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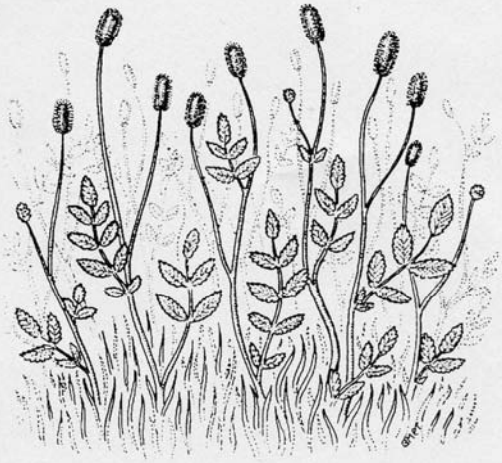
National SSSI sample survey of lowland grasslands

Pilot project



Conservation Resource Monitoring Team

Claire Sketch

English Nature Research Reports

P, S, B, JNCC

English Nature Research Report

Number 130

NATIONAL SSSI SAMPLE SURVEY OF LOWLAND GRASSLANDS

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ERRATUM

Page 29 Line 12 "Figures 16a and 16b below.." **should read** "Figures 16 and 17 below.."

CONTENTS

FOREWORD

Monitoring has always been a challenge to nature conservationists. The first instinct of biologists is to attempt to measure change through replicated, statistically sound, recording of species abundance and cover. This traditional approach can produce the required results, but the cost is very high if variance between recorders or seasons is controlled. With over 3,800 SSSIs in England alone the real challenge is to develop monitoring methodologies which can be applied across all SSSIs in a manner which is consistent across Great Britain, and which meet the needs of European legislation. The challenge facing the statutory agencies is to achieve this within their restricted budgets without recourse to the expensive traditional approaches on every site.

Our response has been to develop a model which defines favourable condition and limits of acceptable change for each feature of a site, then establishes criteria against which assessments can be made of site condition against defined objectives. These assessments will be carried out by staff of the statutory agencies against agreed common standards for generic features across GB. Whilst the model is theoretically sound we are currently developing practical ways of implementing the model and this report is the start of the process for English Nature.

The traditional approach to SSSI monitoring has included three elements; site integrity monitoring, site quality monitoring, and loss & damage reporting. The first element was a routine programme of visits to SSSIs to check on the gross condition of the site. These visits are one of the sources of loss & damage statistics, supplemented by other routine visits or information. The monitoring of site quality has never been a comprehensive programme due to lack of standards and guidance within or between countries. Monitoring of quality has usually been in response to specific threats or for experimental reasons and has invariably been restricted by the cost of detailed, repeated measurement using traditional approaches.

The primary purpose of the trial reported here was to test the methodology and practical implementation of common standards. In addition, we hoped to gain some measure of the condition of semi-natural lowland grassland on SSSIs in England and we believe that the trial does provide a credible assessment of their current status. One of the major factors which influenced this new approach to monitoring is the concern expressed by a range of bodies over the failure of existing monitoring methods. The traditional loss and damage statistics do not reveal deterioration of sites, nor the lack of appropriate management. We chose to test this new monitoring approach on lowland grassland because this habitat is particularly sensitive to changes in land management. Grasslands can lose much of their conservation value through slow, insidious changes which are difficult to detect through the coarse measures of loss and damage reporting. Thus testing the approach against a sensitive habitat type should highlight any problems in the methodology and help us to modify our approach.

From comments received on a draft version of this report it is clear that we need to improve the objectivity of the method. The guidance provided to staff who took part in the sample survey was based upon the best available information. We have moved on since then and are currently developing standard ways of defining optimal condition for a range of habitats. Despite the reliance on professional judgement this trial has provided valuable feedback on the new approach to SSSI monitoring and this is being used to refine methods and guidance.

A major assumption made at the start of this trial was that a SSSI designation does not automatically guarantee the maintenance of quality of any given the grassland habitat. The selection of SSSIs depends upon a view being taken at one point in time. We do not always know where the site lies in terms of long term trends. All SSSIs have to meet a given quality as judged against a series of published criteria. The constituent habitats may be deteriorating but still of sufficiently high quality to merit SSSI status. Only through a monitoring programme can we determine the trend in site quality and address the problems. The conclusions from this trial support the view that we should not be complacent about the success of SSSIs, and in many ways confirm the weaknesses of the traditional measures of 'loss and damage' reporting.

One novelty of this new approach is that it allows us to associate site condition with data on the management of the site. This provides exciting opportunities to analyse the reasons for success or decline of habitat quality and develop policies to address problems. For instance, the results of the grassland trial allow us to challenge the assumptions that a management agreement always secures the appropriate nature conservation outcomes. Where grasslands SSSIs lie within arable landscapes it is very difficult to secure grazing management, despite financial inducements.

This is the first report in a series which will form part of English Nature's contribution to developing common standards across the country agencies. These reports will ultimately provide a view of the status of habitats within the English SSSI series. The approach taken embodies common standards for SSSI monitoring being developed across all the statutory country agencies. The methods described in this first report are essentially experimental and the conclusions must be viewed in this context. Despite this we are confident that the picture given is a fair assessment of the current state of lowland grassland habitats in England. Whilst the conclusions should be treated with caution, we believe that the report gives a fair assessment of the actual state of England's SSSI grassland. We firmly believe that the use of site monitoring as a feedback mechanism will enable the statutory agencies to improve their own schemes and improve the quality of advice to other bodies and government. We hope that this report is seen in this spirit and is recognised as a first step towards improved reporting and utility of monitoring.

Keith Porter
Conservation Resource Monitoring Team
English Nature

SUMMARY

The National SSSI Sample Survey has been identified as a priority within English Nature's monitoring strategy (Felton 1992). It is a rolling programme investigating the condition and factors affecting the safeguard and management of a sample of SSSIs within broad habitat types.

Lowland grassland was the first habitat chosen for survey. 200 SSSIs with lowland grassland as an interest feature were randomly selected for study. Information was collected for 172 sites. On these sites 211 management units were investigated and for each unit a site condition form and owner/occupier questionnaire were completed. Condition assessments followed "Common Standards for Monitoring SSSIs" (Rowell 1993). The sample survey methodology allows results, where appropriate, to be analysed statistically.

The stratified random selection of SSSIs produced a representative sample of the grassland SSSI series as a whole for the major types of lowland grassland, namely acid, calcareous, neutral and wet types.

The key findings of the survey are:

Condition

- 53% of management units were recorded in optimal condition.
- 46% of management units were recorded in sub-optimal condition.
- 19% of management units were recorded in sub-optimal declining condition.
- Calcareous grasslands had the highest proportion of units in declining condition.
- External threats were noted on 63 units with the highest numbers relating to pollution and possible lowering of water tables.

Management

- There appears to be no correlation between management unit size and the condition of the grassland therein.
- There are proportionally fewer units declining in condition where each unit supports a high proportion of the grassland interest of the SSSI as a whole.
- Proportionally there were more units in declining condition and fewer in optimal condition on arable farms than on purely livestock farms.
- 27% of the management units are cut for hay and then aftermath grazed. None of these were recorded as declining in condition.
- 8% of units are not currently being managed. 69% of these are declining in condition.
- On 64% of units the current management was considered likely to maintain the grassland interest.
- On 21% of units it was considered unlikely that current management would maintain the grassland interest.

Ownership

- Grassland condition is less likely to be recorded as declining if all the grassland on an SSSI is within a single tenure.
- Approximately 50% of the management units studied are occupied by those for whom agriculture is their main business.
- 25% of units are managed by conservation organisations.
- Approximately 50% of the units are managed with the help of incentive schemes such as management agreements.
- The numbers of units recorded in optimal condition are nearly the same for those managed with the help of incentive schemes as for those managed without the help of these schemes.
- Twice as many units are recovering in condition and half as many are declining on those sites being managed with the aid of incentive schemes.

1 - INTRODUCTION

1.1 Backgound

English Nature's Monitoring Strategy (Felton 1992) identified four priorities for the organisatio

- a strategic sample survey of SSSIs
- site objective and site management statements
- an SSSI information system
- a quality assurance monitoring programme for SSSIs

The report "Common Standards for Monitoring SSSIs" (Rowell 1993) identifies a basis for a ne site condition recording system for use by the Country Agencies. This has been developed b English Nature as its Site Unit Recording Form system. The SURF system has been used in th sample survey to record condition assessments of interest features on the SSSIs studied.

1.2 The National SSSI Sample Survey - General

The National SSSI Sample Survey is a rolling programme which investigates the condition ar the factors affecting the safeguard and management of a sample of sites within broad habit types. It is distinct from the day to day recording of activities on or the condition of individu sites. A sample survey is a more statistically valid approach, which avoids the biases of previous routine reporting methods.

Knowledge of the condition and management of SSSIs is central to the assessment of how w the system is working. It also helps English Nature adapt site safeguard, monitoring a management policies; identify new issues; and assess the degree to which routine work focus on the important issues for particular types of sites and habitats. The overview produced by th project should also help Local Team staff to set their own experiences in a national context a should ultimately lead to improved schemes for supporting management for nature conservatio

In the Monitoring Strategy (Felton 1992) the principle of the sample survey was explained th

> "In addition to the regular recording of day to day work the organisation needs to be ab to relate this to some assessment of the series overall. For this purpose a strategic samp survey should be carried out, habitat by habitat, each year. The purpose would be identify the main factors influencing the capacity of occupiers to manage sites and the ma external threats to sites. The aim would be to identify all influences that affect 5% or mo of sites of each broad habitat type. The main issues are:
>
> - the relationship between occupiers' wider interests and their capacity to mana the site effectively;
> - the main external threats to sites;
> - indicators of the quality of the site and the appropriateness of the managemen

This would provide a framework to compare the work experience of individual officer Issues they observe that are not identified by the sample surveys should be highlighte they may be growing and hence in need of policy attention, or they may be national uncommon but locally significant. This reporting by 'exception' should help focus effo and identify priorities."

1.3 The National SSSI Sample Survey - Lowland Grasslands

Work begun on the sample survey for lowland grasslands in late 1992. Two hundred SSSIs we randomly selected, stratified by English Nature region (this structure has now been superced by a network of 21 Local Teams). Staff were asked to visit each site and assess the condition the grassland and fill in a questionnaire with the help of the owner or occupier (see Appendix 4 The site assessments were done by those staff who know the sites well and are t owners'/occupiers' usual points of contact with English Nature. The assessment methods used h to be appropriate for a brief site visit.

Many sites do not have baseline data against which to monitor, so condition assessments shou be treated with a degree of caution. Management is also considered along with conditi assessments. There is also improved statistical validity to the survey as the population has be identified and within it the sample chosen randomly (Rowell 1991).

2 - OBJECTIVES

The objectives of the National SSSI Sample Survey are to:

- assess the extent to which nature conservation objectives on SSSIs are being met
- assess the extent of any threats to the achievement of nature conservation objectives
- provide an overview of the interests, management activities and priorities of occupiers

This report presents the methodology as well as the results, thus enabling the survey to be repeated and comparisons to be made at different points in time.

3 - METHODS

3.1 The Choice of Habitat

The National SSSI Sample Survey will investigate one broad terrestrial habitat type each year over a six year period. Lowland Grassland was selected first as an example of a habitat vulnerable to subtle changes in management over short timescales. Some grassland types have a restricted occurrence, often being virtually confined to SSSIs. Grassland of nature conservation interest are known to have declined rapidly in extent and quality in recent times.

In "Habitat Conservation in England" (Moffat 1994) lowland grasslands are defined as:

> "generally enclosed meadow or pasture land normally occurring at altitudes of 300m or less in England..... Some habitats, which may also be managed by cutting or grazing and which are sometimes described as 'meadows' or 'grasslands', are actually classified under different habitats in the National Vegetation Classification (NVC). Fen meadows and some rush pastures, for example, are technically mire communities (M22-M28, Rodwell 1991). These communities are thus excluded from the definition of lowland grassland."

3.2 Generating the List of Grassland SSSIs

A list of grassland SSSIs was produced by English Nature's grassland specialists. Sites qualified for inclusion on the list if they supported lowland grassland (as defined above) and the grassland habitat was a principal reason for notification as an SSSI. These judgements were based upon the information given in the SSSI citations. Grassland described as "additional habitat" interest, such as a woodland ride, was generally excluded.

Lists of the sample sites selected were sent to Local Team staff to check that the sites chosen had been correctly identified as supporting lowland grassland interest. Sites that had been incorrectly identified were replaced as appropriate, however, a few went uncorrected and resulted in nil returns. The classification of the grasslands on the sample sites was rechecked as part of the analysis and few alterations were needed.

3.3 The National SSSI Sample Survey in 1993/94

There were 1322 SSSIs in England with lowland grassland interest at the time of this study. The sample size of 200 SSSIs was chosen so that a factor which affects 5% of the population of SSSIs supporting lowland grassland should be found on at least one of the sample sites. This was based on the probability of failing to detect a factor of known prevalence in different sizes of sample taken from a very large population (Australian Bureau of Animal Health 1982).

The sample size was chosen to reduce the risk of missing important influences on grassland condition. This was based on calculating the probability of failure to detect a factor from an "infinite" population with a specified proportion of positives in the population (Australian Bureau of Animal Health 1982). With a specified number of samples (n) taken from an "infinite" population with a proportion (θ) of positives, the probability that the sample does not contain any positives is $(1-\theta)^n$. With a sample size of 200 the probability that the sample does not contain one individual affected by a factor affecting 5% of the original population is less than 0.1%. This may seem unusually cautious, but the calculation does not consider the probability of observer error.

The SSSIs were chosen at random, stratified by English Nature region (see Appendix 1). They were selected from site lists using random numbers generated by English Nature's VEGAN computer programme. When local staff requested that sites were not included, replacements were again selected randomly. The number of sample sites assigned to each region was proportional to the total SSSI grassland resource in that region, estimated from the number of SSSIs with grassland interest. Further levels of stratification were considered, such as by habitat type, but an extra level of stratification would make some strata too small.

Within each selected SSSI a "management unit" (a sub-unit with a single management regime which normally had a single occupier) was selected at random. These are referred to in the results as "management units" or "grassland units". Management details could then be assigned to the same area as the condition assessment. Many small SSSIs had a sole occupier and a single grassland management unit was investigated. On large, multi-occupancy sites a maximum of three occupiers were contacted. Commons were generally regarded as single management units.

For each management unit a site condition form was completed following a site visit and with the aid of site records. A questionnaire was completed with the help of the occupier. Guidance was provided on how to complete these forms (see Appendices 2, 3 and 4).

3.4 The Questionnaire (see Appendix 2, guidance notes in Appendix 4)

The questionnaire was influenced by work carried out by the Agricultural Development and Advisory Service (ADAS) into the ownership and management of Worcestershire semi-natural grasslands for English Nature in 1992. The ADAS study was a more socio-economic survey of land management and types of manager. It aimed to estimate the area under threat from inappropriate management practices and predict the likely uptake of the Countryside Stewardship Scheme.

The grassland sample survey questionnaire consists of two sections: section one covers information on the occupier's business, including land managed outwith the SSSI; section two concerns details of the current management of the SSSI grassland. The first section provides information on the occupier's resources for managing the grassland, such as whether they own any livestock or would have to find a grazier. Section two provides information on how the grassland is managed and whether this has changed recently or will do so in the near future. There are also individual questions on schemes which help with the site management and on particular problems which the occupier has with the site.

3.5 The Site Condition Form (see Appendix 3, guidance notes in Appendix 4)

This forms collects details about management, threats, loss, damage and the condition of the grassland in the management unit. When this was the assessor's first visit to the site only limited conclusions could be drawn. The background information needed to help inform decisions about condition was not available for some sites.

Condition assessment involves a subjective judgement of the state of the grassland, based on the site visit and knowledge of its management. These judgements were categorised using the "interest feature condition" terminology designed for the implementation of monitoring using the Common Standards model in Rowell (1993). Brief definitions are given in the guidance notes (see Appendix 4), the full definitions are as follows:

Optimal Condition	This "is the management objective for the abundance, distribution, vigour of an interest feature or some other performance criterion. They should be based on informed judgements of the carrying capacity of the site following, if appropriate, recovery management".
Optimal Maintained	"A feature of interest can be recorded as *maintained* when it is present in the condition and abundance formally set as the desired *optimal condition* or, at least, within the *limits of acceptable change*".
Optimal Recovered	"A feature of interest can be recorded as *recovered* if it has regained, following sub-optimal condition, the condition and abundance formally set as the desired *optimal condition*".
Sub-optimal Recovering	"A feature of interest can be recorded as recovering after a damaging activity if it has begun to show, or is continuing to show, a trend towards".....optimal condition. This may be natural recovery after a damaging operation or recovery as a result of positive management.
Sub-optimal Stabilised	"An interest feature may be retained in a more or less steady state by repeated or continuing damage; it is sub-optimal but neither declining nor recovering. In rare cases an interest feature might not be able to regain its original condition following a damaging activity, but a new, stable situation might be achieved".
Sub-optimal Declining	"An interest feature can be said to be *declining* when its abundance, distribution or vigour is decreasing and is below the acceptable limits of change, within the confines of the site in question"..... "In this case, recovery is possible and could occur spontaneously or if suitable management input is made". Condition of the interest feature has declined since the last observation.

Destroyed or Partially Destroyed	"The recording of a feature or site as *destroyed* will indicate that an entire interest feature has been affected to such an extent that there is no hope of recovery, perhaps because the supporting site fabric has been destroyed or irretrievably altered".

Ideally the condition terminology should be used in the monitoring of sites for which there are clear objectives have been formulated and for which there is good knowledge of the past condition of the interest features on the site. This was not the case for many sites at the time of this survey. Judgements on the condition of interest features have a high subjective element and it is inevitable that part of the variation between sites will be due to differences in opinion and levels of experience, rather than real differences in condition.

Optimal condition relates to the potential of a site. The "optimality" of an area is dependent on how far from perfection the "limits of acceptable change" have been set. Despite differences of interpretation, this broad classification is useful and the information is valuable as long as its limitations are remembered.

3.6 Analysis

All the information on the returned forms was entered onto a Paradox database, further details of which are given in Appendix 5. Where statistical analysis is used in the results, the type of analysis is stated. Chi-squared analysis is frequently used as a first step to look for significant relationships. The number of management units where the question is relevant or was answered fully varies between questions. For each set of graphs the number of management units involved is stated as "n". Where "n" is less than 100, more care is needed but patterns and relationships can still be suggested from the data. Chi-squared can be used with smaller datasets with caution. As an example, the high proportion of management units on arable farms in declining condition appears obvious but cannot be supported statistically as only twelve arable farms were considered. Where standard errors are given, these are based on a normal binomial distribution. These are only given when they are needed and the group of sites involved is large enough for the distribution assumptions to be justifiable. Some extrapolations are made in the discussion and the assumptions on which they are based are described there.

4 - RESULTS

4.1 The Original and Actual Samples

The total number of SSSIs in England with grassland interest in December 1992 was 1322, which is 45% of all biological SSSIs. The 200 SSSIs selected for the Sample Survey represent 15 % of the "population" of SSSIs with lowland grassland interest. Information was collected on 172 SSSIs, the distribution of which is shown in Appendix 1. The small number in Devon and lack of sites in Cornwall are partially due to chance but also due to the exclusion of coastal and culm grassland sites from the original list.

At the conclusion of the survey, there were 139 sites where one management unit was studied, 27 sites with two units studied and 6 sites with three units studied. A few sites were divided into 2 units for condition assessment although managed by a single occupier. Some commons were treated as a single management unit although information was gathered from a number of occupants. There were 28 nil returns for site condition forms, including some from multiple-unit sites where forms for one of the two or three units were not returned. In any study of this kind some nil returns are inevitable. The reasons for these include incorrect habitat assignment or because the occupier would not participate in the survey, although this number was small.

Usable information was collected from 211 management units within the 172 SSSIs studied. On two of these units, however, condition assessments were not made. These are considered in the next section but eliminated from further analysis.

Not all questions were answered for all sites as some were not relevant. Where there was a nil return for the questionnaire, the condition assessment form could often still be completed. Where a summary is not based on the whole sample, the number of management units involved is noted. In the following analyses all the nil return sites described above are excluded.

4.2 Comparison of the Sample of Sites with the Grassland SSSI "Population"

The stratification of the sample SSSIs gave a better geographical spread than a totally random sample. Though this does not automatically guarantee that the sample contains an acceptable representation of the different types of lowland grassland, the analysis in Appendix 7 shows that the proportion of SSSIs in the sample supporting each broad type of grassland is very similar to that in the whole suite of grassland SSSIs. As an example, 45% of the SSSIs in the grassland inventory support calcareous grassland compared to 47% of the sites studied in this sample survey. The only two notable differences are for acid and wet neutral grasslands, however, neither difference is statistically significant when tested with a Chi-squared analysis. This indicates that the stratified random approach has produced an acceptably representative sample of grassland types in the survey.

4.3 The Condition of the Grasslands in the Sample

The condition assessment categories used in Table 1 are described in Section 3.5. The following provisions apply:

i. optimal condition relates to the ideal state of a site feature and is not necessarily its condition at the time of notification of the site as an SSSI;
ii. a grassland may be in sub-optimal condition without having deteriorated since notification;
iii. the "optimality" assessment of a grassland feature is also dependent on how the assessor has defined "limits of acceptable change" for that feature; the grassland may be classified as optimal in condition by some people, even though the ideal management regime is not in place, because they consider that the current management and condition are as good as they can be under current constraints;
iv. most figures quoted in the results are of numbers of management units rather than areas or numbers of SSSIs as management relates to individual units; different parts of an SSSI may be in different condition and areas may be strongly influenced by a few very large units;
v. a management unit may be classed as sub-optimal overall, even when part of it is in optimal condition;
vi. assessing a sub-optimal grassland unit as "declining" in condition does not necessarily apply to the whole unit as it may have parts of the feature in both stable and declining condition (the worst case scenario is the one recorded for the overall condition rating).

Table 1: The Condition of Grassland Management Units

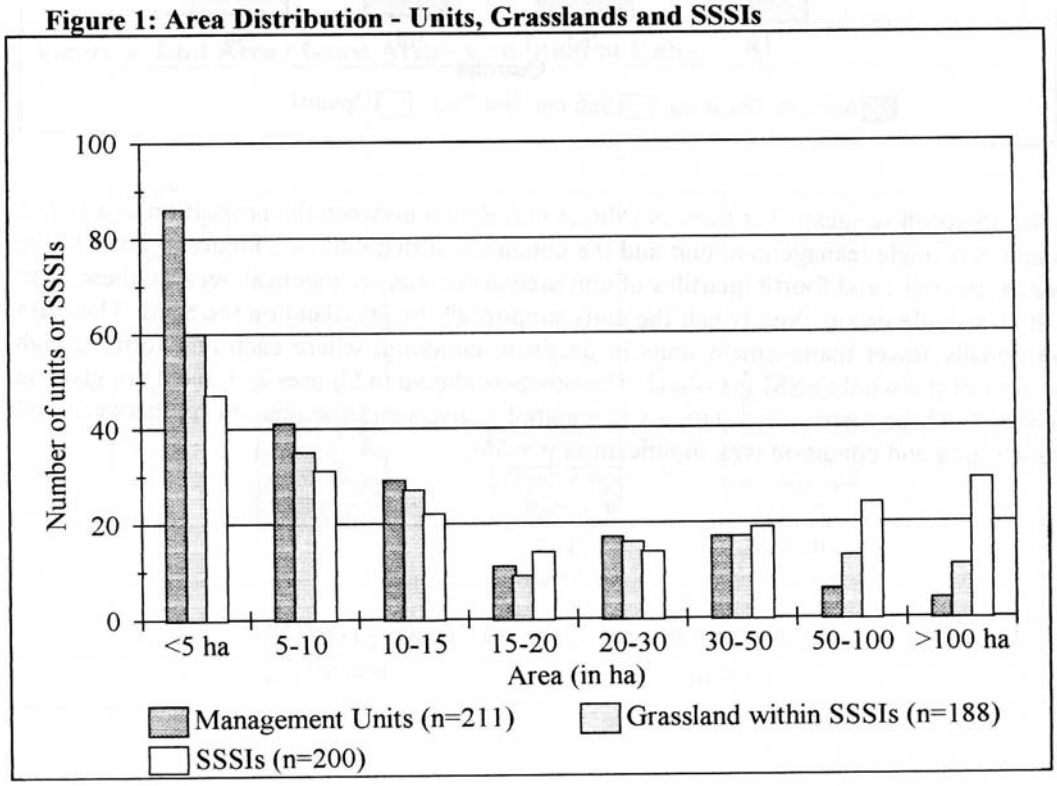
Condition Assessment	**Number of Units**
Optimal Maintained	95
Optimal Recovered	9
Sub-optimal Recovering	29
Sub-optimal Stabilised	25
Sub-optimal Declining	40
Total	**198**
Optimal (without detail)	7
Sub-optimal (without detail)	4
No Condition Assigned	2
Overall Total	**211**

Areas are quoted to the nearest whole number. Within some SSSIs, management units were in different conditions. The two units where condition assessment was not attempted were excluded from further analysis. Management units where a dynamic element to the condition assessment could not be made, were not included in further analyses which require full details of site condition. On some of the 209 units sampled, some questions were either unanswered or irrelevant.

4.4 The Effect of Management Unit Size

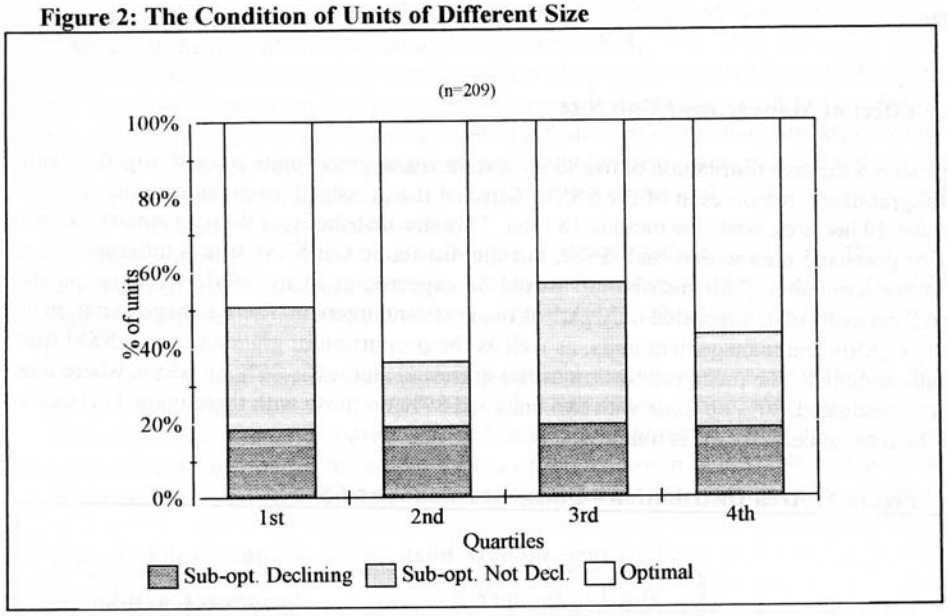
Figure 1 shows the area distribution of the SSSIs and the management units studied, together with the total grassland area on each of the SSSIs. Most of the grassland management units studied were under 10 hectares, while the mean is 18.6 ha. This size distribution follows a similar pattern to that of grassland area within each SSSI, but the distribution of SSSI area is different, there being more large sites. This distribution would be expected as many SSSIs were not purely grassland and many units supported only part of the grassland interest. There is large variation in the size of SSSIs and management units, as well as the proportion of grassland on an SSSI that is actually sampled. The mean proportion of the grassland studied is 86% on SSSIs where one unit was investigated, 80% on those with two units and 89% on those with three units. On twelve SSSIs the total grassland area is unknown.

Figure 1: Area Distribution - Units, Grasslands and SSSIs



The analysis summarised in Figure 2 is complicated because the division of the sample could affect the results. There are no obvious "clumps" within the size distribution, so the management units were sorted by area and then divided into four equal groups or "quartiles". In this sample, the size of the management units had no correlation with their condition.

Figure 2: The Condition of Units of Different Size



A similar approach suggests that there is a direct correlation between the proportion of an SSSI grassland in a single management unit and the condition of that unit (see Figures 3 and 4). The figures for the third and fourth quartiles of unit area/grass area are identical because these were treated as a single group. Nearly half the units support all the grassland on the SSSI. There are proportionally fewer management units in declining condition where each unit forms a high proportion of the whole SSSI grassland. The numbers shown in Figures 2, 3 and 4 are given in Appendix 7. These were tested with a Chi-squared analysis and the relationship between unit area/grass area and condition was significant at $p = 5\%$.

Figure 3: Unit Area / SSSI Area - Condition of Units

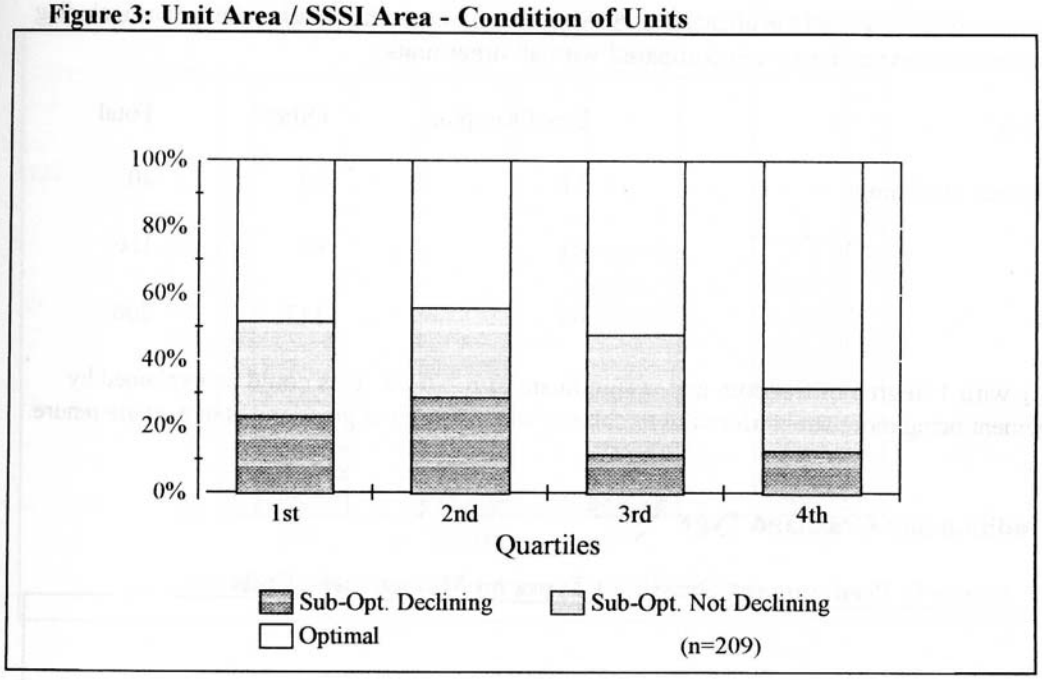
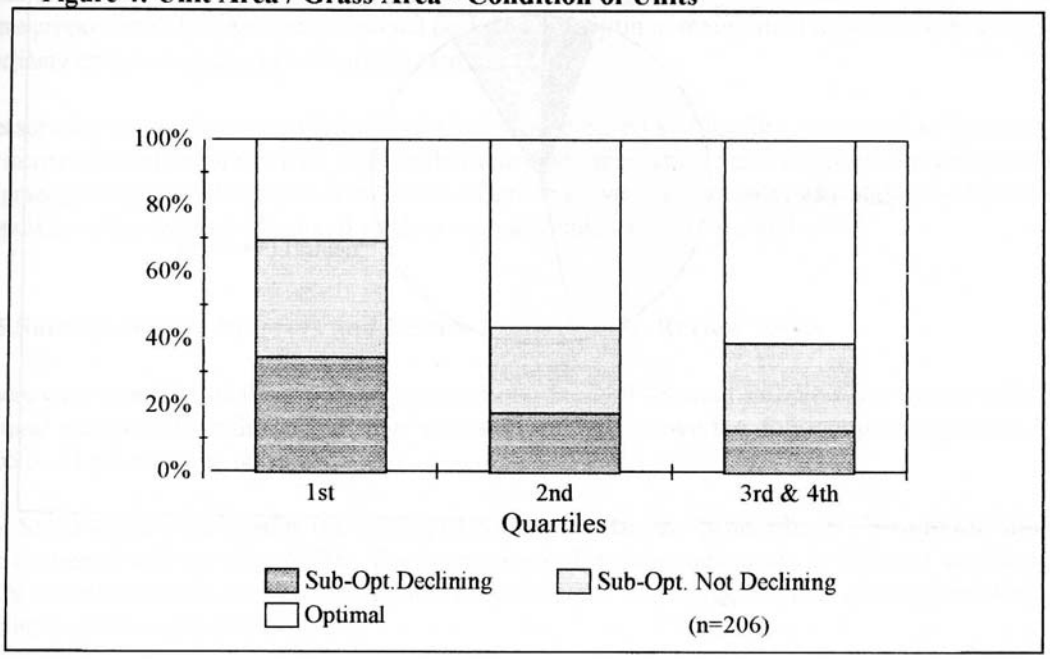


Figure 4: Unit Area / Grass Area - Condition of Units



Management units where all the grass on an SSSI was apparently in a single tenure (not including land in common ownership) were compared with all other units:

Condition	One Occupier	Other	Total
Sub-optimal Declining	11	29	40
Other	84	82	166
Total	95	111	206

$\chi^2 = 6.1$ with 1 degree of freedom and is significant at $p = 0.05$. This could be explained by management being more straightforward to achieve when an area of grassland is in a single tenure.

4.5 Condition and Grassland Type

Figure 5: Predominant Grassland Types on Management Units

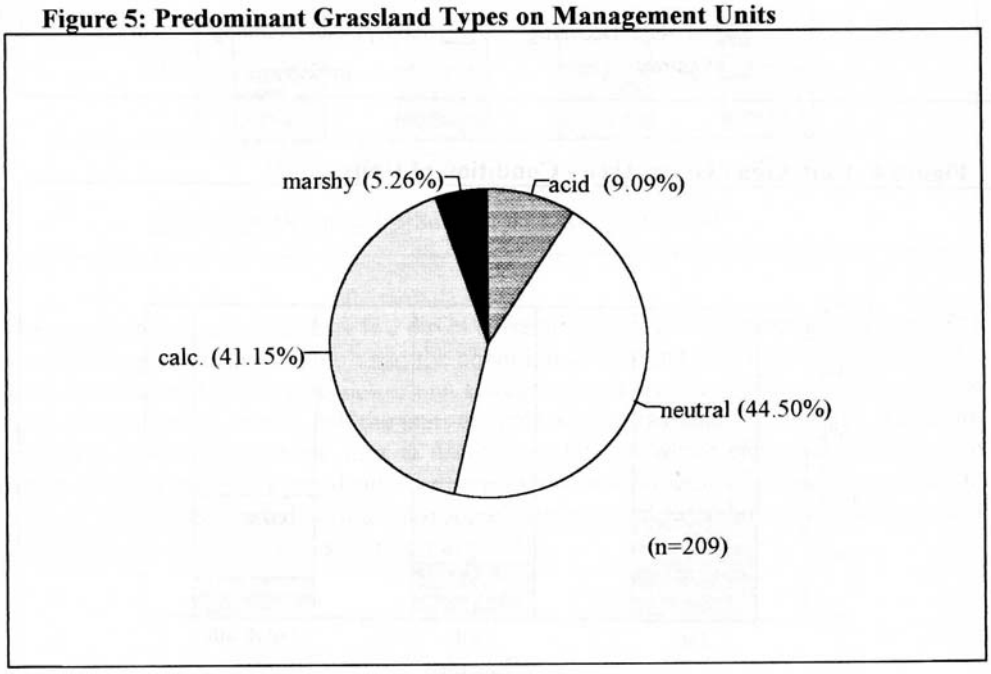
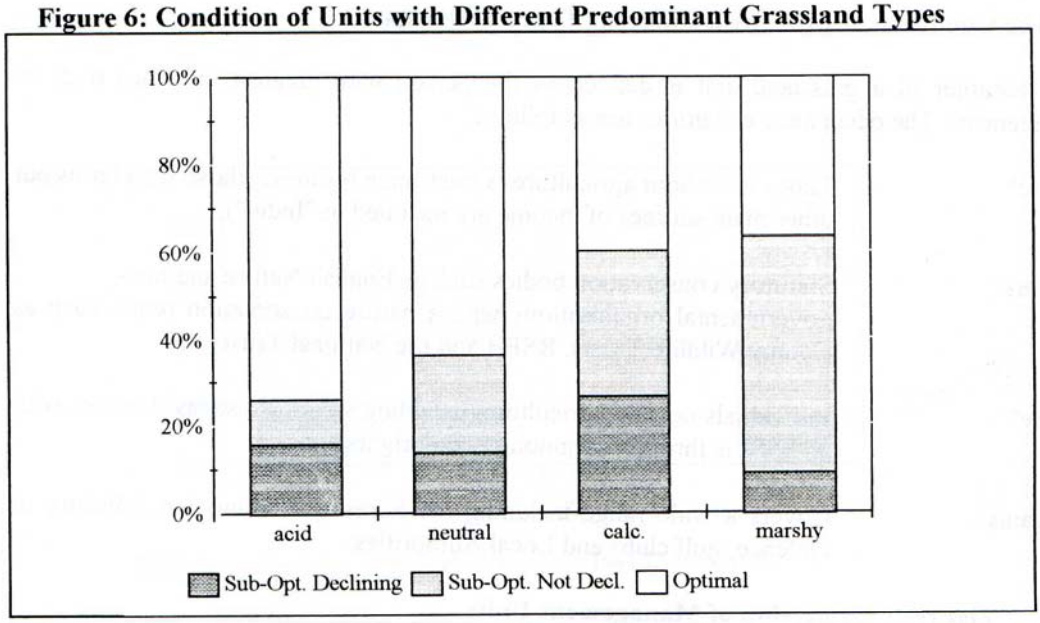


Figure 6: Condition of Units with Different Predominant Grassland Types



There is a particularly high proportion of management units in declining condition among the calcareous grasslands. Fifty-four of the calcareous grasslands are on chalk. Within this group the same proportion (31%) are in sub-optimal declining and optimal maintained conditions. Six of the declining calcareous sites are on arable farms.

Reasons for the declining condition could include increased soil fertility as a result of manuring by increased numbers of stock or, at the other extreme, dereliction resulting from the withdrawal of grazing altogether. Reduction in numbers of grazing livestock coupled with a decline in rabbit populations has led to widespread neglect on many calcareous grassland sites.

4.6 National Nature Reserves and Nature Conservation Review SSSIs

There were nine National Nature Reserves among the 200 selected sample sites. Seven were in optimal maintained condition and one was sub-optimal recovering following overgrazing by rabbits. There was one nil return.

The SSSIs which were listed in the Nature Conservation Review (Ratcliffe 1977) were identified and compared with the other SSSIs. The proportions of management units in different conditions on NCR and non-NCR sites are not significantly different. This suggests that equal prioritisation has been given to all SSSIs.

4.7 The Condition of Units with Different Types of Occupier

The occupier of a grassland unit is defined as the person with greatest influence over its management. The occupancy categories are as follows:

"Agric"	Those for whom agriculture is their main business (those with farms but other main sources of income are included in "Indiv");
"Nature"	Statutory conservation bodies such as English Nature and non-governmental organisations with a nature conservation remit, such as County Wildlife Trusts, RSPB and the National Trust;
"Indiv"	Individuals outside agriculture, including some whose involvement with an SSSI is through common grazing rights;
"Organis"	Covers a wide range including the Forestry Commission, Ministry of Defence, golf clubs and Local Authorities.

Figure 7: Ownership of Management Units

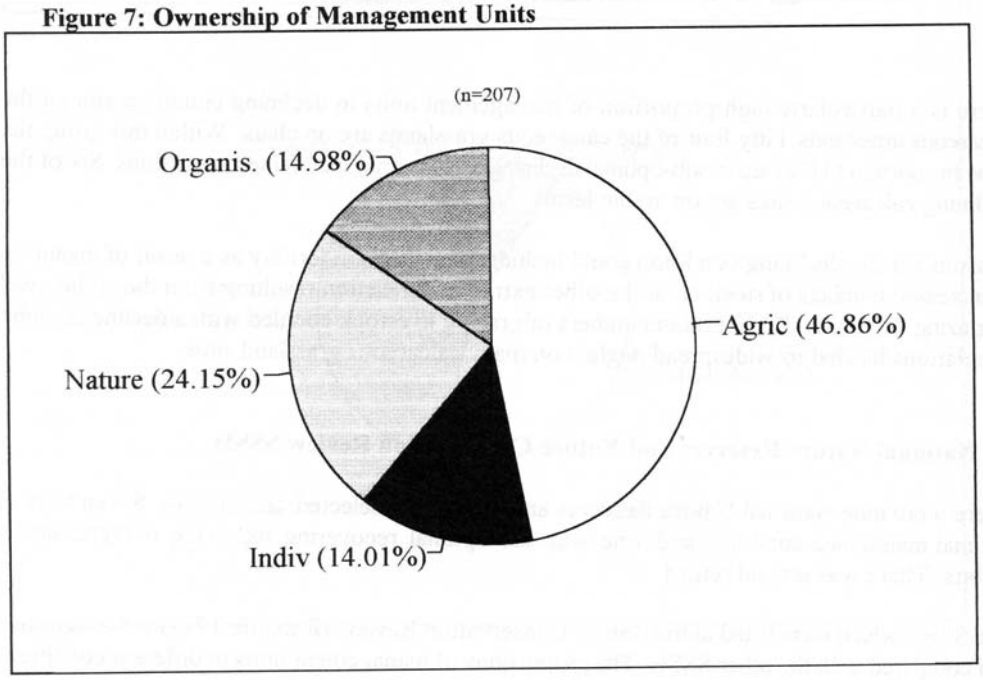
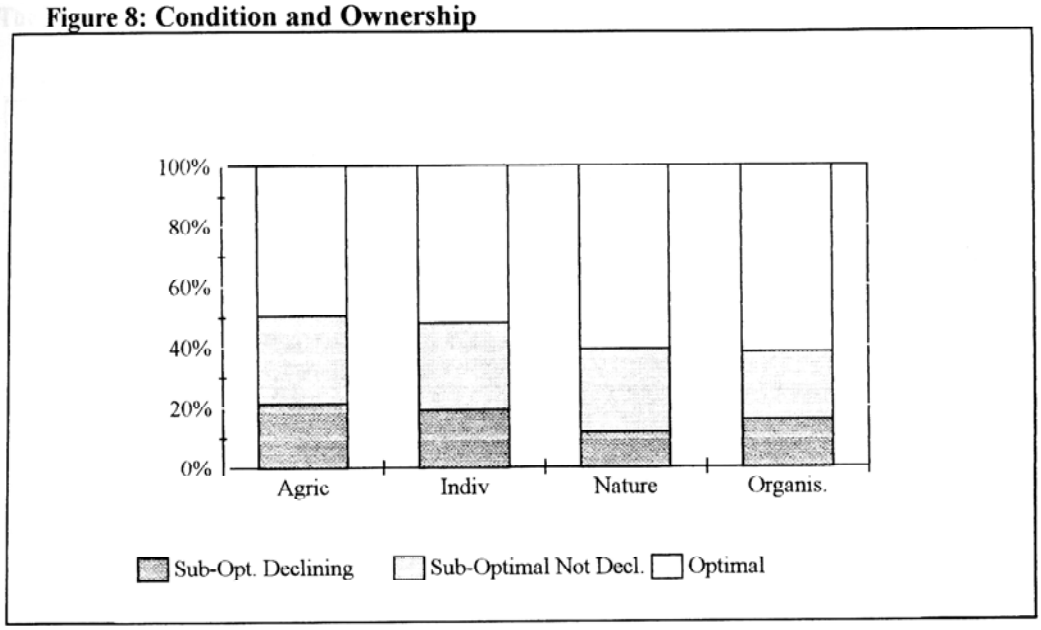


Figure 8: Condition and Ownership



Occupation was unknown at two sub-optimal declining sites where the management questionnaire was not completed. Management units where a dynamic condition element was not given are included under the optimal and sub-optimal not declining categories. The statistics represented in Figures 7 and 8 are tabulated in Appendix 7.

Six of the units managed by conservation organisations are in sub-optimal declining condition. On three of these there are plans to introduce improved management. The others are in urban area or otherwise isolated and therefore difficult to graze. The current management is considered the best that can be achieved under current constraints.

4.8 The Condition of Grasslands on Different Types of Farm

A farm type could be assigned for 106 grassland units. This includes some farms where agriculture is not the occupier's main business. The farms are not assigned their "textbook" classifications, so that all the farms classed as "arable" are ones without any grazing livestock. Management units where a dynamic condition element was not given are included in the "optimal" and "sub-optimal not declining" categories.

The small number of grassland units managed within arable farms means that this data must be interpreted with caution, however, the large proportion of the units on arable farms declining in condition emphasises the difficulty of managing land outside the main farming enterprise. Very few of the farms were purely dairy enterprises so these were included with other livestock farms.

Figure 9: Types of Farm

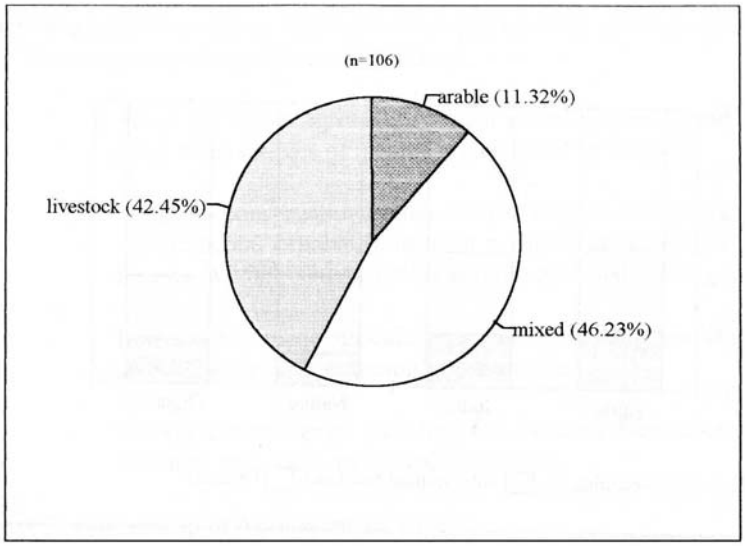
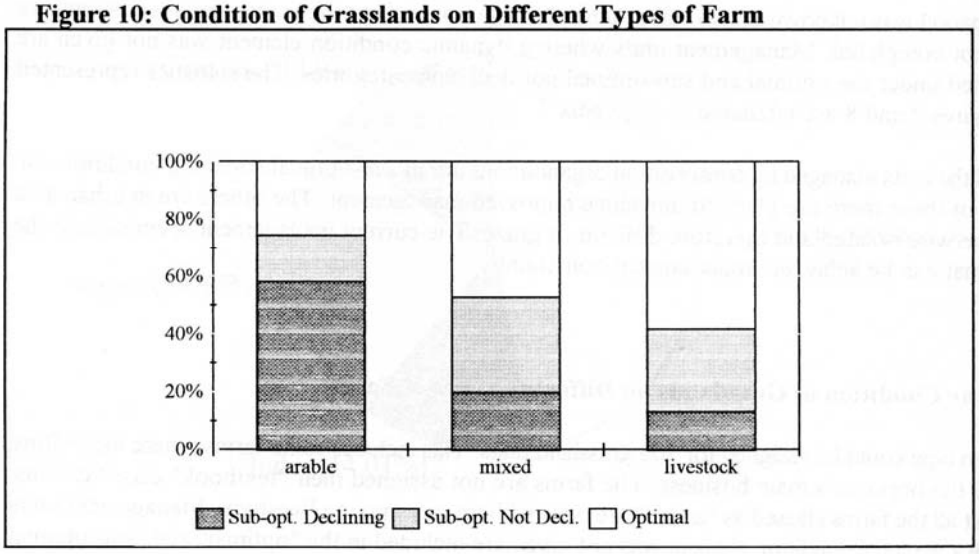


Figure 10: Condition of Grasslands on Different Types of Farm



A possible correlation between the size of farm and the grassland unit condition was also investigated. No clear relationship was established between these two factors, however, there are more units in optimal condition on small farms. These tended to just have livestock. Livestock enterprises had the smallest proportion of grasslands declining in condition and the highest in optimal condition.

4.9 The Management of the Grasslands

Figure 11: Management of SSSI Grasslands

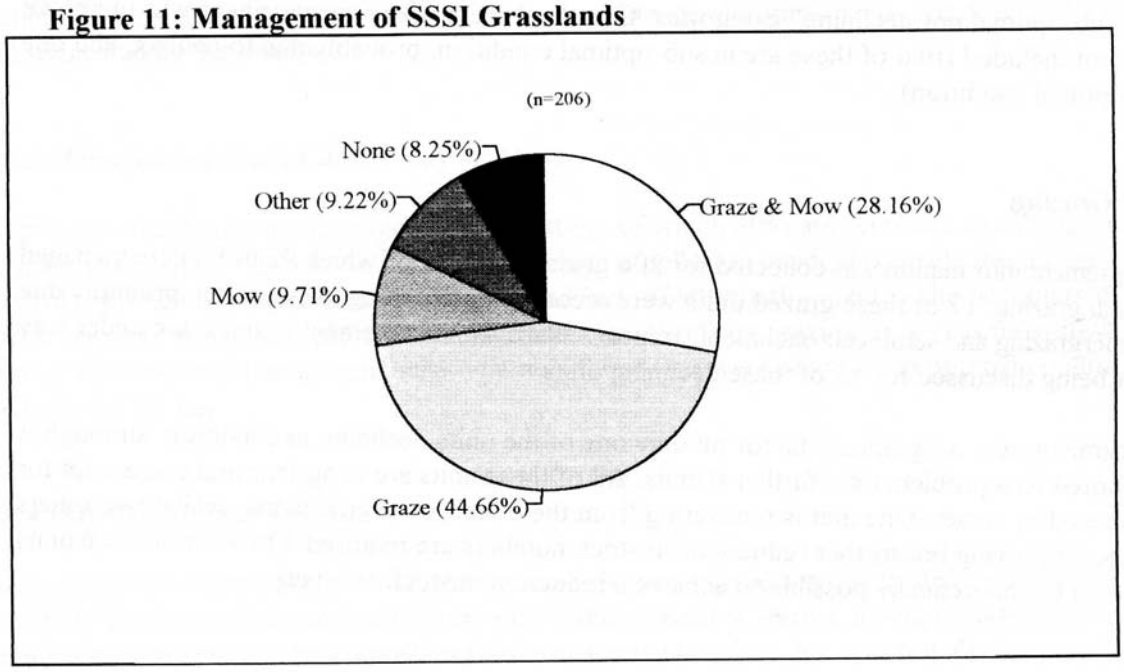
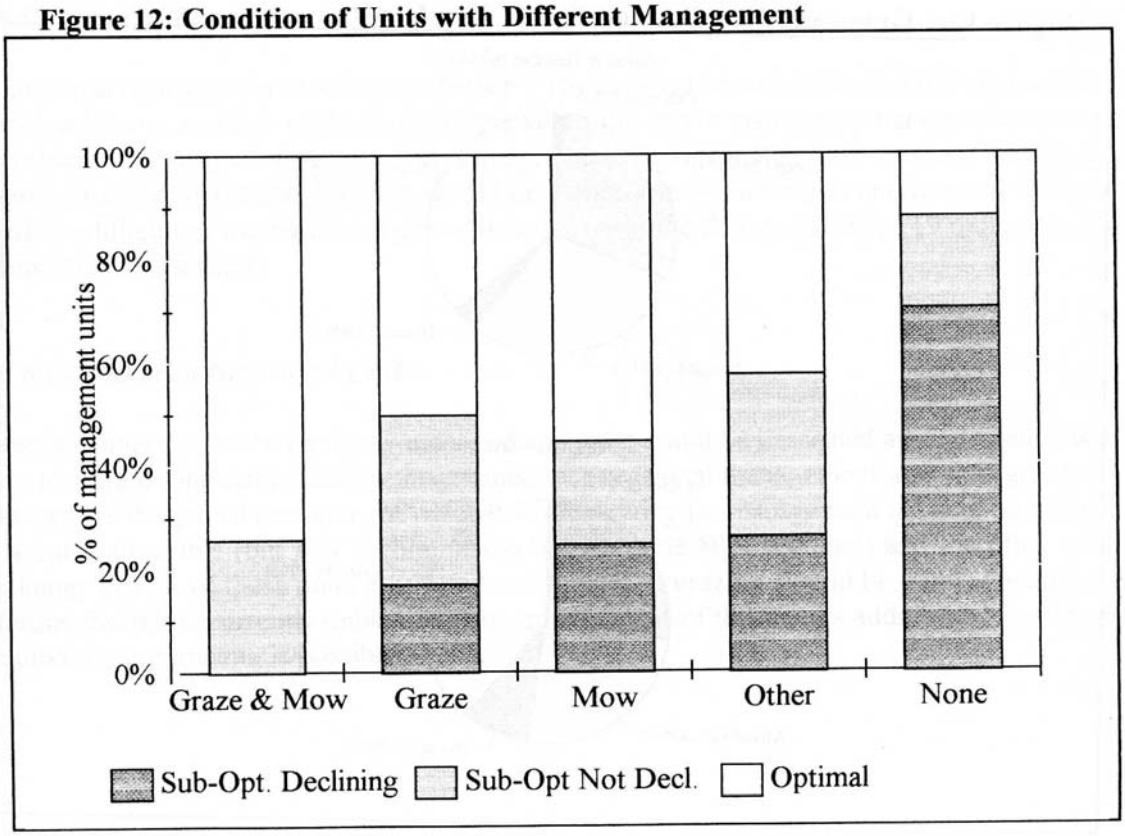


Figure 12: Condition of Units with Different Management



The statistics represented in Figures 11 and 12 are tabulated in Appendix 7. Management units where a dynamic condition element was not assigned are included in this table under the "optimal" and "sub-optimal not declining" categories. Grassland units where management was unknown were not included (two of these are in sub-optimal condition, probably due to neglect, and one is in optimal condition).

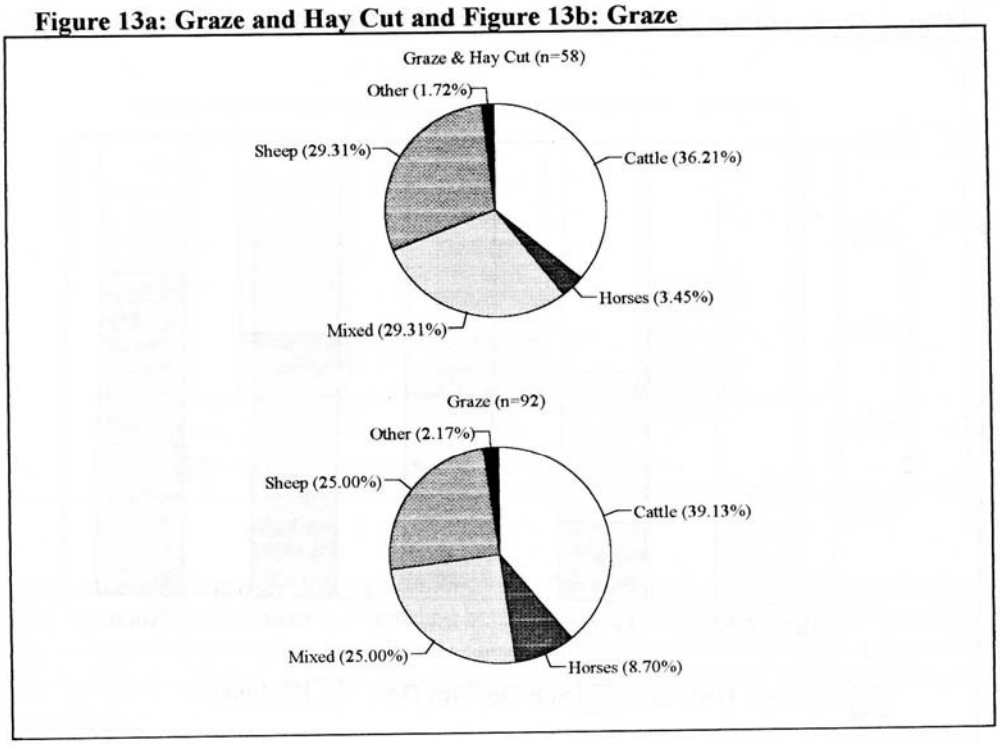
4.9.1 Grazing

Management information was collected for 206 grassland units, of which 92 (45%) are managed through grazing. 17 of these grazed units were recorded as declining in condition, primarily due to undergrazing and scrub encroachment. Improvements to management regimes are under way on or being discussed for 11 of these declining units.

Overgrazing was a significant factor on only one of the units declining in condition, although it was noted as a problem on a further 9 units. All of these units are in agricultural use,except for one grazed by horses. One unit is recovering from the effects of overstocking, whilst two others are also improving but further reductions in stock numbers are required. On most of these units it should be theoretically possible to achieve a reduction in stock numbers.

4.9.2 Management and Grazing Animals

Figure 13a: Graze and Hay Cut and Figure 13b: Graze



"Mixed" grazing included any combination of sheep, cattle and horses. The highest proportion of units in good condition is among sheep grazed sites, followed by those grazed by cattle. The small number of sites grazed by horses alone limit the confidence of comparisons, but differences are still suggested by the results

4.9.3 Management Units Cut for Hay or Mown

Twenty grassland units are managed by hay cutting, of which 30% are recorded as sub-optimal declining in condition. The reasons for decline include a pollution incident (outside the occupier's control); storage of cut material on the site; and lack of aftermath grazing. The occupiers of a further six units would also prefer to manage their grasslands by grazing as well as mowing/hay cutting. The only two management units on arable farms that were recorded in optimal condition are both cut for hay.

4.9.4 Hay Cutting and Grazing

58 management units are cut for hay and grazed. None of these were recorded as declining in condition. On some of the units which are only either grazed or mown, it was reported that hay cutting and grazing would be a more beneficial management regime, but was not always possible.

4.9.5 "Other" Management

19 units had management classified as "other". The division between this and the next section is slightly arbitrary, as a few of these units have very little active management and could almost be described as unmanaged. Only one unit is in agricultural management and most are managed for conservation or recreation. Grazing would be inappropriate on several and most of the others would be difficult or impossible to graze. It is worth noting that out of these 19 units only 4 are in any incentive scheme.

4.9.6 Unmanaged Grassland Units

These are units that are not actively managed and most could be described as neglected. Two of the units are in optimal condition, maintained by occasional management and wild grazers. 14 units are in sub-optimal condition, of which 2 are recovering (as management is being introduced), 1 is currently stable (but will decline unless light grazing is introduced) and the other 11 are declining. On six of these units in sub-optimal condition grazing should be reintroduced but on a further five this is currently unlikely to happen. On most of these units additional investment is required before grazing is possible.

4.9.7 Management of Scrub and Weeds

On the 206 grassland units for which management information was given:

i. both scrub and other weed control were recorded on 44 units (22%);
ii. scrub control only was recorded on 48 units (24%);
iii. weed control, other than scrub, was in progress or about to start on 43 units (21%).

Information on the prevalence of "problem" species was not available for most sites due to a lack of baseline data. Scrub cover was noted as a problem on 9% of the 110 units where no scrub control is currently taking place. Scrub species were not mentioned among problem species on 78 (85%) of the 92 units on which scrub control occurs. Only on 7 (8%) of these units was scrub noted as a problem. The most common weed control noted was thistle topping.

4.10 Maintenance of Site Interest by Current Management

One of the questions asked in the site condition assessment was whether the current management would or would not maintain ("Maintain" and "Not Maintain") the interest of the grassland or aid its recovery ("Recovery"). Figures 15 and 16 show the summarised results (units where a dynamic condition assessment were not given are included in "optimal" and "sub-optimal declining" categories).

Figure 14: Judgements of Current Management

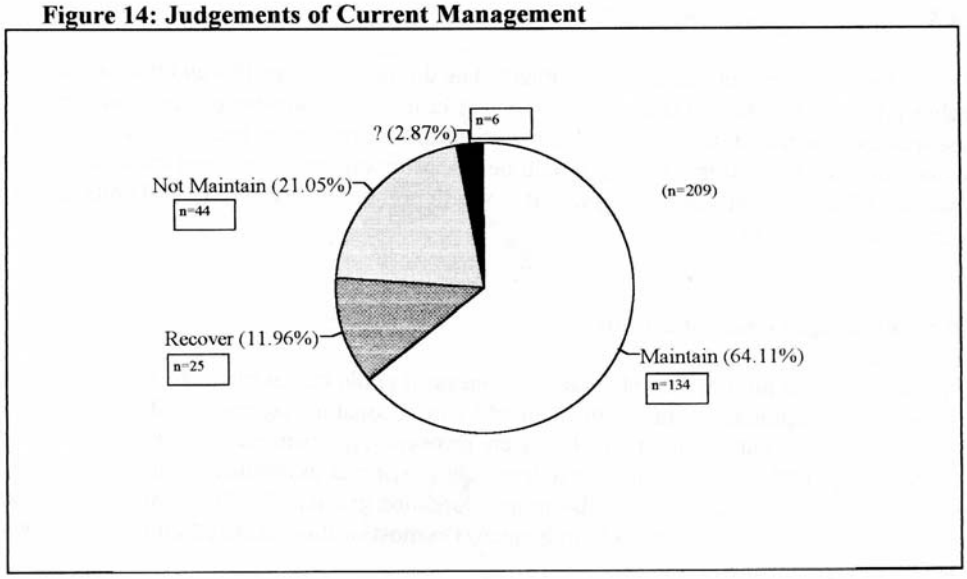
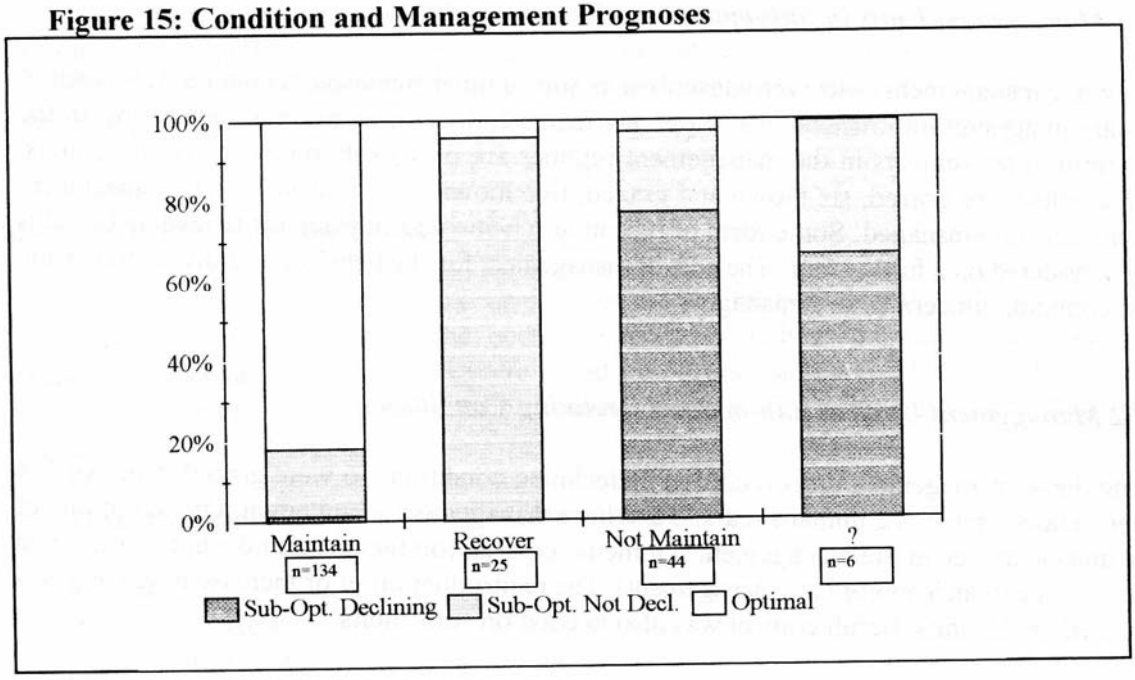


Figure 15: Condition and Management Prognoses



On 76% of the grassland units the current management is expected to maintain or aid the recovery of the grassland interest. Conversely, current management is considered unlikely to maintain the interest of the grassland on 21% of units.

Recent management changes were also recorded (see summary table in Appendix 6). Management had recently changed on many of the grasslands showing recovery in condition. Management changes were noted on fourteen of the units declining in condition. This included the cessation of grazing or other management within the last five years on six of the units and the introduction of improved management regimes on four units.

The 65 units recorded as "sub-optimal stabilised" and "sub-optimal declining" in condition are of particular concern. The information collected on these is summarised in the following two sections. It is thought that the current management would not maintain the current interest of 39 of these in the long term. Improvements to management are being introduced or planned on 31 of the 65 units. Among the others, improvements should be possible on 27, but there are 7 units where attitudes or physical constraints currently make this unlikely.

4.10.1 Management Units in Sub-optimal Stabilised Condition

Twenty-five management units were described as sub-optimal stabilised in condition. Sixteen of these are in agricultural ownership and two are managed by conservation organisations. In the short term improvements in the management regimes are only likely on eleven of these units. Twelve units were grazed, six mown and grazed, two mown only, four in "other" management and one units is unmanaged. Some form of incentive scheme was in place for twelve units and is being considered on a further four. The cost of management for the benefit of nature conservation was a common concern among managers.

4.10.2 Management Units in Sub-optimal Declining Condition

Among the 40 management units recorded in declining condition, 16 were grazed, 5 mown,5 in "other" management, 12 unmanaged and 2 where management is unknown. On all but one of these units a change in the management regime is required (on the one unit decline is attributed to causes other than inappropriate management). The reintroduction of or increase in grazing was suggested on 28 units. Scrub control was also needed on some units.

The patterns of ownership and management are of interest. Twenty-one units are in agricultural ownership. All 7 of the management units on arable farms are unmanaged. Improvements in management regimes are being introduced or are planned on 20 units. Improved management is possible on a further 11 units but here there are constraints, particularly cost. There are 7 units where there is little opportunity for improving management in the near future.

4.11 Loss and Damage Records for the Sample Grasslands

The loss and damage (L&D) records for the SSSIs in this sample survey were checked. The results are given below. There is no apparent correlation between unit condition and whether damage to the grassland had been recorded for that SSSI. More declining units are on SSSIs where loss and damage have been reported, but this difference was not statistically significant at p=0.05.

Condition:	No L&D Recorded for Grassland:	L&D Recorded for Grassland:	Proportion with L&D Recorded:
Optimal Maintained	72	23	0.24
Optimal Recovered	6	3	0.33
Sub-optimal Recovering	22	7	0.24
Sub-optimal Stabilised	21	4	0.16
Sub-optimal Declining	24	16	0.4

40% of these records were for insignificant damage and most of the rest were classed as short term damage. Physical loss of grassland area within the last few years was reported on 21 units (10%) in the sample survey. Almost all of these were very small areas and causes included natural events, third party damage and work with deemed planning permission being carried out.

4.12 External Threats to the Grasslands

These are threats outside the occupier's control. They are not the only threats to the grasslands, as there are also threats linked to the occupier's actions, such as the cessation of active management. Potential external threats were noted on 63 units and were quite evenly spread between management units in optimal and sub-optimal condition. The following figures show the main categories of threat reported:

Threat Category:	**Number of Units:**
Pollution	25
Water Level Related	19
Recreation-general	10
Recreation-motorbiking	5
Invasive Plants	4
Other	8

The threats related to water level were almost all possible lowering of the water table. The recreational threats described as "general" include visitor pressure and vandalism. Invasive plants were only included here if a specific seed source was mentioned. The threats grouped as "other" include road scheme proposals and development of land adjacent to the SSSI. More than one threat was recorded on 8 management units

One threat which was not included in the above figures relates to the location of grasslands. Five management units had particular problems due to their urban locations. On all of these grazing was difficult or impossible and additional problems were encountered. Twelve other units had isolation related threats or problems. Six of these units are optimal maintained in condition but are surrounded by arable land and difficult to get stock to or could be subject to the adverse effects of spray drift.

4.12.1 Pollution on Grassland SSSIs

Pollution incidents on SSSIs are believed to be under-reported. Many forms of pollution damage would be difficult to identify with confidence from a single site visit. Both pollution incidents and threats, however, have been noted on site condition assessment forms. None were reported on 184 management units (87%), 17 units (8%) had a possible threat/ incident and a significant threat or known incident was reported on 10 units (5%). The 27 units for which a possible or actual pollution incident or threat was reported suggest that a pollution incident or threat occurs on 12.8% ± 4.5% of all grassland management units.

The pollution records are divided as follows:

I. Actual incidents or strong evidence of a threat

   i. hay dumped on part of the grassland on 2 management units
   ii. spray drift on 3 units
   iii. runoff from agricultural or sewage sources on 5 units

II. Suspected threats

   i. spray drift on 4 units
   ii. pollution via water or runoff from adjacent fields on 9 units
   iii. miscellaneous on 4 units

4.13 Incentive Schemes for Managing SSSI Grasslands

Some form of incentive scheme was helping to improve the management regimes of over 50% of the grassland units surveyed. Figures 16a and 16b below show the different conditions of grassland in units being managed with and without the help of incentive schemes.

Figure 16: The Condition of Units without Incentive Schemes

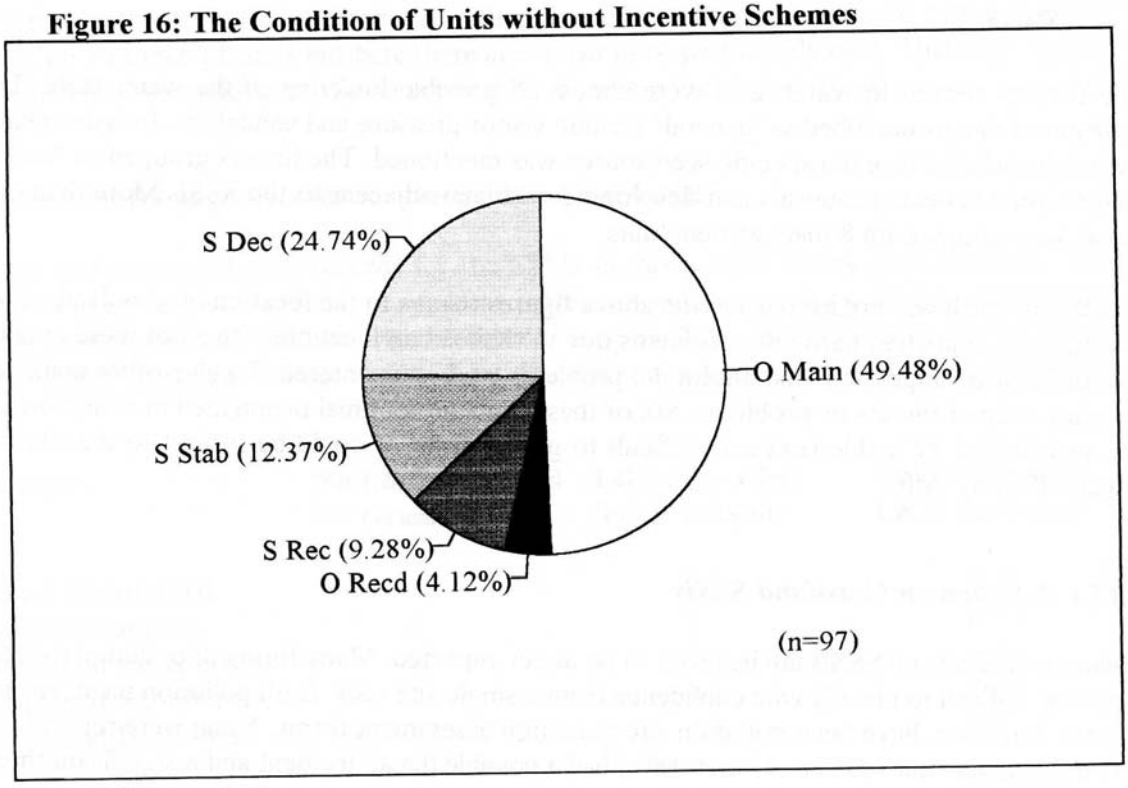
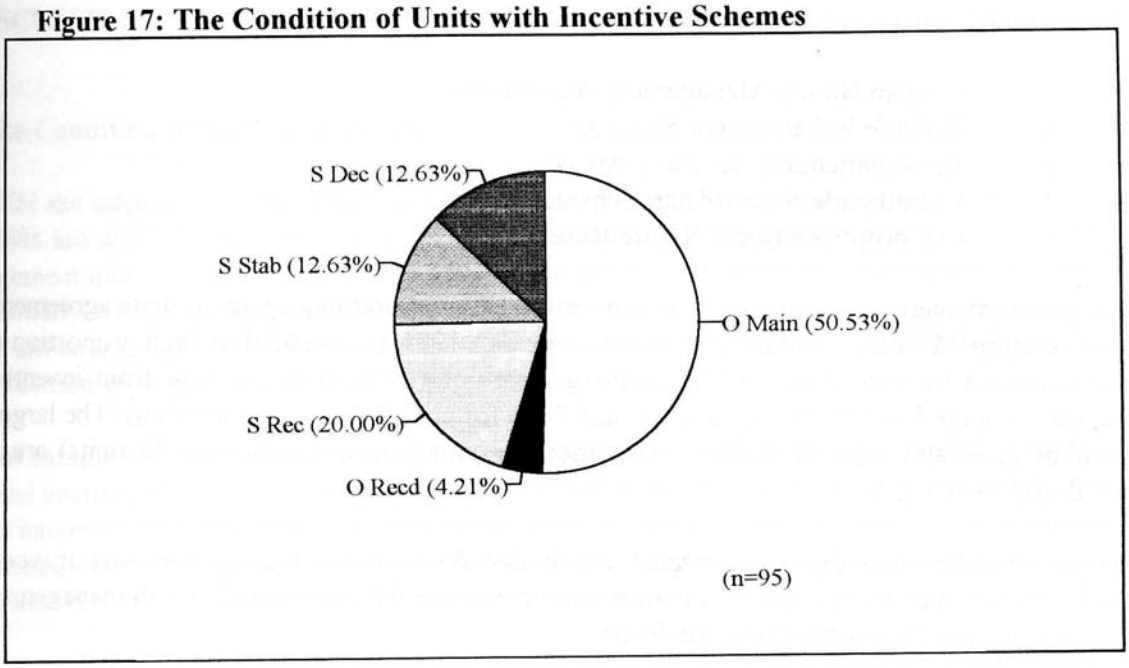


Figure 17: The Condition of Units with Incentive Schemes



It is not possible to compare the condition of units with incentive schemes against what their condition would have been without this help. Figures 16a and 16b show that, for approximately equal numbers of grassland units managed with and without the aid of incentive schemes, the main differences are that about twice as many units are sub-optimal recovering and half as many are declining in condition within incentive schemes. It is also worth noting, however, that approximately equal numbers of units are optimal maintained/recovered and sub-optimal stabilised in condition both with and without the influence of incentive schemes. This is difficult to interpret as their previous conditions are not known and could be due to good targeting of resources or because people managing their land well may feel that they do not require financial help. The group of units with incentive schemes, however, have a higher proportion recovering and a lower proportion declining in condition. This suggests that schemes in specific cases are successful in helping to improve management for nature conservation.

4.13.1 Types of Incentive Scheme

Few management units had more than one incentive scheme in place. The most common schemes are:

i. English Nature Management Agreements
ii. Countryside Stewardship Schemes
iii. Environmentally Sensitive Areas
iv. English Nature Reserves Enhancement Schemes

Schemes being considered are, in order of frequency:

i. English Nature Management Agreements
ii. Wildlife Enhancement Schemes
iii. Environmentally Sensitive Areas
iv. Countryside Stewardship Schemes
v. one proposed Local Nature Reserve

Agricultural managers have the highest proportion of grassland management units agreements under Section 15 of the Wildlife and Countryside Act 1981 as amended. A high proportion of units managed by individuals (55%) and organisations (65%) have no help from incentive schemes, compared to 33% for agriculture and 34% for conservation organisations. The largest group of grassland units declining in condition without incentive schemes (15 units) are in agricultural ownership.

There are 30 units where the manager said that the ideal conservation management was or would be difficult and they had no help from an incentive scheme. 12 of these (6% of all management units) are in sub-optimal declining condition.

5. DISCUSSION AND CONCLUSIONS

5.1 The Condition of SSSI Grasslands

The SSSI site safeguard system cannot be judged in isolation in studies such as the sample survey as SSSIs are also affected by a range of other schemes. As an example almost 50% of the management units studied in this survey have or are being considered for an incentive scheme. Additionally, a high proportion of SSSI land is controlled by conservation bodies. The sample survey can be seen as a series of case studies confirming the need to treat each SSSI individually. Some relationships, however, have been suggested by this work.

80% of sample units are under management that should maintain or aid the recovery of their grassland interest, whilst the remainder are under management regimes unlikely to maintain their current interest in the longer term. On most of the latter, however, improvements in management are planned or are thought to be possible. There remain 3.5% of units where occupier attitudes or physical constraints currently make improvements unlikely.

There were a small number of units where the occupier did not wish to participate in the survey. The nil returns for this and those due to other reasons are a potential source of bias in the final sample.

5.2 Management of the Sample Survey Grasslands

On the grassland management units studied in the sample survey, the most important factor directly affecting condition is management. Ownership has an important indirect influence by affecting the extent to which appropriate management can be achieved. Lowland grasslands of nature conservation interest often do not fit easily into agricultural systems. This is particularly clear when arable farms are considered. The lack of SSSI grassland management units on purely dairy farms suggests that SSSI grassland is also difficult to manage within these intensive enterprises. Problems appeared to be more common on calcareous grasslands. That a higher proportion of these are within arable farming systems may be a contributory factor. Another possible reason is that remaining unimproved calcareous grassland is often on remote or steep land and even if grazing occurs this may be at a lower intensity than the land's traditional use. Neutral grassland may be more accessible and can often give a hay crop as well as providing grazing.

None of the SSSI grassland management units which are cut for hay and grazed are declining in condition. Where this management has continued it can usually be adapted to follow the traditional pattern for a site without causing great disruption to a whole farm's business. This management does not fit into the business of some farms, so extra help from financial incentive schemes may be needed to maintain management. Some of the units which are just grazed or mown should have both but this may not be possible to arrange, for example on some urban sites where grazing would not be an option.

5.3 Improving Management Regimes

The sample survey shows the importance of incentive schemes in achieving appropriate management, particularly for recovery management. The managers of nearly 50% of the grassland units had some form of environment related financial assistance. Half of these included an English Nature management agreement. Money is, of course, not the only issue; this is shown by the large number of units in optimal condition where the occupier is not involved in any incentive scheme.

There are a few management units where the occupier does not wish to manage their land with regard to its conservation interest and there are others where practical problems mean that the ideal management is not possible. These situations highlight the need for policy decisions about the time and effort that should be spent on those sites for which instigating appropriate management is very unlikely.

Among the units in sub-optimal stabilised and declining condition, there are 36 where the occupier receives no financial help with management, though on 10 of these schemes are currently being considered. The sample survey results underline the importance of incentives such as the Wildlife Enhancement and Countryside Stewardship Schemes for land within SSSIs as well as in the wider countryside. One encouraging fact is that the highest proportion of managers considering entering a scheme was among those whose grasslands are declining in condition. This implies both good targeting by staff and willingness of the occupiers to make use of the opportunities offered.

On grassland units in poor condition, the suggested solutions usually involved the introduction or a more intensive level of management. Volunteer help may be available for tasks such as scrub clearance, but financial help may be needed with initial outlays such as fencing or the running costs of management. Nearly half the sample units were in agricultural occupancy. The continuation, and increase, of support for farmers managing sites of wildlife importance is, therefore, vital. The largest group of grassland units declining in condition without incentive schemes are in agricultural ownership. These could possibly be targeted with offers of existing schemes, such as management agreements or Wildlife Enhancement Schemes if appropriate. The large financial inputs needed to reintroduce grazing was a block to improvement on some sites. The sample survey suggests there should also be consideration of whether the financial help for non-agricultural occupiers could be improved. On 40% of the units managed by conservation organisations, managers felt that the ideal management was or would be difficult to achieve, though help from English Nature is becoming more available as the Reserve Enhancement Scheme expands. Individuals and organisations outside agriculture and conservation manage less than a third of the units investigated, but the low proportion of these with any financial help causes some concern. This raises further questions about whether help is not wanted, not known about or not available.

In these times of limited resources lack of suitable finances will inevitably constrain both expansion of existing schemes as well as the creation of new schemes for grassland types not already covered. Nevertheless, this should not preclude funds being sought and being made available if and when appropriate. It is also clear that aspects of agricultural policy need to be addressed in order to reduce negative impacts on semi-natural grasslands and their management. For its part English Nature is addressing these issues through its Grassland and Lowland Strategies together with various agricultural plans.

5.4 External Threats to the Sample Grasslands

Possible threats outside the occupier's control were noted on 30% of the management units. The most common threats were pollution and those related to changes in water levels. Some of the pollution threats could be dealt with by negotiation about the use of adjacent land to produce buffer zones, but others would have to be dealt with at a higher level than the individual occupiers. Solving these, and the threats from changes in water levels, would probably involve the proposed Environmental Protection Agency. English Nature has a water level management plans initiative with the National Rivers Authority for important wetland sites, including some grassland SSSIs. Concern about the effects of water level is not restricted to wet grasslands. Some threats were under planning control, including roads and landfill developments. Those linked to recreation may be more difficult to deal with as the damage is done by third parties over whom little control can be exercised.

5.5 The Sample Survey Approach

The SSSI sample survey has provided much useful information on the condition of lowland grasslands on SSSIs at one point in time, as well as the factors potentially affecting this condition. It therefore provides a baseline against which to make future comparisons and possible changes to be observed. The Conservation Monitoring Resource Team will be carrying out an assessment of the sample survey approach to determine:

i. if the survey should be repeated and, if so,
ii. what modifications, if any, may be required to the methods.

The assessment will consider the roles of the Site Unit Recording Form (SURF) system of monitoring and English Nature's SSSI Information System (ENSIS). These systems will be capable of providing condition assessments on the interest features on all SSSIs.

6. ACKNOWLEDGMENTS

The concept of a national SSSI sample survey is outlined in "A Monitoring Strategy for SSSIs" (Felton 1992). The author of this paper, Mark Felton, gave advice throughout the project. The responsibility for the project fell to George Hinton until the appointment of a project officer, after which he oversaw the project and was the main source of advice. The suggestions of Richard Jefferson and Heather Robertson of Lowlands Team and the many Local Team staff, who helped test and comment on the questionnaire and site condition form, were vital to producing a workable survey. Thanks are also due to those people both within and outside English Nature who commented on the draft of this report. The help of the occupiers and managers of the SSSI grasslands who agreed to answer questions and allow access to their land is very much appreciated. I must thank all the Local Team staff who did most of the difficult work on this project.

7. REFERENCES

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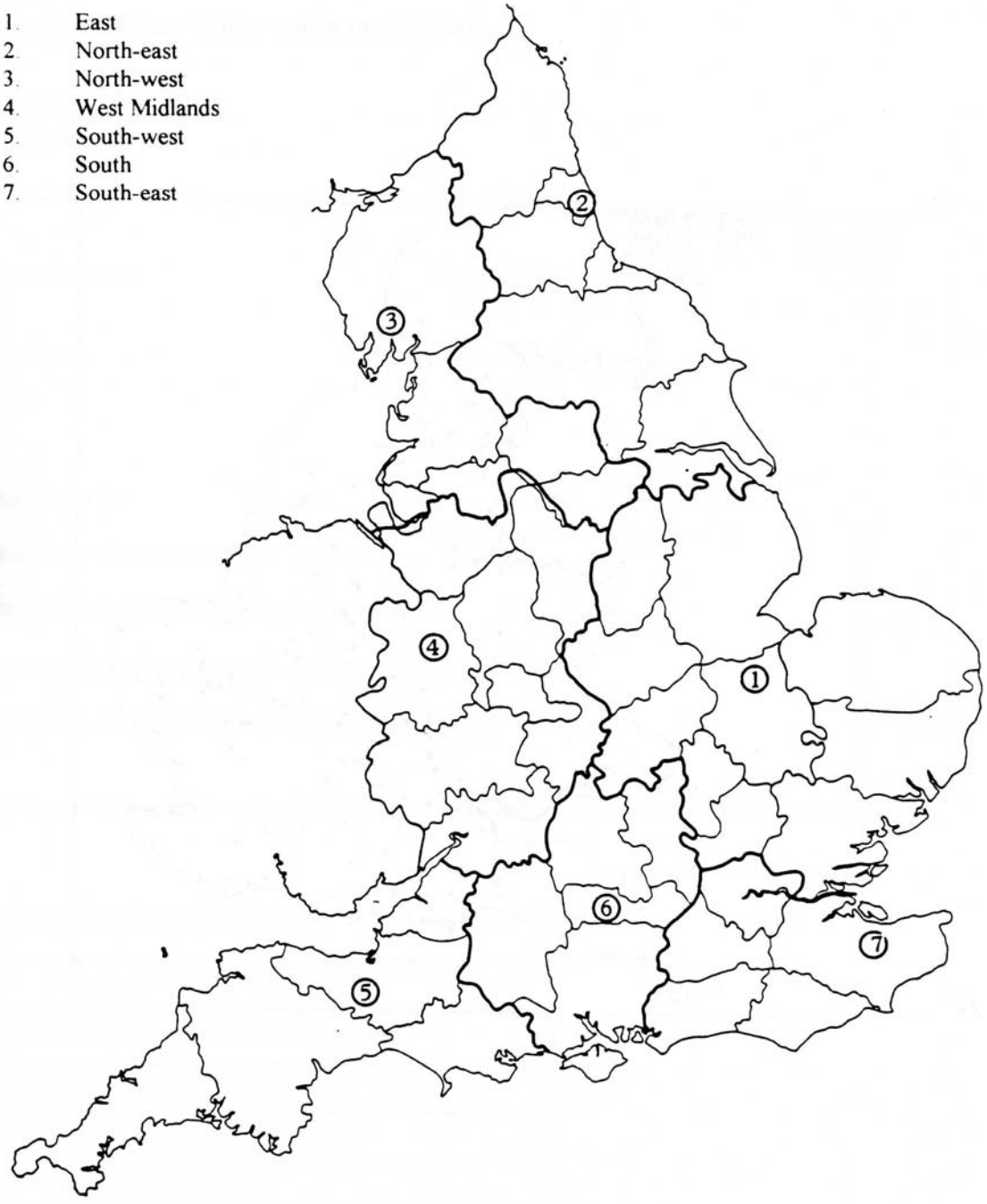
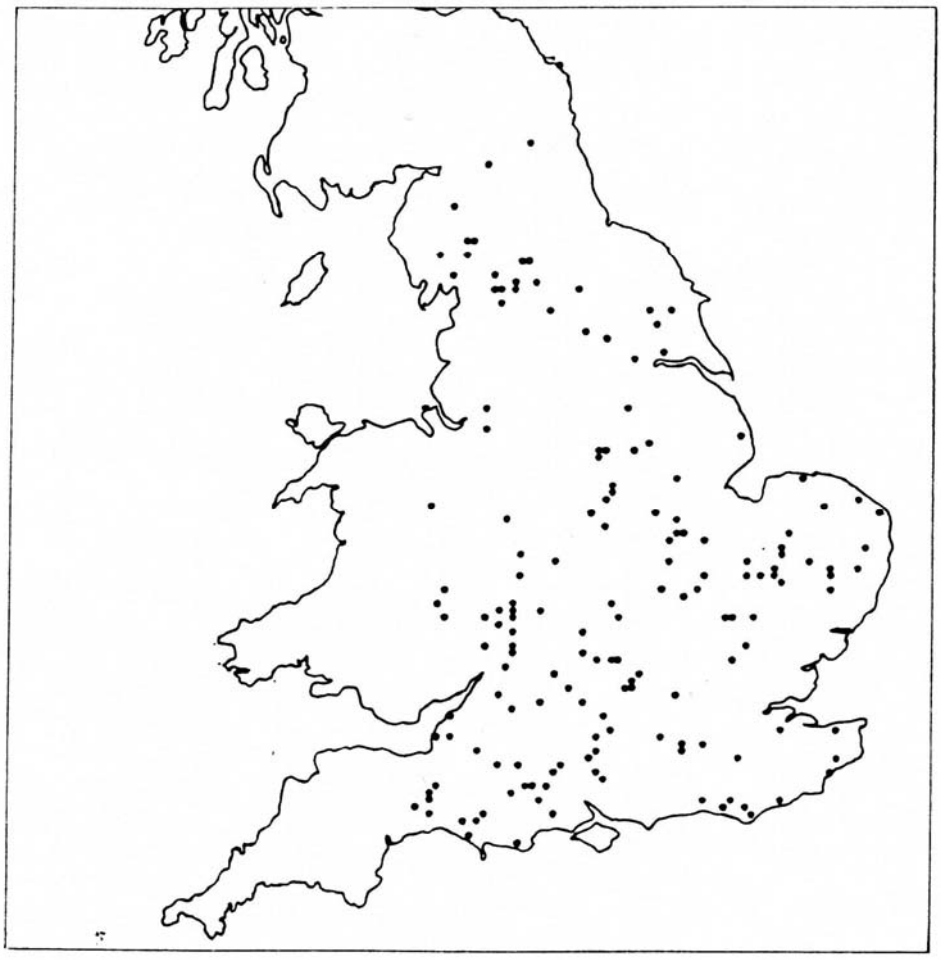
Appendix 1

English Nature's Regions - pre- April 1994

1. East
2. North-east
3. North-west
4. West Midlands
5. South-west
6. South
7. South-east



Distribution of Grassland SSSIs in the 1993 Sample Survey



Appendix 2
NATIONAL SSSI SAMPLE SURVEY QUESTIONNAIRE - Grasslands 1993
Section 1

Complete this page before visiting the occupier.

SSSI Name:
SSSI Area:

Owner of site: SIM unit number:

Occupier Name: Field ref (1:2500 OS):

Address: Grid ref: SSSI:
m.unit:

Telephone No: County:

Total area of grassland within SSSI in ha:

Area of SSSI Grassland management unit in ha:

Is the grassland in agricultural management? Yes/ No

If not then state the current usage of the land:

Is the grassland subject to an English Nature or Local Authority management agreement (specify):

Is the grassland subject to any other form of incentive scheme:

Countryside Stewardship Scheme	
Environmentally Sensitive Area	
National Park Agreement	
Nitrate Sensitive Area	
Other scheme (specify)	

QUESTIONNAIRE

Visit by: Date:

Specify whether areas are in Hectares or Acres

2 OWNER/ OCCUPIER DETAILS

2.1 Is agriculture the occupier's main business? (Yes/No)
if 'no', specify _____

2.2

Total area of land occupied	Area
Owner/ occupier	
Full agricultural tenancy	
Short term agreement	

3 WHOLE FARM ENTERPRISE

3.1 LAND USE

	Area		Area
Cereals		Temporary grass	
Oil seeds		Permanent grass	
Beet		Rough grazing	
Potatoes		Forage crops	
Fruit		Other vegetables	
Set aside		Woodland	
Other			

3.2 LIVESTOCK

	Numbers		Numbers
Dairy		Calf Rearing	
Beef		Sheep	
Pigs		Poultry	
Horses		Other	

4 USE OF SSSI GRASSLAND

4.1 Is it used for: Tick box

Grazing only	
Mowing only (hay)	
Combination	
Other (specify)	

4.2 Details of grazing livestock on SSSI:

Controlled grazing	Approx. number/ stocking density	Approx. grazing dates
Uncontrolled grazers (rabbits, deer etc)	Level of grazing	

4.3 Mowing dates (approx):

4.4 Other management on SSSI grassland: Tick box

Scrub control	
Weed control	
Rolling/ harrowing	
Drain/ ditch management	
Burning	
Flooding	
Other (Specify)	

4.5 Record if there have been any recent changes to management:

	Yes/ No
Grazing regime	
Mowing regime	
Other (Specify)	

Specify major management changes:

5 FEEDING POLICY

5.1 Does farm feed hay, silage or other supplementary feed:

5.2 Is fodder made on farm or purchased:

5.3 How is fodder made, own machinery or contract:

6 MANAGEMENT FOR CONSERVATION

Does the owner/occupier think that the ideal management for maintaining the grassland's nature conservation interest is difficult to put into practice?

Appendix 3

NATIONAL SAMPLE SURVEY OF SSSI GRASSLANDS 1993

Site condition, management and threats:

SSSI Name:

Before the visit

1. Has the grassland been surveyed for NVC type during the last 5 years? (Yes/No)

   If answer is yes, what is the NVC type(s):

   If no, give the habitat type(s):

2. State the objective(s) for the grassland and associated interest:
   (From Site Management Statement if available)

---

3. Site Integrity

Site Area: Any loss	a) **at the boundary**?	(Yes/No)	Extent:
	b) **inside the grassland**?	(Yes/No)	Extent:

4. Current condition for the grassland management unit and associated attributes (sensu Rowell, see guidance notes) - circle one option on left; give more detail on right if possible :

Optimal	Maintained
	Recovered
Sub-optimal	Declining
	Stabilised
	Recovering
Destroyed or partially destroyed (give %)	

5. Species/groups Any indication of change in status for

   a) **Characteristic species:**

   b) **Criteria species:**

   c) **Species indicative of poor management or eutrophication:**

6. Is current management likely to:

i) **Maintain the interest features for which the site was notified** (Yes/No)

ii) **Aid the recovery of the interest** (Yes/No)

7. If management is not appropriate, how is objective(s) in (2) to be achieved:

8. i) Any evidence of any Potentially Damaging Operations (Yes/No)

ii) If Yes then circle on Site PDO list

iii) Was the PDO: **consented**
unconsented
carried out after 4 months notice
an emergency operation

Circle appropriate option

iv) Temporal aspects - were the activities (see definitions in guidance notes):

short-term damaging activities
repeated damaging activities
continuing damaging activities (eg overgrazing, neglect)

Circle one option

9. Are there external threats affecting the grassland or associated interest (Specify)

10. Is owner/occupier present on site visit? (Yes/No)
Date of Visit: Survey completed by:

Appendix 4

Guidance Notes for the National Sample Survey of SSSI Grasslands, 1993

You should have been sent a questionnaire and a site condition form for each selected SSSI in your area. The questionnaire should have a site map on the back of the first page and some of the details in section one will already have been written in. You need to fill in both the questionnaire and the condition form. For any site, the person filling in the form should ideally be the owner/occupier's usual point of contact with English Nature.

The grassland management unit may be the whole SSSI or part of it (e.g. an SIM unit) and may include one or more fields managed as a unit. A single management unit should be investigated on small SSSIs. For large multiple occupancy SSSIs a maximum of three owner/occupiers should be contacted and one survey done for each of them (The availability of NVC information could affect your choice of management units). On some large sites where some of the grassland management units have wildlife interest and others do not, please choose from those with interest. I don't have enough information to know which owner/occupiers manage grasslands on multiple-occupancy sites, so you will need to identify them and choose three at random (rather than choosing the three most co-operative, which would bias the sample). You may be able to combine answering the questionnaire with a visit for another reason. Please photocopy the required number of forms and outline the relevant management unit on the map on each. Some of the grasslands are within NNRs as well as SSSIs; the forms for these should be filled in by or with the site manager. Some questions in the questionnaire will not be relevant to NNRs or other nature reserves, but most will, including those on site management.

Initial contact with owner/occupiers will normally be by letter, outlining the objectives of the survey (see enclosed draft) and asking if you can visit them and the site. If they do not wish to be interviewed face to face, the questionnaire could be answered over the phone, but this would only be a last resort. Obviously, if they do not wish to be interviewed at all there isn't much you can do about it - please let me know about any sites for which the survey could not be done despite your efforts. The questionnaire should be completed before the site visit; the owner/occupier's presence on the site visit may well be advantageous for both of you but is not essential. If the occupier will not answer the questionnaire but will let you visit the site, please fill in the site condition form and as much information as you can on the questionnaire.

Any personal information collected is confidential and will not be published except in summary form without references to individual sites.

Section one of the questionnaire and questions one and two of the site condition form should be completed before the visit. Records of recent site visits should be checked before the visit, and a copy of the PDOs list is needed for question 8 in the site condition form.

Questionnaire

Section 1
Please check any answers filled in by the project officer. The 'grassland area' is taken from the area of habitat classified as B on COREDATA, so it may be out of date.
Field references may not be readily available; whether these can be given or not, please mark the outline of the grassland management unit on the SSSI map on the back of the first sheet of the questionnaire. In the grid references section, "m.unit" stands for grassland management unit.

Section 2
If the answer to 2.1 is no, please indicate the main type of business of the occupier; this doesn't need to be very detailed.
If agriculture is not the occupier's main business, sections 2.2 and 3 may still be relevant (for example, if the occupier keeps livestock on a few fields, including an SSSI). On sites managed by, for example, a wildlife trust the exact number of livestock owned or controlled by the group is not important as long as they have the resources to organise an effective grazing (or mowing) regime for the site in question.
Areas for 2.2 include land inside and outside the SSSI.

Section 3
3.2 Include followers with "Dairy" rather than "Calf rearing".

Section 4
This section just refers to the management unit you are investigating. Adapt this section as appropriate if the management unit includes more than one field, with different management details. In 4.4, fertiliser applications should be noted as 'other', with details of regime beside the box. This was not listed specifically as, although it is part of the normal management on some sites, it is a PDO on others. If the answer to any part of 4.5 is yes, please describe important changes below the box.

Section 5
The rationale for section 5 is that factors such as on-site supplementary feeding can affect the grassland. Also, these details will affect the ease with which, for example, the management of a hay meadow can be fitted into the whole farm enterprise.

Section 6
This could be taken as a "Yes/No" question but is for use as an opening for discussion. It may be answered earlier in the conversation, but is a chance for you and the owner/occupier to discuss problems and possible positive management. Any external threats to the site discussed with the owner /occupier could be noted here or under question 9 on the site condition form.
You may wish to ask this question in two parts - i.e. does the owner/occupier know what the ideal management is, and is it difficult to put into practice? You need to think about this question before meeting the individual owner/occupiers, especially what you would say if they don't know how they should manage the site and want your advice.
If anything is discussed which you feel would be relevant but is not covered by any of the questions, please note it after section 6.

Site Condition Form

Questions 1 and 2
These should, as noted above, be answered before the site visit. The 'objectives' in 2 will probably be quite broad. Their source will depend on the work which has been done on the site - at best they can be taken from a Site Management Statement or management plan; if no more information is available they could be based on the interest features listed on the criteria sheet. Please note the source of the 'objectives'. How specific the 'objectives' are for a site will affect the answers to questions 4 and 6. Ideally the objectives would set a standard against which site condition and management could be judged. There will also be variation between sites depending on the interest of the grassland (for example, on a site with ornithological interest the grassland might only need to be present and of a suitable structure while on other sites the composition of the sward will be of much more concern).

Question 3
Site integrity: relevant details from SIM files could be noted here.
"Loss" refers to *physical* loss of site area (e.g. by ploughing up the grassland). 'Loss' of grassland through habitat change (such as scrub encroachment) should affect your answer to question 4 rather than 3.

Question 4
For more information see the JNCC report 'Common Standards for Monitoring SSSIs' by T.A. Rowell. This section will obviously involve a subjective decision, based on your experience and knowledge of the site. This set of terms was devised for use in the monitoring of a site for which clear objectives have been decided and there is good knowledge of the past condition of the site. If you know the site well enough you can choose an option including the 'dynamic' element on the right of the table (see definitions below). If you do not feel able to do this, choose an option from optimal, sub-optimal or destroyed (the three basic options on the left of the table), judging the condition of the grassland against the objectives. 'Optimal' condition means that the nature conservation objectives are being met and condition is at least within the limits of acceptable change.

Circle one option and write explanatory notes at the side if you have doubts about the category chosen. If you feel that the grassland cannot be described by a single category, note the interest features in each category. Judgement should be based on the site visit, management questionnaire and any other recent information available (e.g. if there was a SIM visit this year or fixed point photography records). The site visit should be a brief inspection rather than a detailed investigation, unless you are particularly concerned about specific aspects of the site condition. If the answer to this question is based on more than just the site visit, please state other sources of information.

Rowell's definitions of the terms used:
Optimal Maintained - at least within limits of acceptable change; nature conservation objectives are being met.
Optimal Recovered - after being sub-optimal, returned to a condition within the limits of acceptable change.
Sub-optimal Declining - condition of the interest feature has declined since last observation.

Sub-optimal Stabilised - sub-optimal but neither declining or recovering.
Sub-optimal Recovering - showing trend towards a condition within the limits of acceptable change; for example, may be after a damaging operation or due to positive management.
Destroyed or partially destroyed - all or part of the interest feature damaged beyond hope of recovery.

The diagram reproduced on the last page of the guidance notes is taken from the JNCC report and the bottom half shows the process of decision between these terms.

Question 5
If the answer to any section is 'yes', please specify. Please don't leave this section blank; if the answer is "don't know" rather than a yes or no, then write it in. The categories used in question 4 might be useful.
5 b) 'Criteria species' are those of individual importance on citation / criteria sheets.
5 c) For information, a copy of John Hopkins' list of 'negative' indicators in semi-natural grassland is given on the next page.

Question 6
This refers to all the interest features; please specify any with which you can see problems.
Questions 6 and 7 are very important, even though they may seem difficult to answer. These are aspects which have rarely been recorded on site visit forms but are of obvious significance. As with questions 2 and 4, the detail of the answers will depend on the work which has been done on the site and how familiar you are with it. Sources of information other than the site visit (particularly the questionnaire) can help with this question.

Question 7
This obviously links with question 6. It should not be a detailed management plan, but suggestions for improved or positive management (e.g. reduce stocking rate or change timing of cutting or grazing).

Question 8
These are more standard questions for site monitoring. This may overlap with other questions but, for example, on-site supplementary feeding could affect the site interest and would not be noted elsewhere on the form. If there is more than one PDO, write PDO numbers next to appropriate categories in sections 8 iii) and 8 iv).
8 iv) There may be PDOs which are occurring but not damaging the site.
These terms are defined in Terry Rowell's report as follows:-
Short term damaging activities - "activities that last for a restricted period of time and, once they have occurred, would not normally be, themselves, amenable to management. Their consequences, however, last for longer periods, although the subsequent period may be devoted entirely to recovery", e.g. pollution incident.
Repeated damaging activities - "short term damaging activities that affect an interest feature more than once within a period of, say, ten years."
Continuing damaging activities - "are expected to continue over an extended period with no obvious end point", e.g. overgrazing, neglect.

Question 9
This is, again, a more standard question.
The project officer will investigate other sources of information for relevant widespread threats to sites (e.g. acid deposition).

The work should be done and forms returned to me by the end of May 1994.

If you have any further questions about the Sample Survey please contact me: I am based in Northminster House; I have been allocated some T&S for visiting regional offices; and my direct line number is 0733 318310.

Claire Sketch
Monitoring Strategy Project Officer

'Negative' Indicators in Semi-Natural Grasslands

List drawn up by Dr John Hopkins. The species chosen were intended to indicate increasing nutrient status which was undesirable in calcicolous grassland or neutral meadows. However, Dr Hopkins recommended that the abundance of each species at a particular site was important as the species can occur at low levels in good grassland.

Alopecurus pratensis	Meadow Foxtail
Bromus hordeaceus	Soft Brome
Lolium perenne	Perennial Ryegrass
Anthriscus sylvestris	Cow Parsley
**Cirsium arvense*	Creeping Thistle
Cirsium vulgare	Spear Thistle
Galium aparine	Cleavers
Heracleum sphondylium	Hogweed
Rumex crispus	Curled Dock
Rumex obtusifolius	Broad-leaved Dock
**Senecio jacobea*	Common Ragwort
Taraxacum officinale agg.	Dandelion
Trifolium repens	White Clover
Urtica dioica	Nettle

* May also increase due to overgrazing

The National SSSI Sample Survey

Within English Nature there is already ongoing monitoring at the level of individual sites (varying from basic SIM and loss & damage reporting to SQM) and more detailed recording on NNRs. The current statistics can only show reported cases, rather than giving a picture of the 'health' of the SSSI series as a whole.

Until now there was no attempt to investigate the condition of the SSSI series, which would allow assessment of how well the system is working to help English Nature adapt site safeguard, monitoring and management policy and identify new issues which need to be considered. This would check whether routine work focuses on the important issues for particular types of sites and provide an overview which would help regional staff to set their own experience in a wider context.

This gap is hopefully to be filled by the National SSSI Sample Survey, coordinated by Claire Sketch. This is separate from the recording of day to day site related activities and is a *survey* of the condition of the SSSI series rather than part of the *monitoring* of the condition of individual sites. It is a rolling programme, beginning in 1993, which focuses on one habitat type each year and investigates the condition and the factors affecting the condition of a sample of the sites containing that habitat around England.

The objectives of the survey have been summarized in the English Nature Monitoring Strategy as:-

-Analysis of the pattern of ownership and farm business in relation to the capacity to achieve appropriate and effective management
-Analysis of the condition of a representative sample of SSSIs of each broad habitat type
-Analysis of the main internal and external threats to sites

It aims "to identify the main factors influencing the capacity of occupiers to manage sites and the main external threats to sites. The sample size should be sufficient to identify all influences that affect 5% or more of sites of each broad habitat type."

The first habitat being targeted is grassland. Problems which occurred in the early planning stages should be avoidable if we learn from experience. The 'site condition form' is also the first widespread use of terms suggested by JNCC, and will act as a trial of them. These terms were suggested for site *monitoring* rather than specifically for this project and the dynamic element (i.e. improving, stabilised, declining) will only be usable on sites which the Conservation Officer knows very well, but the Survey should show some of their potential for use in practice.

Letter to an owner/occupier of a grassland SSSI
The sections in **bold** will need to be adapted for each site.

Dear ,

National SSSI Sample Survey 1993/4 - Grasslands
site name

(mention last visit / contact with them, and, if appropriate, planned visit)

During 1993, English Nature introduced a new project, the National SSSI Sample Survey. Each year this will focus on one habitat type and look at the factors influencing the management and condition of sites containing that habitat. The project aims to give a national overview which will help regional staff providing site management advice by setting their own local experience in a wider context. It will also indicate the strengths and weaknesses of the SSSI system and show where English Nature needs to target more effort in the future. The first habitat being studied is lowland grassland. 200 SSSIs containing grassland have been selected randomly, including ---- **(site name)------**

Would it be possible for me to visit you to fill in a short questionnaire and to visit the site? The questionnaire contains a few questions on how you manage the site and how it fits into the rest of the farm business **(adapt as appropriate if not to a farmer)** and any particular management problems. If you are too busy, the questionnaire could be answered over the phone, although I would still need to visit the site **(and it would be an opportunity to discuss any questions they have about the site??, this could be combined with a visit for another reason)** I will phone in a few days to discuss this.

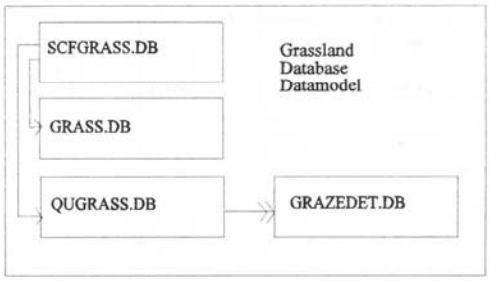
An overview for England will be produced, but it won't contain any details of information recorded for individual farm enterprises and no information about you personally could be obtained by someone reading the published figures. All information given voluntarily will be treated as confidential.

(You may wish to mention Claire Sketch as contact in Peterborough)

Yours Sincerely

Appendix 5 The Paradox Database

The information held in the database is not available due to confidentiality. However, a summary spreadsheet is available for research purposes. Further details should be sought from the Conservation Resource Monitoring Team at English Nature in Peterborough.



The simplified datamodel shows the links between the tables in the Paradox database. SCFGRASS.DB is the main table and contains a record for every management unit and every nil return SSSI. This table contains information from the site condition forms (Appendix 3).
GRASS.DB contains information on the SSSIs selected. Most of this information was taken from CORDATA.
QUGRASS.DB and GRAZEDET.DB contain information from the management questionnaire (Appendix 2). GRASS and SCFGRASS are linked by SSSI code, and SCFGRASS is linked to QUGRASS using a composite key of SSSI code and unit number.

Appendix 6 - Summary Table of Main Factors and Condition of Grassland Units

Units where a condition judgement was not given are not included in this table. Percentages are the percentage of units with a particular 'factor' (i.e. row) which are in a particular condition (i.e. column).

	CONDITION	Opt Main	Opt Rec'd	Sub Rec	Sub Stab	Sub Dec	Total
	Number of Units	95, on 87 SSSIs (48%)	9, on 9 SSSIs (4%)	29, on 29 SSSIs (15%)	25, on 21 SSSIs (13%)	40, on 37 SSSIs (20%)	198 units (172 SSSIs)
FACTOR	Area (ha)	1976	224	362	353	758	3673
NNR		7	0	1	0	0	8
NCR		20(57%)	2	4	4	5 (14%)	35
Occupier	?	0	0	0	0	2	2
	Agriculture	41(46%)	2	10	16	21(23%)	90
	Nature	28 (57%)	2	11	2	6 (12%)	49
	Individual	12 (44%)	1	5	3	6 (22%)	27
	Organisation	14 (47%)	4	3	4	5 (17%)	30
Farm Type	Arable	2(20%)	0	0	1	7 (70%)	10
	Dairy (pure)	1	0	1	1	0	3
	Mixed	18(40%)	2	6	9	10(22%)	45
	Stock	23(56%)	1	5	6	6(15%)	41
	N.A.	51(51%)	6	17	8	17(17%)	99
Management	?	1	0	-	0	2	3
	Hay & graze	39	2	9	6	0	56
	Graze	38	4	14	12	16	84
	Mow	9(47%)	1	2	2	5(26%)	19
	Other	6(32%)	2	2	4	5(26%)	19
	None	2(12%)	0	2	1	12(70%)	17

Grazer	**Cattle**	32(57%)	0	9	8	7(12%)	**56**
	Horses	3	0	0	1	2	**6**
	Sheep	23(59%)	4	4	5	2(5%)	**38**
	Mixed	18(47%)	1	10	4	5(13%)	**38**
	None or ?	18	4	6	7	24(41%)	**56**
Signif. Wild	**Yes**	20	4	10	7	8	**49**
Grazers	**No**	75	5	19	18	32	**149**
Recent	**?**	7	1	4	1	7	**20**
Management	**Yes**	19(32%)	6	18(30%)	3	14(23%)	**60**
Changes	**No**	69(58%)	2	7(6%)	21(18%)	19(16%)	**118**
Will	**?**	0	0	0	0	4	**4**
Management	**Maintain**	94	8	5	18	2	**127**
Maintain	**Recover**	0	1	22	2	0	**25**
Interest?	**Not maintain**	1	0	2	5	34	**42**
Scrub	**Control**	22(49%)	1(2%)	9(20%)	4(9%)	10(20%)	**46**
Weed	**Control**	22(53%)	0	4(10%)	6(15%)	9(22%)	**41**
Both Scrub	**and Weed**	17(42%)	4(10%)	7(18%)	9(23%)	3(8%)	**40**
Neither		34(48%)	4(6%)	9(13%)	6(8%)	18(25%)	**71**
PDOs	**Yes**	13	1	2	7	16	**39**
noted	**No**	75	5	22	12	18	**132**
	Beneficial	2	3	3	2	2	**12**
	?	5	0	2	4	4	**15**
Loss and	**Grassland**	24(44%)	3	8	4	16(29%)	**55**
Damage	**Other**	1	0	1	0	2	**4**
	None	70(50%)	6	20	21	22(16%)	**139**

Habitat Type	**Acid**	11(58%)	3	1	1	3(16%)	**19**
	Neutral	53(60%)	2	11	9	13(15%)	**88**
	Calcareous	28(35%)	3	14	12	23(29%)	**80**
	Marshy	3	2	3	3	0	**11**
Threats noted	**Yes**	26(44%)	4	13	6	10(17%)	**59**
	None	69(49%)	5	16	19	30(22%)	**139**
Conservation management difficult?	**Yes**	17	1	14	15	27	**74**
	No	67	5	12	9	8	**101**
	?	11	3	3	1	5	**23**
Incentive Scheme	**?**	0	1	1	1	4	7
	None	47	4	9	12	24	**96**
	Yes (not S15)	22	2	11	4	6	**44**
	Yes (inc S15)	26	2	8	8	6	**50**

Appendix 7
Tabulation of Statistics Summarized in the Graphs in the Results (Section 4)

Representation of Types of Grassland in the Population and the Sample

Chi squared analysis of representation of different types of grassland in the final sample, with a specific check of the representation of acid grasslands. For this analysis, the 'expected' values for each type are predicted from the proportion of the original population (1322 grassland SSSIs) with that type of grassland.

grassland type	observed (final sample)	expected $\left(\frac{\text{no in popul}}{1322}\right) * 172$	$\frac{(O - E)^2}{E}$
acid	22	31	2.6
calcareous	80	77	0.12
neutral	73	72	0.013
wet/neutral	57	49	1.3
wet / fen	16	16	0

total chi squared is 4.04, which is not significant with 4 d.f.

When the representation of acid grassland is considered a continuity correction is needed.

$$\chi^2 = \frac{(|22-31| -0.5)^2}{31} + \frac{(|150 - 141| -0.5)^2}{141}$$

$$= \frac{(8.5)^2}{31} + \frac{(8.5)^2}{141}$$

= 2.84 which is not significant at 5% with 1 d.f.

Grassland Type	Number of SSSIs	% of total grassland SSSI	Number in Original Sample (actual sample in brackets)	% of sample total
Acid	235	18	25 (22)	12.5 (13)
Calcareous	593	45	95 (80)	47 (47)
Neutral	550	42	83 (73)	41 (42)
Wet Neutral	374	28	67 (57)	33 (33)
Wet neutral /Fen	123	9	20 (16)	10 (9)

Figure 2 The Condition of Units of Different Size

A temporary database was created with fields of (a)unit area/SSSI area, (b)unit area/total area of grass on that SSSI, and (c)total grass area / SSSI area. This was queried with site condition. NB, some SSSIs have more than one unit

It was expected that some relationship between size of unit and condition would be suggested and it would be worth looking at how types of site vary in area, eg large grazed chalk downland in poor condition compared to others. No relationship was apparent.

areas and ratios are divided into quartiles. unit/grass could not be divided thus as nearly half were 1, so the third and fourth quartiles were combined.

Unit area				
Quartiles	**0-2.85**	**<6.51**	**<15.51**	**<6.78.1**
Optimal	26	33	22	30
Sub-Opt, not decl.	17	9	19	13
Sub-Dec	10(19%)	10(19%)	10(21%)	10(19%)

no difference apparent due to area

SSSI Area Quartiles				
	0-6.55	**<19.21**	**<=81.1**	**<1383.7**
Optimal	31	27	31	22
Sub-Opt , not decl	12	19	9	17
Sub. Dec	9(17%)	8(15%)	14(26%)	10(20%)

Grass Area Quartiles(3 sites where grass area is unknown are excluded)				
	>0,<4.61	**<12.11**	**<36.31**	**<1000**
Optimal	30	30	24	24
Sub-opt not decl	16	12	12	17
Sub. Dec	7(13%)	8(16%)	16(31%)	10(20%)

Figure 3 Condition vs Unit Area / SSSI Area

unit/SSSI 'quartiles'(n=209)				
	<=0.165	**0.174-0.493**	**0.5-0.877**	**>=0.879**
Opt	25	23	27	26
Sub-opt. not decl	15	14	19	10
Sub-opt decl	12	15	6	7

Figure 4 Condition vs Unit Area / Grassland Area

unit/grass(n=206 as three lack grass area)			
	>0, <=0.387	**0.388-0.858**	**>0.858**
Opt	15	28	65
Sub-opt not decl	17	13	28
Sub-opt decl	17	9	14

Figures 5 & 6 Condition vs Grassland Type

	Acid	**Neutral**	**Calc.**	**Marshy**
Optimal	14	55	31	5
Sub-Optimal (not declining)	2	20	26	6
Sub-Optimal Declining	3	13	23	0

Figures 7 & 8 Condition vs Type of Occupier

	Optimal	Other Sub-Optimal	Sub-Optimal Declining	Total
Agriculture	48 (49%)	28 (29%)	21 (22%)	97
Nature	30 (60%)	14 (28%)	6 (12%)	50
Individuals	14 (48%)	9 (31%)	6 (21%)	29
Organisations	19 (61%)	7 (23%)	5 (16%)	31

Figures 9 & 10 Condition vs Type of Farm

	Arable	**Dairy**	**Livestock**	**Mixed**
Optimal	3	1	25	23
Sub-Optimal, Not Declining	2	2	11	16
Sub-Optimal Declining	7	0	6	10

Figures 11 & 12 Condition vs Management

	C	G	M	N	O
Optimal	43	46	11	2	8
Other Sub-Optimal	15	30	4	3	6
Sub-Optimal Declining	0	**16**	5	**12**	5

Figure 14 Condition with Different Grazers

		Grazer				
Condition	Management	cattle	horse	mixed	sheep	? or other
Optimal	Graze & Hay	15	2	11	14	1
	Graze	19	2	11	13	1
Sub-optimal	Graze & Hay	6	-	6	3	-
	Graze	18	6	12	10	1

Figures 15 & 16 Condition and Management Prognoses

	M	R	N	?
Optimal	109	1	1	-
Sub-Opt. not decl.	23	24	9	2
Sub-Opt. Declining	2	-	34	4
Total (total 209)	134	25	44	6