Part 4: Characterising Broad Habitats and the Wider Countryside

Introduction

4.1 Our evaluation of ENs general requirements for nature conservation accounts suggested that the system of Broad Habitats defined by the *Biodiversity Action Plan* was a useful focus. It was suggested that the conservation status of the wider countryside could be assessed by reference to the condition of the Broad Habitats that occur within a defined area or landscape type. It was also suggested that because Broad Habitats are themselves often mosaics, their status might also depend on the judgements about the condition of the individual elements that make them up.

4.2 Although we have shown that CS2000 data can be helpful in describing the hierarchical relationships between landscapes and habitats, we have not considered in detail how a set of natural conservation accounts could be constructed. We now consider this issue in detail.

Measuring 'Favourable Condition'

4.3 In this scoping study we were asked us to consider whether the accounting model could be used to examine the concepts of 'generic targets' and 'favourable condition', as they might be applied to the wider countryside.

4.4 The concept of a 'generic targets' comes from the approach used to monitor SSSIs. It allows descriptions of sites to be given by reference to a number of criteria ('Generic Targets', GTs) that characterise the vegetation or habitat when it is in the optimal condition. Sites can then be classified according to their 'conservation status', using a range of categories ranging from 'favourable maintained' through to 'unfavourable declining' and 'destroyed' (e.g. Jerram and Drewitt, 1998).

4.5 Given the need to describe the condition of the wider countryside identified by this Study, our initial discussions considered whether the concept of GTs could be transferred to the assessment of habitat patches occurring outside the SSSI network in the wider countryside.

4.6 We concluded that, while it is potentially helpful to identify a set of threshold conditions for each habitat type against which their status could be judged, the **existing system of Generic Targets could not be used to characterise the condition of the BAP Broad Habitats**. It was suggested that:

- GTs are more applicable at the level of BAP Key Habitats, rather Broad Habitats, which tend to be mosaics of different habitat patches.

- Even if the status of a given Broad Habitat was measured by reference to the habitat patches within it, the existing system of GTs would not be satisfactory as the basis of an assessment methodology. The concept of GTs was formulated in the context of SSSI monitoring, to assess the condition of the 'best sites'. Thus most habitat patches outside the SSSI network would fail to meet the criteria. Different types of measure are required for the wider countryside.

It is concluded, therefore, that an alternative approach is required to assess the condition at the Broad Habitat level.

4.7 **Consultations suggested that for any alternative methodology to be acceptable, it must:**

i. **Include criteria that relate to the characteristics of the wider countryside that will help deliver BAP targets in the short, middle and long term.**

ii. **Ensure that they help us to determine whether or not habitat change is in a direction that will secure sustainable populations of BAP Priority Species.**

iii. **Take account of geographical variation in the character of Broad Habitats**, by allowing the criteria used to assess condition to vary regionally.

4.8 As the result of our discussions we concluded that the problem of characterising Broad Habitats was best approached within the framework of the *Biodiversity Action Plan*, in which the status of a habitat or species was assessed in relation to some target or statement about the preferred 'direction of change'. The idea of assessing the condition by reference to the direction of change going on in the Broad Habitats was considered helpful, because in general no clear targets can yet be identified for the wider countryside.

4.9 Although the 37 Broad Habitats initially proposed by the *Biodiversity Action Plan* have been reduced to 27, the Habitats Statements published in the *Steering Group Report* can still be used to identify trend or direction statements. The original list was largely reduced by redefining habitat categories as subtypes of another Broad Habitat, or by combining existing categories. **Table 4.1** summarises the main criteria used to assess the direction of change for the 19 Broad Habitats that characterise the wider countryside.

Table 4.1 BAP Broad Habitats and Example Criteria for Assessing 'Direction' or Trends in Conservation Status.

BAP Broad Habitats[1]	Example 'Direction Statements'
1 Broad-leaved, mixed and yew woodland	• Maintain extent and reduce conversion to other use. • Restrict planting on sites that would adversely affect conservation value • Encourage natural processes • Restore selected ancient woodland sites
2 Coniferous woodland	• Restrict planting to sites of low conservation value • Promote diversification by restructuring
3 Boundaries and linear features	• Protect boundary features important for wildlife • Support appropriate management • Extend boundary features to connect isolated habitat
4 Arable and horticulture	• *Protect arable areas important for wildlife from inappropriate land use or intensification*[2] • *Discourage conversion of valuable semi-natural habitats to arable.*
5 Improved grass	• Protect important sites and enhance value for wildlife. • Recreate semi-natural habitats on areas of improved grassland. • Target development to improved grassland that would otherwise damage more valuable sites. • Encourage environmentally sensitive farming.
6 Neutral grass	• Protect and restore species rich grasslands, and expand remnant patches • Encourage appropriate management
7 Calcareous grass	• Protect from inappropriate management • Encourage appropriate grazing
8 Acid grass	• Encourage appropriate grazing regimes • Protect from intensification • Restore important or vulnerable sites
9 Bracken	N/a[3]
10 Dwarf shrub heath[4]	• Maintain and improve management • Reduce habitat fragmentation • Protect from development and conversion to inappropriate use
11 Fen, marsh and swamp	• Protect, restore and recreate • Encourage appropriate management
12 Bogs	• Protect from inappropriate use and loss • Encourage appropriate grazing, burning & other management for blanket bogs • Encourage restoration of degraded raised lowland bog
13 Standing open water and canals	• Encourage appropriate management of water body and surrounding habitat. • Reduce damage to open water from acid precipitation
14 Rivers and streams	• Encourage appropriate management of water body and surrounding habitat. • Reduce damage to open water from acid precipitation
15 Montane	• Encourage lower levels of grazing and burning • Protect and discourage inappropriate forms of development
16 Inland rock	N/a[3]
17 Built-up areas and gardens	• Protect important sites • Encourage green networks • Restore habitats on vacant or derelict land
18 Supra-littoral rock	• Protect against inappropriate use • Discourage disturbance
19 Supra-littoral sediment	• Avoid damage or disruption to natural processes. • Protect, enhance and reduce impacts of sea level rise • Encourage appropriate management • Reduce damage by introduction of non-native species

Notes:
1. Broad Habitats as understood by English Nature 9/6/98
2. Although no habitat statement is available - 'direction' implied in BAP main text
3. Habitat statements not available
4. Combines upland and lowland heathland statements

4.10 A review of the direction statements summarised in Table 4.1 suggests that, in general terms the condition of each Broad Habitat could be assessed by using one or more of the following types of measure:

i. **Stock levels and change in stock levels over time.** A number of statements (e.g. Bogs, Dwarf Shrub Heath) refer, for example, to the protection of existing sites. Thus habitat accounts could be used to monitor any decline in stock levels, where stock is measured in terms of area. **This type of account will be described as a 'stock account'**.

ii. **The types of change occurring**. Some statements refer to the need to prevent or encourage certain types of change between Broad Habitat categories. Thus habitat accounts showing the transfer of land between stock categories can be used to monitor such trends. Type of change would be measured in terms of the area of land associated with different types of transformation. The Broad-leaved Woodland Broad Habitat is an example of this type, for although gains in area are to be encouraged, the habitat statement asserts that it should not occur on land of high conservation value. **This type of account will be descried as a 'flow account'**.

iii. **Habitat structure and landscape pattern.** Several habitat statements refer to the need to reduce the effects of habitat fragmentation (e.g. Dwarf Shrub Heath), or to improve habitat connectivity (e.g Boundary and linear features, Built-up). Thus accounts recording aspects of habitat structure, such as the size frequency distribution of habitat parcels or their relative isolation, could be used to monitor the condition of a Broad Habitat unit in relation to these structural aspects. **This type of account will be described as a 'pattern account'.**

iv. **Habitat quality:** Many of the direction statements imply an assessment of the status of a Broad Habitat relative to some optimal or preferred condition. In a number of cases, for example, it is asserted that different types of management should be encouraged or discouraged. The Dwarf Shrub Heath, Calcareous Grassland and Bog are examples of this type. If the effects of different management regimes or other processes can be defined or recognised by reference to some set of characteristic or typical species, then the state of a Broad Habitat relative to this target can be assessed. **Accounts describing the qualitative characteristics of Broad Habitats, in terms of the occurrence of particular species or species groups, will be described as 'biodiversity accounts'.**

4.11 Although other types of account can be envisaged, we suggest that these four sets of tables can be used as a foundation for a set of nature conservation accounts for the wider countryside. We will now consider how they can be constructed using CS2000 data.

Table 4.2: Extract from Woodland Flow Account for GB (after Haines-Young et al. 1996, and Barr, et al. 1993)

00 sq km	1984 Stock	woodland rotation	afforestation	deforestation	development	reclamation	1990 Stock	net change	se of change	% change	loss	% 1984 stock lost
coniferous woodland	**125.0**	0.1	10.7	-4.1	-0.1	0.0	**131.6**	**6.6**	4.8	5.4	5.1	**4.1**
mixed woodland	**20.3**	0.7	0.8	-0.3	-0.1	0.2	**21.5**	**1.2**	0.8	6.1	1.5	**7.3**
broadleafed woodland	**88.8**	-0.2	6.8	-3.3	-0.8	0.1	**91.2**	**2.7**	1.5	3.1	6.7	**7.5**
scrub	**9.7**	-0.7	1.8	-2.0	-0.1	0.0	**8.7**	**-1.0**	0.6	-10.1	3.5	**35.9**
Total woodland	**252.0**	0.0	21.5	-13.1	-1.3	0.4	**259.6**	**7.6**	**2.0**	**3.0**	**20.2**	**8.0**

Stock and Flow Accounts

4.12 Stock and flow accounts are closely related and can be considered together. Stock accounts are the simpler of the two. They merely show the area of each habitat type at a particular time, or if data are available for several survey periods, net change over time. Flow accounts, are more complex, in that they not only show net change over time, but also identify the types of gain and loss in area that each habitat category has experienced. In this way they give an insight into the turnover in land area occupied by each habitat so that we are better able to judge the significance of net change in area. **Where data are available, the construction of flow accounts is preferable to stock accounts.**

4.13 The value of flow accounts for understanding the significance of land cover change has been shown by our earlier study that look at CS1990 data in an accounting framework. Two example accounts have been taken from this work to illustrate the key issues involved in the construction of flow accounts.

4.14 **Table 4.2** shows an extract from accounts prepared for GB using Countryside Survey 1990 data for woodland. The Table gives the 'opening' and 'closing' balance in terms of the area of each woodland type, and the gains and losses over the survey period in terms of processes such as afforestation or deforestation. If we consider broad-leaved woodland, then the net increase in area masks the fact that a proportion of the initial woodland stock has been lost. There has been a decline of 'initial capital' as highlighted by the indicator ' % stock carried lost'. In our earlier study we argued that this indicator was perhaps more useful in helping make judgements about the changing conservation status of woodlands than 'net change', because it focuses

Table 4.3: Extract from Flow Account for Semi-Natural Cover Types in GB (after Haines-Young et al. 1996, and Barr, et al. 1993

'00 sq km	**1984 Stock**	semi-natural change	intensification	extensification	afforestation	deforestation	development	reclamation	**1990 Stock**	**net change**	se of change	% change	loss	**% 1984 stock lost**
non-agricultually improved grass	**15.1**	0.9	-3.1	5.3	-0.3	0.1	0.0	0.1	**18.1**	**3.0**	2.4	19.6	4.0	**26.5**
upland grass	**64.2**	-2.6	-5.9	6.5	-1.4	0.5	-0.2	0.0	**61.2**	**-3.0**	3.2	-4.6	19.2	**29.9**
dense bracken	**41.6**	-5.2	-0.1	1.2	-0.7	0.9	0.0	0.1	**36.9**	**-4.7**	4.1	-11.4	12.2	**29.4**
purple moor grass-dominated moorland	**39.0**	0.3	-0.1	0.2	-2.4	0.3	0.0	0.0	**37.2**	**-1.8**	1.6	-4.5	6.1	**15.6**
moorland grass	**86.1**	-1.4	-0.7	0.2	-1.0	0.0	-0.3	0.0	**82.9**	**-3.2**	2.0	-3.7	11.7	**13.6**
unmanaged grassland and tall herb	**22.3**	1.0	-4.7	11.9	-1.1	0.9	-2.4	0.8	**28.7**	**6.5**	2.6	29.0	9.6	**42.9**
dense heath	**46.4**	0.8	-0.1	0.1	-0.4	0.1	0.0	0.0	**46.9**	**0.4**	1.4	0.9	4.4	**9.5**
drier northern bogs	**49.5**	-0.3	-0.2	0.0	-3.2	0.0	0.0	0.0	**45.9**	**-3.6**	3.2	-7.3	5.3	**10.6**
Total semi-natural	**693.7**	-0.7	-18.1	29.1	-13.2	6.2	-3.2	1.3	**695.1**	**1.3**	**1.3**	**0.2**	**90.2**	**13.0**

attention of the question of whether new planting compensated for loss to the habitat category.

4.15 The value flow accounts can be further illustrated by reference to an extract for various types of semi-natural cover types recorded in CS1990 (**Table 4.3**). In this case we see that overall the area of semi-natural land has been stable, in that net change has been small. The flow accounts show however, that despite this apparent stability there has once again been a considerable turnover of land within the reporting category. As with woodlands, there appears to have been a loss of initial capital.

4.16 The interpretation that one gives to the loss of initial capital shown by the flow accounts for woodland and semi-natural habitats clearly depends on the extent to which the gains and losses of area compensate for each other in an ecological sense. In the case of woodlands, for example, we need to understand whether the biodiversity gains associated with new planting make up for any losses due to felling. Similarly, in the case of semi-natural habitats, we need to understand whether losses due to 'intensification' (i.e. conversion to managed grass or arable) are compensated for the gains due to 'extensification' (i.e. conversion from managed grassland or arable). Only if the land gained was of equivalent ecological status to that lost value could stability in semi-natural area be considered consistent with the goal of maintaining the conservation value of the resource.

4.17 These examples illustrate that the construction of flow accounts depends upon the ability to monitor the exchange of land between reporting classes, rather than just net change in area. **CS2000 is particularly useful for the construction of flow accounts because the survey design specifically allow the history of each land parcel to be recorded**. The earlier accounting study was able to classify exchange of land between habitat into the following general types of flow:

- Intensification
- Extensification
- Afforestation
- Deforestation
- Development
- Reclamation

4.18 **The structure of CS2000 is such that a similar typology of flows could be constructed, although it is clear that with a shift in focus from the reporting classes used for CS1990 to that of Broad Habitats, some modification might be necessary.** In the case of broad-leaved or coniferous woodland, for example, it would be useful to distinguish between forms of gain according to the type of habitat they replaced, because the Habitat Statement asserts that planting should not occur on land of high conservation value.

4.19 From our review of the design of CS2000 we conclude that it will be possible to use these data to construct of flow accounts for Broad Habitats for England. It will also be possible to draw up flow accounts for large geographical units, either equivalent to the four landscape types used to present the results of CS1990, or defined by some aggregation of EN's Natural Areas.

4.20 In both cases the main source of data will be the field survey component of CS2000, and the main constraint in using them will be the level of statistical precision associated with stock estimates. As noted in Part 3, is likely that stock and change estimates with a standard error of less that 25% will be possible for England.

4.21 **In addition it will be possible to construct stock accounts down to local geographical scales using data from LCM2000.** As noted in Part 3, the LCM2000 database will contain information for all land and habitat parcels larger than about 2-3ha. Thus, subject to qualifications about the definitions of the Broad Habitats made earlier, it will be feasible to build stock accounts at the level of individual Natural Areas and to map geographical patterns within them.

Pattern Accounts

4.22 The extent to which information about landscape pattern could be derived from CS1990 data was investigated as part of the ECOFACT[5] Project (Module 7a). It was shown that the analysis of pattern using field survey data was limited because of the restricted number of land parcels occurring entirely

[5] The ECOFACT Project was a major research programme, which followed publication of CS1990. It was funded by DETR and others to look at the ecological factors controlling biodiversity in the British countryside. It consisted of a number of modules, the results from which are currently being published.

within the 1kmx1km sample squares. **The CS2000 field survey data will also have the same limitation and so it will not be possible to use these data to construct pattern accounts. Structural information will, however, be available from LCM2000 and it will be possible to construct pattern accounts for many Broad Habitats from this source.**

4.23 Since LCM2000 will be based on a 'per-parcel classification' (see Part 3) it will be possible to extract or identify all the polygons of a given type in an area and use a range of pattern indices to describe the spatial characteristics of the 1998 stock. Thus a range of landscape pattern indices can be constructed for each Broad Habitat including the size-frequency distribution of habitat patches, patch isolation and patch shape. Such structural accounts, although simple, will serve as a base line against which the significance of future change can be judged. They could also be used in the analysis of whether present-day habitat patterns are likely to hinder or support existing BAP targets.

4.24 In fact, LCM2000 will be a rich source of information about the spatial characteristics of both the Broad Habitats themselves and the landscape mosaic as a whole. In addition to indices relating to individual patch geometry, it will, for example, be possible to measure the patch diversity in an area, and patterns of spatial association between habitats. Such data will be particularly important for species that require more than one type of habitat patch to complete their life cycle.

4.25 We therefore recommend that following the publication of LCM2000, these data are used to develop a set of pattern accounts that can be used to assess the conservation of Broad Habitats and the wider countryside. However, the resolution of these data will not permit pattern accounts to be built for linear features.

Biodiversity Accounts

4.26 In 1990 an understanding of the causes of vegetation change occurring in the botanical plots recorded by Countryside Survey was limited. Following other work undertaken as part of the ECOFACT (esp. Module 6), however, it is now apparent that these botanical data could be used to assess aspects of habitat quality and the factors impacting upon it, such as management pressure or other environmental controls (see Firbank et al, in press). These botanical data provide the basis for developing a set of biodiversity accounts that can be used to describe a range of qualitative characteristics of Broad Habitats and the wider countryside.

4.27 The framework for the analysis of vegetation change is the Countryside Vegetation System (CVS). The CVS is a new classification of the British vegetation, which was constructed by using data from all countryside survey quadrats recorded in1978 and 1990. These were grouped using the TWINSPAN algorithm set to define 100 basic vegetation classes. Each class is characterised by a set of typical species and is associated with a particular set of environmental conditions.

4.28 The 100 CVS classes have been positioned along axes that account for the maximum variation occurring between them using DECORANA. They have been grouped statistically into eight 'aggregate classes':

I	Crops/weeds
II	Tall grass/herb
III	Fertile grassland
IV	Infertile grassland
V	Lowland wooded
VI	Upland wooded
VII	Moorland grass/mosaic
VIII	Heath/bog

4.29 **The aggregate classes are considered to represent the major units of the British vegetation. It has been proposed that they should be used to characterise the structure of the vegetation within a given land cover unit recorded, or to characterise change according to the shifts in composition or class membership between surveys** (see Firbank et al., in press, for extensive discussion).

4.30 As the result of work undertaken in ECOFACT eight Indicators of Botanical Diversity (IBD) were proposed to characterise vegetation structure and change (**Table 4.1**). Four have now been selected as the basis of reporting the vegetation data recorded in CS2000, namely:

i. ***Changes in aggregate class membership (IBD1)*:** the number of plots in each aggregate class in each Broad Habitat can be used to characterise the structure and the variability of vegetation within a habitat unit. Moreover, change in the mix of plots within the Broad Habitat between surveys can be used to characterise the direction of any transformation in vegetation composition.

ii. ***Weighted CSR Scores (IBD3):*** shifts in the balance between the major functional groups (ruderals, competitors, stress tolerators) can be used to indicate possible changes in management regime or other controlling factors affecting fixed plots. The weighted CSR score at a particular survey period can be used to characterise the condition of a given Broad Habitat unit, and changes in the weighted CSR score over time can be used to characterise the direction of any transformation.

iii. ***Species Richness per Plot (IBD5)***: The ECOFACT project has shown that the number of species[6] per plot is a useful measure of the structure of the vegetation classes themselves, and of the types of change occurring between surveys. Changes in species number can be

[6] That is 'category 1 species' (see Barr et al. 1993) whose identification was consistent and reliable between field surveyors.

Table 4.4: Indicators of Botanical Diversity (IBD) developed by ECOFACT Module 6.

Indicator[1]	Comment
IBD1*	**Changes in aggregate class membership:** ***to measure shifts along key environmental gradients.***
IBD2	CVS class membership: *to characterise the composition of each Broad Habitat.*
IBD3*	**Functional attributes:** ***to assess composition of vegetation in terms of the life strategies occurring and relate changes in dominant strategy to shifts in management regime.***
IBD5*	**Species richness per plot:** ***recorded in terms of mean species number.***
IBD6*	**Ellenberg scores:** ***to measure shifts along key environmental gradients.***
IBD9	Frequency of EN grassland indicators: to assess changing quality of grassland communities using taxa characteristic of vulnerable, high conservation value communities.
IBD10	Frequency of food plants for animal groups: *to assess quality of habitat for selected animal groups and to assess implications of vegetation change.*

[1] The indicators are labelled following the system used in ECOFACT Modules 1 & 6. Of the 12 initially proposed only the eight shown were considered be useful; thus IBD4, 7, 8, 11 and 12 are not describe here.

* Indicators proposed for the analysis CS2000 vegetation data.

associated with changes in vegetation structure as plots move from one aggregate class to another. Alternatively, for plots that stay within the same aggregate class between surveys, change in mean species number per plot may indicate an overall gain or loss in biodiversity within the habitat unit.

iv. ***Ellenberg Scores (IBD6)***: The ECOFACT Project has also shown that characteristics of the biophysical environment, notably in levels of fertility, light and wetness, could be assessed using a system of 'Ellenberg Scores'[7]. Thus the structure of a given habitat unit could be

[7] Ellenberg scores are based on an assessment of the types of environment in which a plant typically occurs estimated from expert knowledge and data in Central Europe (Ellenberg, 1988). These data have been recalibrated for GB as part of the ECOFACT Project (Firbank et al. in press).

characterised in terms of its position on these key environmental gradients, while change could be characterised in terms of shifts along these axes related to 'eutrophication' (nutrient levels), moisture status and shade.

4.31 For the initial analysis of CS2000 data it has been proposed (**Figure 4.1**) that:

i. Each Broad Habitat is characterised in terms of both the aggregate vegetation classes and the more detailed CVS classes that occur within it.

ii. The status of each Broad Habitat is determined in relation to each of the four IBDs described above.

iii. Changes in each Broad Habitat since 1990 and 1978 are expressed in terms of change in the value of each of the IBDs.

iv. Comparisons will be made for IBD scores of plots in each aggregate class in each Broad Habitat that have not changed their assignment with plots lost or recruited to that Broad Habitat over the survey period.

It has further been proposed that such data should be produced for England as a whole and for major landscape types at national scales.

4.32 The analysis of the character of vegetation plots associated with each Broad Habitat and their change over time provides a good basis for evaluating the condition of each habitat unit in relation to some of the targets or direction statements contained in the *Biodiversity Action Plan.* **If such data are to be used as the basis of a set of biodiversity accounts that will meet ENs requirements, however, then it is clear that additional work is required over and above that which forms part of the CS2000 work programme.** In particular, it is necessary to:

i. Characterise each Broad Habitat according to the value or range of values one would see for each IBD if that habitat were in a favourable condition.

ii. Develop a way of comparing 'observed' and 'preferred' IBD values, so as to express notions of 'distance to target' and 'favourable trajectory'.

iii. Extend the range of IBDs to take account of a wider range of quality indicators such as the presence of typical or characteristic species.

4.33 We base our conclusion that the range of IBDs should be extended to take account of additional floristic characteristics on the evaluation of the grassland indicator species made in ECOFACT (Table 4.4, IBD9). The indicator species were defined by English Nature on the basis of data collected by the English Field Unit (then part of NCC). The indicators used were plant species that appeared to be restricted to unimproved grasslands throughout England, subdivided into those characteristics of calcareous, neutral and acid grasslands.

Within each habitat species were also ranked according to their strength of association.

4.34 Since the presence of these grassland indicators have been acknowledged to indicate botanical quality, their presence or frequency in plots located in the different grassland Broad Habitats could be used to evaluate conservation value. The analysis of CS1990 data suggested, for example, that there has been a significant decline in the frequency of acid grassland and mesoptropic grassland indicators since 1978 at the GB scale. The decline in the frequency of acid grassland indicators was most marked in upland landscapes, while loss of the mesotropic grassland indicators was concentrated in pastural landscapes.

4.35 The indicator based on grassland species has not been adopted as one of the IBDs used for the analysis of CS2000 because it is restricted to a single habitat type. The approach is, however, generic and our consultations suggest that there is scope for carrying out additional work to draw up equivalent lists of typical or characteristic species for all Broad Habitats[8]. Such work could draw upon expertise within EN and previous work commissioned by EN that included the analysis of habitat occupancy of vascular plants in Britain using NVC data (Eversham et al. 1997). Where possible, the criteria based on the presence or absence of typical species should be augmented with information on other structural characteristics such as relative frequency or degree of dominance.

4.36 In addition to the identification of characteristic or typical we also suggest that these habitat lists be extended to include undesirable species, that indicate poor or declining quality.

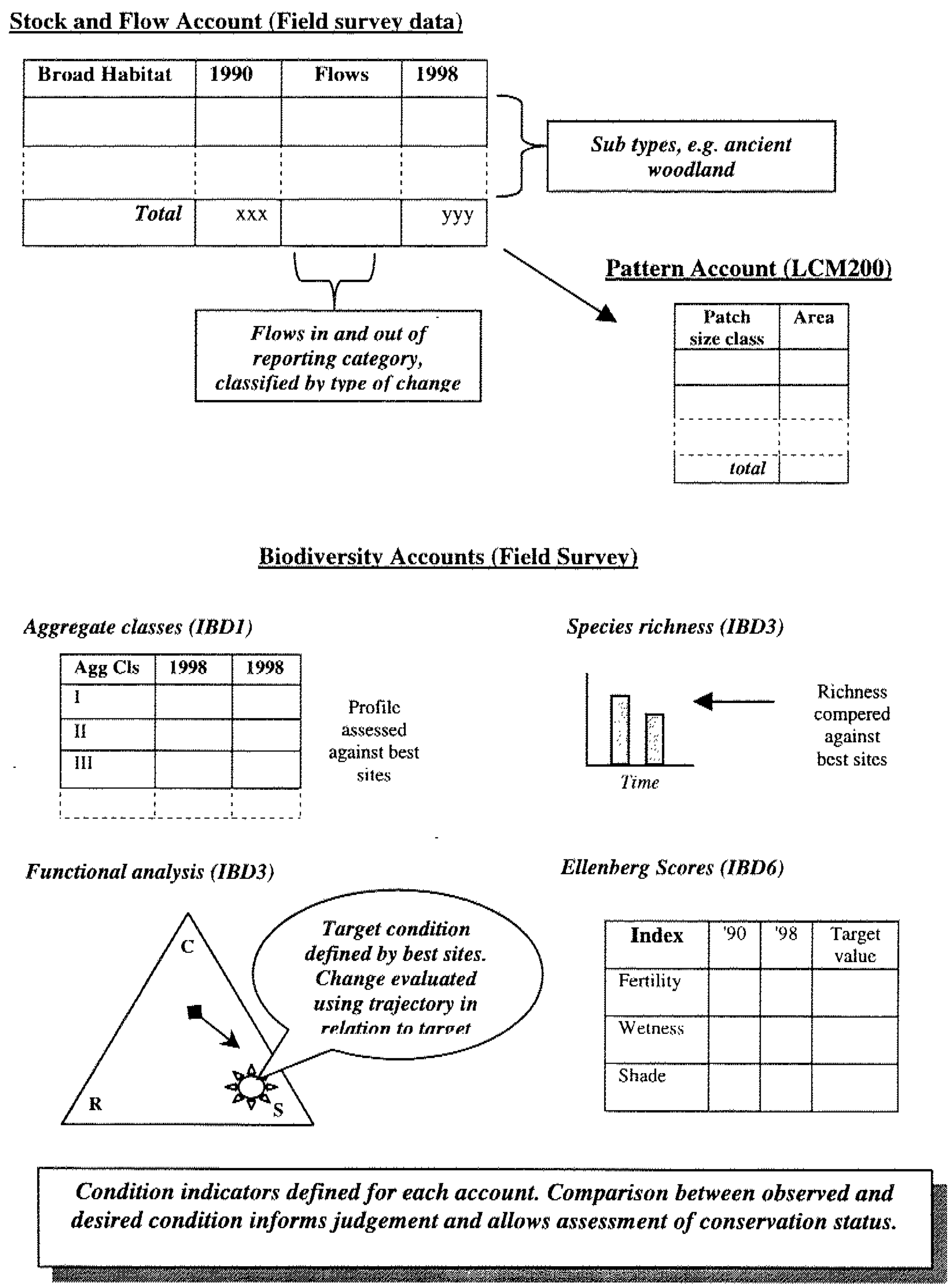
Generic Targets and Condition Indicators: Implementing Nature Conservation Accounts

4.37 Although the generic targets used for evaluating the conservation status of special sites are not applicable to Broad Habitats and the wider countryside, the definition of criteria against which condition can be judged is a useful one. Our review suggests that such criteria can be used to develop a flexible system of environmental accounts for nature conservation (**Figure 4.1**).

4.38 To implement the accounting framework described above, involving stock, flow, pattern and biodiversity accounts, we must redefine the statements set out in **Table 4.1**, to specify what state or trend should we should observe in each type of type of account, given the content of the BAP Habitat Statement. We will call these refined statements as ***condition indicators*** (to distinguish them from GTs). By using information from the best sites to define an optimum or target state, the condition of a given Broad Habitat can be referenced to a robust and defendable set of criteria.

[8] For example Keith Kirby has suggested that it would be possible for woodlands

Figure 4.1: Structure of Accounts for Broad Habitats



Some accounts are illustrated graphically although all underlying data are tabular.

4.39 Clearly the criteria used to assess each Broad Habitat can vary, and particular condition indicators specified may be qualified by geographical context. The system proposed is flexible and avoids the blanket application of any single measure such as species richness (cf. Eversham et al., 1997). Although species richness is an important measure of habitat quality, indicators based on this attribute must be referenced to some scale of habitat quality. It is not species number *per se* that is important for habitat quality, for example, but the right species in the right place.

4.40 **Having specified the set of condition indicators for each habitat unit and having assessed the standing of that habitat from the environmental accounts, a judgement could then be made as to whether the habitat was at or approaching a favourable condition. Similarly by looking at the condition of all the habitat units in an area, one could make a judgement about the conservation status of the wider landscape.** At the landscape scale one may also make use of data for key species groups (see para 3.33).

4.41 Although we have emphasised the role of Broad Habitats in his discussion, it is important to note that the condition indicators envisaged need not apply only to this level of thematic resolution. For example, information may be available for some of the BAP Key or Priority Habitats that are nested within them. Clearly we can specify additional quality criteria at this level and decide that a favourable condition could not be achieved at the Broad Habitat level, if the quality of some part of it was poor or declining.

4.42 The judgement that a given habitat or landscape unit is 'in a favourable condition' or 'is approaching a favourable condition' need not, however, depend on all the condition indicators being met. Unlike GTs, some criteria may be more critical than others. Expert knowledge would clearly employed to specify what the particular condition indicators apply to each habitat unit; experts could also be asked to rank or flag the indicators according to their importance.

4.43 Unlike decisions about the conservation status of special sites, judgements at the level of Broad Habitats and the wider countryside are likely to be more open and qualified. The accounts envisaged here are not meant to replace expert judgement but to inform decisions by providing information in a systematic way. **We consider that the concept of condition indicators outlined here is however, valuable for it could provide a foundation on which EN could build a suite of indicators that characterised the state of the wider countryside.** We suggest that such indicators would gain credibility because they would be underpinned by a systematic analysis of a substantive body of environmental data.

General feasibility of developing environmental accounts for nature conservation

4.44 Our review of the range of information that will become available from the analysis of CS2000 data suggests that it is feasible to develop a set of nature conservation accounts that would meet many of ENs current requirements. For this to be achieved, however, additional development work is required to develop and extend the range of indicators available for the analysis of habitat quality. **We recommend that this work be undertaken prior to the publication of CS2000 results in November 2000, so that a more informed analysis of these data can take place.**

4.45 It should be emphasised, however, that the accounts developed using CS2000 would be limited by virtue of the fact that they were based on a single data source. In the long term such accounts would need to extend these accounts by including a wider range of information. The reporting framework represented by the system of Broad Habitats is highly generalised and may mask important patterns at finer scales. Techniques would have to be developed to nest more detailed habitat information into these general habitat classes.

4.46 In addition to refining the habitat accounts themselves by combining CS2000 data with other habitat information, further types of accounts could be developed based on other species groups. For example, given the analysis of habitat occupancy of bird species, such as that reported by Brown and Grice (1998), it is feasible develop species accounts based on BTO census data (Fuller pers. comm.). By referencing such species accounts to landscape types (e.g. aggregates of Natural Areas or regions) they could be used to derive further indicators of the condition of the wider countryside that could be set alongside those based on Broad Habitat mosaics.

4.47 **Although it is proposed that CS2000 data are used to build an initial set of nature conservation accounts, the structure proposed is sufficiently flexible for them to be developed into a more complete picture of the wider countryside. As noted above, environmental accounts are essentially a tool to facilitate data integration and analysis in a policy relevant context.**

4.48 If the concept of environmental accounts is to be progressed using CS2000 data a limited amount of development work is needed. In order to achieve maximum benefit from the invested made in such work its relationship to other initiatives must be considered carefully so that efforts can be co-ordinated. These issues of co-ordination are discussed in Parts 5 and 6 of this Report.