Structural habitat requirements - appropriate grazing levels (and mowing for meadows), livestock infrastructure, viable management units, protection/expansion through site buffering and linkage targeted to lower nutrient substrates (appropriate water levels for mires and grazing marsh).

Short-term objectives/solutions - Use of ELMS to secure appropriate management, targeted expansion of habitat to secure site linkage, buffering and facilitate grazing management; increased use of conditionality in livestock commodity regimes (mainly in uplands).

Generic policy solutions - Evolutionary transformation of CAP commodity regimes into socio-environmental direct payments with objectives defined by Natural Area.

The objective for Natural Areas will be the conservation, enhancement and expansion of all such examples. The conservation of such habitats is fundamentally incompatible with high input agriculture because the former are dependent upon low nutrient status substrates. Moreover, in much of lowland England, the management systems required for their conservation have often disappeared from the land holdings of which such habitats are a part. In the short-term, therefore, the conservation of semi-natural 'infield' habitats in 'peripheral' (usually lowland) contexts will continue to depend upon the provision of special management secured by incentives through environmental land management schemes. Expansion of this habitat is severely constrained by surrounding intensive agriculture. The high opportunity costs of diverting the latter into low intensity systems means that , for budgetary reasons (and initially for ecological ones as well), semi-natural habitat re-creation will have to be highly targeted a. to areas of highest priority (eg to achieve site linkage) b. to areas of lowest productivity (eg to areas of thin soils or those of naturally impeded drainage). Achievable targets for expansion and re-creation will therefore be modest because of difficulties (outside measures linked to commodity supply control) of purchasing the diversion of intensively farmed land. If targets for re-creation are to be met, either the budget of ELMS will have to be increased substantially or, alternatively, greater consideration given to the use of conditionality/cross-compliance within CAP commodity regimes (eg 'orange-ticket' cross-compliance [see Baldock and Mitchell, 1995]). Additionally, current quota restrictions upon the movement of livestock impose practical constraints upon the area that can be returned to grazing management in the lowlands. The potential for securing 'whole countryside' objectives in the shorter-term is therefore limited and success, if any, will tend to be confined to ESAs.

Semi-natural 'infield' habitats in the uplands, by contrast, are utilised as integral parts of mainstream farming systems. Here the currently prevailing problem is not the peripheral status of the habitat or the absence of appropriate management tools, but rather too much management in the form of ecological overgrazing. In other words, the management systems (at least livestock if not always labour) required for habitat conservation, together with the habitat itself, albeit in sub-optimal condition, are already in place. In principle, all that is required therefore (for the restoration of heather moorland, for example) is the replacement of the current system of output related support with one founded upon environmental criteria. This could prefigure the end of livestock commodity regimes and their displacement by direct socio-

environmental payments, rendering ELMs largely redundant except as mechanisms to secure 'additionality' on more sensitive sites.

b. **'Interstitial' habitats**

Main habitat types - hedgerows, field margins, ponds, ditches and streams.

Generic issues - Symptoms: Loss and degradation, eutrophication and drainage.

Generic issues - Causes: Intensification, specialisation, neglect, mismanagement.

Structural habitat requirements - appropriate management regimes (cutting and clearing), creation of buffer zones to exclude effects of pesticides and fertilisers and to expand habitat.

Short-term objectives/solutions - Conservation of extant resource, with priorities defined by species richness and 'critical' species dependence; use of conditionality in commodity regimes to secure appropriate management and creation of buffer zones; re-creation and exacting management requirements supported through ELMS.

Generic policy solutions - Transformation of commodity regimes into environmental direct payments; introduction of strong baseline regulation to secure basic standards of countryside management (needed for farms which operate outside 'policy reach'

Hedgerows, field margins, ponds, ditches and streams are key determinants of landscape character and, in the lowlands, constitute throughout large areas, the sole surviving semi-natural habitat. They are therefore key to the survival of many plant, insect, bird, mammal and amphibian species in the wider countryside. Interstitial habitats are still, however, subject to direct destruction or, more commonly, to slow process of degradation through mismanagement and/or neglect. The objective should be to conserve, enhance, restore and, where feasible, to create all such interstitial habitats. In the short-term priorities will need to be identified, based on species richness and 'critical' species dependence, where current policy constrains objectives and requires use of agri-environment funds.

The management systems required for appropriate conservation of interstitial habitats are, with the exception of traditional skills, largely available and need simply to be adapted to achieve defined goals. Moreover, the conservation objectives for some interstitial habitats (eg hedgerows) can be secured at little, zero, or even negative expenditure for the farmer and are therefore ideally suited to realisation through a system of environmental conditionality attached to mainstream commodity support. The diversion of land to form buffer zones to safeguard/create field margins, linear water courses and ponds is again theoretically feasible via conditionality attached to arable area payments (or, indeed through redeployment of set-aside), for example, but is likely to prove more contentious for technical reasons and because high productivity land will be involved. Where substantial restoration or creation of habitat is required, incentives through ELMs should be (and indeed are on a discretionary basis) available. The high cost of purchasing the diversion of productive land into

conservation usage means, however, that such agri-environment funds will need to be highly targeted to priorities.

In the longer-term, the desired transformation of commodity regimes into a system of direct payments will afford the primary generic policy solution. This solution will not be applicable, however, to those farmers who choose to produce for a liberalised market and who therefore place themselves beyond policy reach. In such circumstances environmental objectives cannot be secured through use of incentives (except on a very restricted basis) and will require, therefore, the introduction of alternative mechanisms such as regulation involving, for example, mandatory adherence to a code of good environmental practice.

c. **'Artificial infield' habitats (infield practices of modern farming)**

Main habitat types - arable fields, grass leys, improved pasture.

Generic issues - Symptoms: Loss and decline of arable weed species, loss and decline of characteristic farmland species (typically birds), loss of arable/pasture mosaics, shift to winter-sown crops, loss and decline of field edge flora and fauna (see also above).

Structural habitat and species requirements - arable/pasture mosaics, field margins, conservation headlands, spring-sowing of crops, retention of winter stubbles, retention of high soil organic content, limited/ targeted application of pesticides and artificial fertilisers.

Generic issues - Causes: Intensification and specialisation of production involving increased use of pesticides and artificial fertilisers; excessive, 'insurance' and non-targeted use of the latter.

Short-term objectives/solutions - Use of conditionality in commodity regimes, use of targeted ELMS (eg new 'wider countryside' ESAs), introduction of regulation to enforce minimum environmental standards.

Generic policy solutions - Transformation of commodity regimes into direct payments with most wider countryside objectives secured through basic tier payments. Use of environmental regulation and targeted incentives for farms beyond policy reach.

The great bulk of the lowland English landscape is now dominated by the ecologically impoverished environments of improved grassland and intensive arable cultivation. Current land-use practices of the latter appear to bear particular responsibility for the decline in 'common' farmland species. Thus, arable specialisation has led to the loss of pasture-arable mosaics required by species such as brown hare, stone curlew and skylark, whilst the shift to autumn-sown cereals has entailed a. a drastic reduction in winter stubbles required by many seed-eating birds and b. unsuitable nesting conditions for species such as corn bunting and lapwing.

A number of measures could be adopted to address such declines including the creation of field and fallow margins, conservation headlands and beetle banks, a shift back to the use of spring-sown cereals and, where feasible, the adoption of mixed farming practices to re-create arable pasture mosaics.

Current farming systems and practices can in theory fulfill all these objectives with the exception of the last - this is because they can be implemented at the margins of intensive practice or require only a rescheduling of that practice. The major constraints comprise, however, a. the likely adverse impacts of such proposed measures upon farm profitability and b. the rigidities of current policy. Again, the high opportunity costs of reverting arable land renders diversion to less intensive conservation use outside AAPS set-aside generally prohibitively expensive; the profitability of arable vis-a-vis livestock production combined with the rigidities of commodity regimes render a return to mixed farming unlikely in the shorter term. AAPS set-aside could be deployed, however, to much greater environmental effect than is currently the case both to create field and fallow margins and to mimic arable-grassland mosaics. Environmental conditionality could also be introduced into AAPS as a mechanism to create field and fallow margins and to buffer interstitial features.

These conclusions suggest that conventional agriculture can in theory be made more congenial to 'common' farmland species via improved management of interstitial habitats, creation of field and fallow margins and beetle banks. These measures are all 'field edge' in character, however, and infield practices remain as uncongenial to biodiversity as before. Biodiversity enhancement on this conventional model is purchased essentially through diversion of land out of intensive use. It is uncertain whether such measures alone will be sufficient to secure biodiversity objectives. What this conventional model is unlikely to achieve is a shift back to spring-sown cereals; what it cannot achieve because of its structural characteristics is a. the increased adoption of mixed farming practices and b. increased availability of infield food sources, eg seeds, insects and soil organisms that are a product of the restricted use of agrochemicals and the application of organic manures. These objectives can be secured, however, by organic agricultural systems. Organic systems incorporate features which will be central to objectives for 'infield' practices *viz*

a. rotations incorporating grass leys and legumes;

b. reliance on animal and green manures produced within the farm, rather than on synthetic fertilisers; and

c. very little use of chemical pesticides. Organic farming will also be central to securing other sustainability objectives relating to soil, water, atmosphere and agri-biodiversity (see Tilzey, forthcoming).

d. **Habitats affected indirectly by agriculture**

Main habitat types - Open water, rivers, canals, fens, topogenous mires, estuaries and saltmarsh.

Generic issues - Symptoms: Reductions in water quality and quantity, coastal squeeze.

Generic issues - Causes: Intensification and specialisation of agricultural production involving increased application of artificial fertilisers and pesticides, drainage, water abstraction, and conversion of coastal habitats to intensive use (mainly arable).

Structural habitat requirements - high water quality and appropriate water quantity, habitat expansion.

Short-term objectives/solutions - Use of ELMS (NSAs, Habitat Scheme, ESAs) , conditionality in commodity regimes, environmental regulation, strategic management and planning (eg Local Area Management Plans).

Generic policy solutions - Transformation of commodity regimes into direct payments, strong environmental regulation.

Problems of water quality, water quantity, flood and coastal defence have increased in tandem with agricultural intensification and specialisation and are manifested in pollution by fertiliser/pesticide runoff and drift, irrigation, drainage, disruption of natural river catchment processes and coastal squeeze.

Habitats affected by these trends include standing open water, rivers, canals, fens, topogenous mires, estuaries and saltmarsh. Shorter-term objectives for these habitats are defined by the Biodiversity Action Plan. Many of these habitats tend to be differentially located in areas of high productivity agriculture and will tend to be subject to the same sorts of constraints relating to more ambitious, whole countryside objectives that pertain to other lowland habitats described above. Policy mechanisms that can be marshalled in support of nature conservation objectives in the short-term comprise incentive schemes - ESAs, Countryside Stewardship, Habitat Scheme (Water fringe and Saltmarsh) and Nitrate Sensitive Areas - , regulation - Nitrate Directive, abstraction licencing and charging, regulation of farm waste - , and collaborative strategic planning - water level management plans, Local Environment Action Plans (formerly Catchment Management Plans), delineation of 'groundwater catchment areas' and 'managed retreat' to address the issue of coastal squeeze. These objectives will be secured either through diversion of land out of intensive production and targeted appropriately to secure buffering and habitat re-creation or through the adoption of more extensive conventional farming or organic agriculture. Longer-term objectives will depend upon further reforms of the CAP and upon a tighter regulatory framework which more fully enforces the internalisation of environmental costs by users of scarce resources.

e. **Species dependent upon multiple habitats (eg Greater Horseshoe Bat)**

Generic issues - Symptoms: Contraction in population numbers and range. Generic issues - Causes: Agricultural specialisation and intensification, leading to loss of arable/pasture mosaics, hedgerows and small woods and increased use of pesticides (including substances such as Ivermectin).

Structural species requirements - permanent pasture, small fields, thick hedgerows, small broad-leaved woodland, no insecticide use.

Short-term objectives/solutions - Maintain and enhance mosaic habitats of small, broad-leaved woods, thick hedgerows and permanent pasture; create smaller fields where possible through hedgerow planting and plant new broad-leaved woodlands. Use of ELMS (ESAs, CS, Farm Woodland Premium Scheme) and conditionality in commodity regimes (maintenance of hedgerows, extensification of grazing, reduction in pesticide use).

Generic policy solutions - Transformation of commodity regimes into environmental direct payments supported by appropriate environmental regulation.

(Note: the above draws heavily upon the example of the Greater Horseshoe Bat to demonstrate how the structural habitat requirements of a species using multiple habitats may be identified. These structural requirements may be similar to, or overlap with, other species (e.g woodland edge bird species) allowing generic solutions to address multi-specific objectives. However, such KNCF species may vary from Natural Area to Natural Area and such variation will generate differing structural habitat requirements and differing solutions.)

The analysis of 'structural' habitat types presented above suggests that, in the short-term, both priority and feasibility dictate that semi-natural infield habitats (particularly in 'peripheral' situations) will be primary targets for action. In the medium-term and within a largely unchanged policy configuration the lowlands may see more ambitious programmes to reduce fragmentation and to enhance populations of characteristic farmland species through pilot Prime Biodiversity Areas, delivered perhaps through new ESAs and wider use of Countryside Stewardship and other agri-environment schemes. In a more radical policy departure the uplands could witness a progressive 'greening' of livestock regimes through wider use of conditionality to achieve ecologically desirable stocking levels (rendering a separate suite of agri-environment measures largely redundant other than to secure additionality in targeted areas). The latter represents a model of how, over the longer-term, more fundamental reform of the CAP towards sustainability might be achieved through a transformation of production-related payments to environmental conditionality attached to direct/compensatory payments to an eventual 'recoupling' of support to environmental objectives. This would represent the replacement of the CAP with a Rural Sustainability Policy.

7. Putting in place appropriate policy mechanisms; opportunities, risks and contradictory forces

The achievement of whole countryside objectives for Natural Areas, embodied in a Rural Sustainability Policy, will depend upon a reform of the CAP which removes incentives, through production-linked support, to undertake environmentally damaging activities. Whilst a necessary condition, however, the mere removal of damaging incentives will be insufficient to secure environmental objectives. The abandonment of support of any kind will leave the market to determine land use decisions. The results of this are likely to be mixed but on balance the environmental consequences will probably be negative (cf. Potter, 1996). Throughout much of the arable belt, comparative advantages will be realised and a continuation of the current configuration of intensive production is likely. High opportunity costs of diverting land to conservation use or of environmentally beneficial extensification are likely to mean that environmental 'policy reach' will be limited - incentive schemes will be able to afford conservation costs only on marginal land and will tend to 'cherry pick' the priority sites for biodiversity. Throughout much of the wider countryside the only means of securing cost-effectively compliance with environmental objectives will be by means of tighter regulation.

In much of the uplands the removal of all support would similarly generate negative environmental consequences but for rather different reasons. Here comparative advantages in a free market are unlikely to be realised and common results are likely to be farm abandonment and amalgamation with deleterious consequences for the

management of semi-natural habitats. Such widespread environmental and social market failure in 'integral' situations will require extensive mitigation of a kind which minimalistic and 'cherry picking' agri-environment schemes will be unable to deliver. Intervention will need to be of a scope and scale that matches the need for widespread retention of 'joint economies' (of agricultural products and environmental services) upon which the nature conservation resource in 'integral' areas in particular depends.

The realisation of whole countryside objectives will therefore require intervention and support by public policy. Its rationale, however, will not be production maximisation as at present but rather environmental and socio-environmental in character. Its design will be one which simultaneously achieves conservation of the broader fabric of countryside while at the same time delivering additionality on special sites. The ESA scheme provides a model (albeit an imperfect one) for such an approach, combining as it does basic tiers for wider countryside management with higher tiers to deliver more demanding wildlife and landscape objectives. An ideal delivery mechanism for whole countryside objectives would be an ESA coextensive with each Natural Area. The ESA would comprise a number of tiers which would encapsulate management options for the whole of the Natural Area profile. These management options would address three basic situations: sensitive (maintenance and enhancement of semi-natural habitats); diversion/reversion (habitat expansion and re-creation); extensive/organic (adoption of extensive conventional or organic systems of 'intensive' infield production). This ESA model would be most needed and would be most readily achievable (as is currently the case but without the encumbrance of competing production incentives) in 'integral' situations because:

a. retention of the whole farm system is vital to both wider countryside and special site objectives; and

b. because livestock production is unlikely, particularly in more marginal areas, to be very profitable in a free market with the result that purchasing nature conservation services will be less costly.

The first reason is well evidenced in current 'integral' ESAs where it is important to make basic tier payments for wider countryside management to attract and keep farmers in the scheme in order that higher tier objectives can be realised.

By contrast, this model would be less necessary (at least in the short-term) and less achievable in 'peripheral', particularly lowland arable, areas:

a. because priority habitats are generally peripheral to farm systems and therefore do not depend immediately upon basic tier payments for conservation (ie additionality is delivered 'outside' the farm system); and

b. because of the considerable expense of purchasing reversion or extensification of arable land even at world market prices.

It should be recalled, however, that the conservation of special sites depends in the longer-term upon the expansion of this resource into the wider countryside, making this peripheral model unviable when viewed over time. Moreover, this model of special site conservation does not address the conservation of 'critical' species dependent upon both special sites and the wider countryside. Outside areas targeted by ELMS (in particular ESAs), the realisation of whole countryside objectives is unlikely in most 'peripheral' areas in the foreseeable future, however, unless:

a. world-market prices fall sufficiently that arable farmers are pushed back into 'policy reach';

b. introduction of environmental regulation governing agricultural production is sufficiently stringent as to compromise comparative advantage, having ultimately the same effect as a. above;

c. new regulation is sufficient of itself to conserve key nature conservation features;

d. growth of environmental consumerism encourages, through the market, a shift in production away from conventional and towards less intensive/organic farming.

8. Conclusions

The Natural Area approach provides English Nature with a framework with which to take forward its goal of whole countryside management. In so doing I have argued, however, that English Nature needs to understand and to address the generic issues which underlie the changing, and generally deteriorating, status of the biodiversity resource in agroecosystems. If generic solutions, rather than symptom management, are to be the way forward, as I have argued they should be, then we need a means by which we can articulate constituent components of the biodiversity resource with policy delivery mechanisms and farming practice. In order to do this, I have sought to develop a structure that defines key elements of agroecosystems in terms of their farm management requirements. I have also sought to outline the policy opportunities and constraints with which English Nature will need to engage if whole countryside objectives are to be secured. In taking a generic issues approach and in undertaking a 'risk assessment' of opportunities and constraints, I hope that English Nature will be encouraged to take a more strategic view of agricultural policy, and indeed, of rural policy in general. More immediately, I hope that this document will facilitate the process of Natural Area objective setting for agroecosystems as the preparation of 'full profiles' proceeds.

References

ANDREWS, J. & REBANE, W. 1994. *Farming and Wildlife Handbook: A Practical Management Handbook.* Sandy: RSPB.

BALDOCK, D. & MITCHELL, K. 1995. Cross-compliance within the Common Agricultural Policy. A review of options for landscape and nature conservation. Department of the Environment, London.

COOKE, R. 1996. Setting objectives for Natural Areas. Internal memorandum. Peterborough: English Nature.

HEWSTON, G.D. & COOKE, R.J. 1996. Issues facing nature conservation in England: A Natural Areas perspective. Peterborough: *English Nature Research Reports,* No.165.

MARSDEN, T. *et al* 1993. Constructing the Countryside UCL Press, London.

POTTER, C. 1996. Decoupling by degrees? Agricultural liberalisation and its implications for Nature Conservation in Britain. Peterborough: *English Nature Research Reports,* No. 196.

TILZEY, R.M. forthcoming. Sustainable development and agriculture - a discussion paper.

Annex 1

Generic agricultural causes of biodiversity loss and decline

Standard Issue No.

1. Loss and fragmentation of semi-natural 'infield' habitats through improvement or arablisation.

2. Abandonment or undermanagement of extant semi-natural 'infield' habitats (mainly in the lowlands).

3. Overgrazing of sem-natural habitats (mainly in the uplands).

4. Loss or mismanagement of 'interstitial' habitats.

5. Drainage or drying-out of wetland habitats due to water over-abstraction.

6. Pollution and eutrophication of surface and groundwaters leading to loss or degradation of aquatic ecosystems.

7. Loss of crop rotations and arable-pasture mosaics leading to severe reduction in characteristic farmland species.

8. Shift from spring-sown to autumn-sown cereals leading to loss of winter stubbles and to loss of suitable nesting sites for characteristic bird species.

9. Universal application of pesticides leading to loss of arable weed species, invertebrates and thereby food sources for other wildlife groups.

10. Universal application of artificial fertiliser leading *inter alia* to the loss or degradation of characteristic hedgerow and field margin vegetation.

Annex 2

The application of generic causal analysis to a Natural Area core profile

Blackdown Hills NA

			Structural Casual Analysis					
KNCF	Issue (as per core profile)	Standard issue category	Symptom	Cause	Management Objective	Spatial Objective	Short-term policy	Long-term policy
C.G., M.	Grazing levels	2	Under/overgrazing?	Livestock payment levels? Lack of livestock?	Extensive grazing	(To be defined as approp. to NA). All sites approp. managed.	ELMs Conditionality	Direct env. payments
M.G. C.G., M.G.	Habitat loss	1	Habitat loss					
C.G., M.G. Hedgerow	Isolation fragmentation	1, 4	Isolation fragmentation	Improvement/ arablisation	Buffering and appropriate management - low nutrient substrate	Habitat expansion and re-creation on appropriate substrates	ELMs conditionality	Direct env. payments
C.G., M.G., M.	Traditional management Drainage	2, 3, 5	Under/overgrazing? Drainage	Livestock payment levels? Lack of livestock. Improvement	Extensive grazing	Appropriate grazing management on all sites	ELMs conditionality	Direct env. payments
H.M. Hedgerow	ESA payment levels	2, 3	Inappropriate management (over/ undergrazing)	Livestock payment levels? Lack of livestock	Extensive grazing	Appropriate grazing management on all sites	ELMs conditionality	Direct env. payments
M.	Water quality	6	Decline in water quality	Eutrophication from intensification	High water quality	Restoration of desired water quality	Stat. water quality objectives	Ecologically defined. W Q objective
M.	Water abstraction	5	Decline in water quantity	Abstraction, drainage from intensification	High ground water levels	Restoration of high water table	Local Area Management Plan	Regulation

			Structural Casual Analysis					
KNCF	**Issue (as per core profile)**	**Standard issue category**	**Symptom**	**Cause**	**Management Objective**	**Spatial Objective**	**Short-term policy**	**Long-term policy**
M.	Habitat management	2, 3	Inappropriate management (over/ undergrazing?)	Livestock payment levels/lack of livestock	Extensive grazing	Appropriate grazing on all sites	ELMs & conditionality	Direct env. payments
Hedgerow	Arablisation/ intensification	4	Habitat loss/ degradation	Intensification/mis-management	Buffering/ appropriate management	Appropriate management of all hedgerows	ELMs & conditionality	Basic tier direct payments
He	Field margins	4	Habitat loss/ degradation	Intensification/mis-management	Buffering/ appropriate management	Recreation to restore linkage	ELMs & conditionality	Basic tier direct payments
He	Hedgerow removal	4	Habitat loss/ degradation	Intensification/mis-management	Buffering/ appropriate management	Recreation to restore linkage	ELMs & conditionality	Basic tier direct payments
He	Hedgerow Incentive Scheme	4	Habitat loss/ degradation	Intensification/mis-management	Buffering/ appropriate management	Recreation to restore linkage	ELMs & conditionality	Basic tier direct payments
He	Hedgerow Trees	4	Habitat loss/ degradation	Intensification/mis-management	Buffering/ appropriate management to allow tree regeneration	Recreation to restore linkage	ELMs & conditionality	Basic tier direct payments
He	Management	4	Habitat loss/ degradation	Mis-management	Buffering/ appropriate management to allow tree regeneration	Recreation to restore linkage	ELMs & conditionality	Basic tier direct payments

Key: C.G. = Calcareous Grassland; M.G. = Mesotrophic Grassland; M = Mire; H = Heathland; He = Hedgerow

Annex 3

Agriculture and Natural Areas - a guidance note

1. Agricultural Policy and Natural Areas

Agricultural policy and practice remain key factors in the continuing loss and decline of habitats and species, particularly in the wider countryside. By the same token, the removal of current agricultural policy constraints and the adoption of positive measures will be key to achieving a majority of Natural Area objectives. However, whilst the importance of agriculture both as a negative and as a positive influence on nature conservation is generally appreciated, there is perhaps less understanding:

a. of the ways in which agriculture impacts upon the nature conservation resource and of the causes (policy context) behind such impacts (issues);

b. of what we want from agriculture in the wider countryside and on special sites (objectives); and

c. of the policy mechanisms appropriate to the delivery of these objectives.

With this in mind, the following note is designed to provide guidance on:

a. the identification of issues in Natural Area core profiles of relevance to agricultural policy;

b. the definition of objectives in Natural Area core profiles of relevance to agricultural policy;

c. the identification of policy constraints and appropriate policy mechanisms for the delivery of Natural Area objectives.

2. The identification of issues in Natural Area core profiles

The Natural Area core profiles have sought to identify issues relevant to the conservation of Key Nature Conservation Features (KNCFs). There are two important issues that need to be addressed in this context. The first is the nature of causality underlying a particular issue; the second is the way in which the issue is described. These two issues are closely related because the way an issue is described is key to identifying the cause underlying it.

The nature of causality is vitally important. The majority of issues surrounding nature conservation are anthropogenic (directly or indirectly) in origin. Those of agricultural origin are, either directly or indirectly, a result generally of processes of intensification and specialisation (industrialisation) stimulated by a particular type of productivist policy (embodied in the CAP). Such issues are **generic** in type, that is they are the result of **generic causes**. This means that solutions to these issues must be sought at the same generic level, that is in changes to causal policy stimuli. It follows that they cannot, or can only partially, be addressed through measures that at best mitigate continuing **generic** impacts. (N.B. it should be noted that some issues can be specific or local in character and therefore will be amenable to specific/local rather than generic solutions.)

The generic agricultural causes of biodiversity loss and decline can be enumerated as follows:

1. Loss and fragmentation of semi-natural 'infield' habitats through improvement or arablisation.

2. Abandonment or undermanagement of extant semi-natural 'infield' habitats (mainly in the lowlands).

3. Overgrazing of semi-natural habitats (mainly in the uplands).

4. Loss or mismanagement of 'interstitial' habitats.

5. Drainage or drying out of wetland habitats due to water abstraction.

6. Pollution and eutrophication of surface and groundwater leading to loss or degradation of aquatic ecosystems.

7. Loss of crop rotations and arable-pasture mosaics leading to severe reduction in characteristic farmland species.

8. Shift from spring-sown to autumn-sown cereals leading to loss of winter stubbles and to loss of suitable nesting sites for characteristic bird species.

9. Universal application of pesticides leading to loss of arable weed species, invertebrates and thereby food sources for other wildlife groups.

10. Universal application of artificial fertiliser leading *inter alia* to loss or degradation of characteristic hedgerow and field margin vegetation.

(The above are represented as Standard Issue Categories in the accompanying table.)

The way in which issues are described is also very important. It is possible, if there is a lack of consistent decision rules, to describe issues imprecisely, leading to the mis- or non-identification of causality. The recent report by Hewston and Cooke (ENRR 165) exemplifies this - the lack of consistent decision rules embodied in the use of free text and compounded by the uncritical key wording from this text has led to the serious under-representation of agricultural policy in the issues analysis.

If generic issues and hence solutions are to be identified, a more disciplined and structured approach is required, therefore - in effect a structured causal analysis of issues. The following sequence of actions is suggested:

a. Identification of KNCFs;

b. Identification of symptoms (problems) affecting KNCFs (eg fragmentation, inappropriate management, pollution). These symptoms would need to be rigorously defined as categories and identified by means of a structured questionnaire.

c Identification of generic issue/cause (eg conversion of grassland to arable, undergrazing through lack of livestock, nitrate runoff through intensive cultivation).

3. Definition of Natural Area objectives

When generic issues have been identified, the next step is to define generic solutions to these issues. Such solutions will involve the **definition of objectives** to address generic causes. Defining objectives requires the identification of what may be termed the 'desired future condition' for a Natural Area. This will involve the identification of spatial/numerical targets and management objectives for habitat and species recovery. Broadly, these will derive from the following aims:

- Conservation/enhancement/expansion of remaining areas of high quality semi-natural habitat (including aquatic ecosystems).
- Conservation/enhancement/expansion of 'second-tier' semi-natural habitat.
- Conservation/enhancement/expansion of characteristic habitats and species in the wider countryside.
- (Programmes for particular rare or threatened species where generic measures alone will not be effective.)

If objectives are to be delivered through appropriate agricultural practice it is vitally important, however, that the former are identified in a way that articulates with the latter. This can be facilitated by the derivation of generic or structural elements making up a KNCF profile that equate with discrete types of agricultural practice. These generic elements may be defined as:

- Semi-natural 'infield' habitats (all grazed/mown habitats of high nature conservation interest including unenclosed habitats).
- 'Interstitial' habitats (hedges, ponds, ditches, streams).
- Habitats affected indirectly by agriculture (eg river systems, open water bodies).
- 'Artificial' infield habitats (arable and improved grassland).
- Species dependent upon a mosaic of habitat types and therefore upon a variety of agricultural (and non-agricultural) practices.

Finally, these objectives must be translated into appropriate (generic) policy solutions. This will involve the definition of policy opportunities/constraints delineating the parameters for action to secure Natural Area objectives. These policy responses may be described as either shorter-term or longer-term. Shorter-term responses will involve, in the main, currently available environmental land management schemes and the use of conditionality in respect of CAP commodity regimes. Longer-term responses should involve the increasing integration of environmental concerns into agricultural policy, for example, transformation of commodity support into direct environmental payments.

4. Example of structured causal analysis

Using the above model, the entire process of generating issues and objectives for Natural Areas can be demonstrated through the following example. The example chosen is one of the key generic elements making up the KNCF profile - semi-natural 'infield' habitats.

Semi-natural 'infield' habitats:

- Main habitat types - chalk and limestone grassland, neutral grassland, acid grassland, fen meadows, mires, grazing marsh, lowland heathland, heather moorland.

- Symptoms - arablisation or improvement, undergrazing or abandonment, fragmentation, overgrazing, drainage.

- Generic causes - intensification, specialisation generated through production-linked agricultural subsidy.

- Objectives (management requirements) - appropriate grazing levels (and mowing for meadows), livestock infrastructure, viable management units.

- Objectives (spatial targets) - expansion to secure site linkage, buffering and facilitate grazing management.

- Policy objectives (shorter-term) - use of ELMS and increased use of conditionality in livestock commodity regimes (mainly in uplands).

- Policy objectives (longer-term) - evolutionary transformation of CAP commodity regimes into socio-environmental payments with objectives defined by Natural Area.

This process can then be repeated for the other generic elements of the KNCF profile to complete the process of issues identification and objective definition for the Natural Area. The accompanying table provides a worked example of this model using the case of the Blackdown Hills Natural Area. A more detailed exposition of this model is included in a discussion paper Agriculture and Natural Areas available shortly.