, walls, ditches, trees or verges, these features are considered to form part of the hedgerow.

Definitions of ancient or species-rich hedgerows

These are taken from the published HAP:

Ancient hedgerows : Those hedgerows in existence before the Enclosure Acts (generally between 1720 and 1840).

Species-rich hedgerows :

a) Those containing 5 or more native woody species on average in a 30 m length or 4 or more per 30 m in northern England, upland Wales and Scotland. Note that this latter criterion may need to apply to eastern England as well, based on Countryside Survey data.

b) Hedges with a rich basal flora: This criterion has yet to be defined in detail but might relate to any or some of the following:

- Countryside Survey 10 x 1 m plots (H plots) with greater than, say, 15 species in total (non-woody plus woody species), or equivalent number in two 2 x 1 m quadrats in Hedgerow Survey method
- Plots identified as species-rich hedge bottom associations, eg HG3 and HG4 in Countryside Survey analyses (Cummins *et al* 1992) or particular classified types in a Hedgerow Survey area
- Plots with more than 3 woodland herb species (out of 57 species listed in Hedgerow Regulations 1997), eg in Countryside Survey plots or Hedgerow Survey quadrats

Conservation objectives

Assessment of condition requires objectives to identified against which the assessment can be done. Two overall objectives derived from the HAP are:

- Maintain hedgerows across the UK in favourable condition to conserve the full range of associated biodiversity (includes species complement of approximately 600 plants, 1500 insects, 65 birds, 20 mammals)
- Maintain the function of hedgerows in the landscape to conserve biodiversity by maintaining connectivity between hedgerows and between other wildlife habitats

Condition of individual hedgerows compared to the population or network of hedgerows

The two overall objectives outlined above relate to the whole population or network of hedgerows included in the HAP. A variety of hedgerow types is required to conserve the full range of hedgerow biodiversity, for example some birds nest in low hedgerows (eg whitethroat), while others select tall hedgerows (eg song thrush). Thus a broad, network level, assessment (eg at a county or UK level) is required to see if sufficient amounts of different types of hedgerow are available to conserve the

biodiversity referred to in the first overall objective. This network level of assessment is also required to assess connectivity, which underlies the second overall conservation objective.

However, the general condition of an individual hedgerow is also of significance to the conservation of hedgerow biodiversity, and condition assessment can be used, in particular, to assess the scale of generic threats such as over-intensive management or eutrophication. Such assessments can be used as stand-alone evaluations or contribute towards an overall assessment of hedgerow condition across the UK or other appropriate area, such a Local Biodiversity Action Plan area.

The progress report recommendations refer to the network level assessments and to the general assessment of condition of individual hedgerows rather than detailed site-specific assessments. Specific hedgerows known to have particular wildlife inhabiting them, eg those with dormice present or those noted for the occurrence of a rare plant such as Plymouth pear, would need to be assessed with attributes tailored to these sites. For example, for a dormice locality, the hedgerow could be required to be greater than 3 m in height and contain sufficient suitable food plants such as hazel to be in favourable condition (Bright and Macpherson 2002).

Defining favourable condition

The sub-group considered a range of possible attributes that might define the general condition of individual hedges and the network of hedgerows at a landscape scale. The attributes suitable for further development and testing should satisfy the following criteria:

- Must be relevant to HAP hedgerows, need not necessarily be relevant to all hedgerows
- Be applicable across the UK
- Allow any hedgerow to be assessed in isolation
- Provide a snapshot of condition at any one time. Trends should not be needed to allocate condition category though can be identified from repeat recording
- Allow consistent, measurable recording over much of the year. Should pick up main problems and threats, but will not necessarily identify subtle and complex issues or trends

The outcome of the sub-group's discussion of possible attributes is summarised in Tables 1 and 2. Possible threshold targets for the attributes selected for further development and the availability of Countryside Survey data and potential data from local hedgerow surveys are summarised in Table 3.

For the purposes of reporting against the national HAP target for the UK, individual hedgerows would be in favourable condition if they met the thresholds for every chosen attribute (such as those specified in Table 3A) and the network as a whole would be in favourable condition if it satisfied thresholds set for network attributes (as specified in Table 3B).

If reporting is done at a more detailed level than the UK scale, regional or local distinctiveness and site-specific biodiversity may need to be taken into account by appropriate modifications and additions to the attributes and targets.

The UK assessment could not be applied during any one round of assessment to hedgerows that had recently been laid, coppiced or established. However, these hedgerows could be assessed during subsequent rounds.

Table 1. Individual hedgerow condition assessment: evaluation of attributes

Attribute	Type	Comment	Suitable for
Countryside Survey 2000 FOCUS Final Report	174	Q8	August 2003

			development for UK assessment?
Length/extent	Specific	Depends on pre-existing knowledge of length of a particular hedgerow. Overall length is a relevant attribute for the whole network and has HAP targets related to it	No (but see network attributes)
Height of woody component	Generic	Threshold minimum height can be given, and actual height can contribute to network attribute related to hedgerow types	Yes
Width of woody component	Generic	Threshold minimum width can be given	Yes
Horizontal gappiness of woody component (continuity along length of hedge)	Generic	Maximum threshold proportion can be given	Yes
Vertical gappiness of woody component (continuity from base to top)	Generic	Maximum threshold proportion can be given, for example by estimating basal canopy height, compared to minimum overall height or actual height.	Yes
Regeneration potential of woody shrub component: direct assessment	Generic	Difficult to quantify and hard to estimate actual regeneration in the field (such as regrowth of stems after management, or frequency and likely fate of seedlings)	No
Regeneration potential of woody shrub component: indirect assessment	Generic	Negative early warning signs that could indicate likely longer term problems are evidence of bark stripping and amount of bare ground derived from livestock trampling. Maximum thresholds could be given	Yes
Age structure of hedgerow trees	Specific	Trees not always present. Where they occur, categorisation by age classes can contribute to network attribute related to hedgerow types and assessment of progress on HAP target related to these trees	No (but see network attributes)
Dead wood component of hedgerow trees	Specific	Dependent on site-specific presence of veteran trees. Proportion of such trees and amounts of dead wood could be looked at network level	No (but see network attributes)
Associated habitats: in relation to woody component	Generic	General attribute of width of perennial herbaceous layer can be assigned a threshold minimum width but individual thresholds for different components such as ditches and banks are best considered as site-specific	Yes
Negative indicators: woody species	Generic	Maximum proportion of recent (post c.1840) introductions such as <i>Leylandii</i> could be given. Not easy to define thresholds for historical introductions such as sycamore in species-rich hedgerows and particularly in ancient hedgerows	Yes

Negative indicators: herbaceous species	Generic	Maximum proportions of indicators of eutrophication or deleterious herbicide use in the hedge base could be given eg nettles (<i>Urtica dioica</i>), cleavers (<i>Galium aparine</i>), barren brome (<i>Bromus sterilis</i>) and black grass (<i>Alopecurus myosuroides</i>). Could also include invasive recent aliens such as Japanese knotweed NB: Not possible to assess attribute accurately in winter	Yes
Positive indicators: number of woody species	Specific	The minimum level of 5/4 spp per 30m could be used but would only apply to this type of hedge, not necessarily to ancient hedgerows or hedgerows rich in herbaceous species. However, network level information, collected over time, could be informative	No (but see network attributes)
Positive indicators: fruiting levels of woody species	Specific	Depends on particular type of hedgerow and is variable throughout the year	No
Positive indicators: herbaceous species	Specific	May only be relevant to hedgerows noted for rich herbaceous floras. However, network level information, collected over time, could be informative. NB: may have limited survey window eg for spring bulbs such as bluebells (<i>Hyacinthoides non-scripta</i>)	No (but see network attributes)
Quality indicators eg presence of dormice	Specific	Depends on species present in a particular hedgerow, may require specialised survey techniques eg use of dormice nest tubes. At national level, population trends from other recording schemes that include species dependent on hedgerows could be informative	No

Table 2. Hedgerow network condition assessment: evaluation of attributes

By definition these are generic at the UK level.

Attribute	Comment	Suitable for development for UK assessment?
Length / extent	Related to HAP loss targets (i) Halt the net loss of species-rich hedgerows through neglect and removal by the year 2000. (2) Halt all loss of hedgerows which are <i>both</i> ancient <i>and</i> species-rich by 2005	Yes
Height of woody component: proportions of types	Target proportions of different heights in categories, such as those used in Countryside Survey, could be defined. May need to be linked to presence / absence of hedgerow trees	Yes
Presence, age structure and dead wood component of hedgerow trees	Related to HAP target ie, maintain the overall national number of individual hedgerow trees .. through ensuring a balanced age structure. Presence / absence of trees and dead wood amounts affect type of wildlife selecting particular hedgerows and could be used in assessment of proportions of types in the population of	Yes

	hedgerows	
Positive indicators: woody and herbaceous species	Full lists of species where recorded systematically in sufficient quantity, eg as done in Countryside Survey, can allow enhanced examination of trends over time at the network level eg increase of proportion of species suited to higher nutrient levels	Yes
Connectivity	The number and character of connections between hedgerows and other semi-natural habitats could be assessed per unit area and threshold densities and trends over time examined	Yes

Table 3: Possible target thresholds and data sources for the selected generic attributes

The principal source of information is Countryside Survey, with systematic information available for the UK, excluding Northern Ireland which has its own survey, for 1984, 1990 and 1998. An additional survey is planned for 2006. It is also expected that information will become available via regional surveys using the protocols presented in the Hedgerow Survey Handbook. Both sources can provide quantitative estimates for most of the attributes or could incorporate them in revised protocols, for example, Countryside Survey records currently do not include width estimates, but these could be included in the next survey.

Attribute	Possible threshold	Countryside survey	Hedgerow survey handbook
A. Individual hedgerows: Structure			
Height of woody component	At least 1 m from the base of the stems of the woody component to the average top height of shrubs eg in a 30 m length	4 classes: < 1m; 1-2 m; 2-3 m ; > 3m high	Average height in 4 classes: 0.1-1m; 1.1-2m; 2.1-4m; >4.1m
Width of woody component	Average of at least 1 m wide at ground level eg in a 30 m length	Not currently recorded	Average width at base in 4 classes: 0.1-1m; 1.1-2m; 2.1-4m; >4.1m
Horizontal gappiness of woody component (continuity along length of hedge)	Less than 10% of hedgerow length is occupied by gaps in woody component	Unfilled gaps > or < 10% and other categories , up to 50%, in D plots	Integrity – gaps (Significant or Minor)
Vertical gappiness of woody component (continuity from base to top)	Less than 10% of height is vertical woody stems only with no/few side branches	Categories of mean basal height in D plots	Types of cross-section eg leggy, dense
Regeneration potential of woody shrub component: indirect assessment	Bare ground trampled by livestock less than 10% cover eg in 30 x 1 m section of ground below base of woody stems, or less than 10% of woody stems showing signs of fresh bark stripping	Bare ground % cover (but no information on the type in current records). Bark stripping not in	Bare ground domin cover in quadrats (but the type not specified). Bark stripping not

		existing records.	included.
Table 3 cont.			
Attribute	Possible threshold	Countryside survey	Hedgerow survey handbook
Associated habitats: width in relation to woody component	At least 1.5 m width of herbaceous vegetation (based on measurement along ground surface to cater for sloping ground on banks), from the mid-line of the hedgerow either side of the hedgerow unless bordered by a built structure such as a wall or tarmac road Potential problems deriving from adjacent structures eg the extent of oil and salt pollution from roads would need separate, specific studies.	Not in existing records	Width of verge on each side in 3 classes (< 1m; 1 - 2 m; > 2m. Would need to modify classes if 1.5 m threshold used.
A Individual hedgerows : Composition			
Negative indicators: woody species	Less than 10% of woody species cover made up of recent introductions	30 m plots (D plots) include woody species % cover	Cover in 30 m plot using domin scale.
Negative indicators: herbaceous species	Less than 20% cover of negative herbaceous species eg in a 30 x 1 m section. Different thresholds for different species might be appropriate	10 m plots (H plots) include herbaceous species % cover	Ground flora in 2 quadrats of 1 x 2m, cover using domin scale.
B Hedgerow network attributes			
Length / extent	(1) No net loss of species-rich hedgerows through neglect and removal (2) No loss of hedgerows which are <i>both</i> ancient <i>and</i> species-rich Baseline from introduction of HAP / revised HAP	Total lengths are estimated from 1 km sample squares, though ancient hedgerows not currently identified	Total could be estimated for the survey area
Height of woody component: proportions of types	Needs development: eg minimum of 30% greater than 3 m in height. Could be expressed on a per unit area basis or over whole network	Heights are recorded, would need calculation of proportions in 4 classes in whole data set (< 1m; 1-2 m; 2-3 m ; > 3m high)	Heights are recorded, would need calculation of proportions in 4 classes in survey area (0.1-1m; 1.1-2m; 2.1-4m; >4.1m)
Presence, age structure and dead wood component of hedgerow trees	No decline in the overall national number of individual hedgerow trees, and a balanced age structure eg according to Merthyr Committee proportions. No decline in x proportion of dead wood component Baseline for numbers of trees from introduction of HAP/ revised HAP.	Numbers and age structure in categories recorded (1-4 years, 5-20 years, 20-100 years > 100 years). May need additional definition of veteran tree eg > 1.3 m dbh. Would need estimates of dead wood component.	Numbers and age structure in categories recorded (semi-mature, mature, senescent)

Positive indicators: woody and herbaceous species	No increase in proportion, or proportion above a threshold level, of species suited to high nutrient levels eg with Ellenberg values of 6 or more.	30 m (D plots) and 10 m plots (H plots) include species % cover	30 m plots and 2 x 1 m quadrats include species % cover (domin)
Connectivity	Needs development eg density of connections between hedgerows per unit area no lower than x, density of connections to other semi-natural habitats no lower than y	Density and type of connections of network per 1 km square could be calculated	Number and nature of connection of individual hedgerow could be averaged across a survey area

Recommendations

- 1. The Steering Group is invited to approve the further development and testing of the selected attributes that would define favourable condition, subject to any amendments agreed at the meeting.**
- 2. The HAP sub-group should continue in operation to pursue these refinements and testing of the attributes in the coming months. Interest from members is invited for participation in a proposed field workshop to be held in Devon during the summer 2003.**
- 3. Once the definition and attributes have been tested and refined, they should be presented to the Steering Group for final approval. Countryside Survey methodology and the Hedgerow Survey Handbook should then be modified as appropriate to permit collection of the necessary information to assess progress towards the relevant HAP targets.**
- 4. In the interim, the FOCUS project should be completed as soon as possible using the available Countryside Survey information to assess probable progress towards the HAP targets. The results should be considered at the next meeting of the Steering Group to assess whether adjustments in actions are necessary to meet the 2005 HAP targets.**

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