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National SSSI sample survey of lowland heathland

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National SSSI Sample Survey of lowland heathland

A Brown, G Hinton, K Porter & D Soden
English Nature

Strategic Development & Reporting Team

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EXECUTIVE SUMMARY

This is one of several pilot surveys undertaken by English Nature to develop a methodology for determining the condition of habitats on SSSIs, based on a sample of sites. They are part of English Nature's integrated approach to biodiversity monitoring on SSSIs. This survey uses the common standards for SSSI monitoring that have been agreed by the Joint Nature Conservation Committee.

Heathland is a rare and threatened habitat and as such is given a high priority in the UK Biodiversity Action Plan and the European Union Habitats Directive. There has been a significant reduction in the area of England's heathland due to agriculture, forestry, mineral extraction and development. The remaining areas are under pressure from encroachment of trees, nutrient enrichment, development and agricultural improvement. Many of the agricultural activities which created and sustained heathland in the past - burning, cutting and grazing - have ceased, as heathland no longer has any significant agricultural value. As a result of these concerns English Nature initiated a project in 1993 to improve heathland management.

This survey, of 93 heathland SSSIs, was undertaken in 1994 and 1995 and analysed in 1996/97. The results show that heathland SSSIs require a substantial investment to undertake the extensive management necessary to achieve nature conservation objectives. Approximately 25% of site units studied were in favourable condition and 26% in unfavourable condition but recovering. This reflects the work in recent years to implement positive management on SSSIs. When assessed by area, 59% of heathland was in favourable or recovering categories. Of particular concern are the 19% of site units in unfavourable but stable condition and the 27% of units in unfavourable declining condition.

The survey shows a strong link between the existence of incentive schemes and the condition of heathland sites. Sites where a landowner has entered an incentive scheme are far more likely to be in good condition. Of site units surveyed, 48% have no nature conservation management agreement or incentive scheme of any kind, and the ability of private owners and many organisations to provide appropriate positive management appears limited. This is to be anticipated as heathland provides little economic return from land uses which might help sustain the conservation interest. Only one third of the sites are managed through controlled grazing, the preferred management technique to maintain nature conservation interest. Natura 2000 sites were in better than average condition, with only 6% of units classed as unfavourable and declining.

The most dramatic consequence of low financial returns from heathland ownership is neglect. The result is often scrub and tree invasion and other problems which cause a decline in conservation value. These changes are reversible with appropriate management. In most cases the management required is well known, but there is a lack of funds to restore and subsequently to maintain sites. The survey predicts that with current management 70% of site units will achieve favourable condition, but 30% will remain unfavourable. The survey indicates where resources should be targeted to achieve maximum benefits.

The sample survey methodology is still developing. Future surveys will be modified in the light of experience and will include stratifying the sample on the basis of Natural Areas, rather than local team boundaries, and will also refine the questions asked to help policy development. Future surveys will benefit from the development of improved conservation objectives and the experience

gained from applying the common standards for SSSI monitoring. This will lead to more consistent judgements over the condition of sites, especially where there are mosaics of communities and a variety of species interests.

Since the survey was started, several management schemes have begun which should contribute to the improved condition of heathlands. The Countryside Stewardship heathland option is now being widely applied. English Nature's own Wildlife Enhancement Scheme and Reserve Enhancement Scheme have been established. A major new initiative, Tomorrow's Heathland Heritage, funded through the Heritage Lottery Fund, has also been launched. All these schemes should have a significant effect upon the recovery of lowland heathland from a position of neglect and decline.

1. INTRODUCTION

1.1 Background

Nature conservation has experienced fundamental change in the last decade as a more integrated and dynamic approach has developed. The EU Habitats Directive and the UK Biodiversity Action Plan have focused priorities and promoted the development of habitat and species targets which have been agreed by a wide community including Government, statutory agencies and voluntary conservation organisations. Improvements in assessing wildlife gains and losses are essential if we are to adjust our individual and collective actions in ways which allow us to achieve these targets. However, the complexity of nature, the number of people and organisations involved and the scarcity of resources presents enormous challenges for the orderly and cost-effective collection, collation, exchange and analysis of data and information on the state of the natural environment.

English Nature has divided the whole of England into a series of areas, Natural Areas, and has described the wildlife characteristics of these areas. Biodiversity Action Plan targets can be related to different areas and action taken to achieve national targets whilst retaining the local character and distinctiveness of each area. Action has also been taken to support the development of the National Biodiversity Network (a partnership between local and national custodians of biodiversity data) and to develop a reporting process for habitat and species action plans. Much of English Nature's work centres around Sites of Special Scientific Interest (SSSIs) which provide an essential component of the overall approach to nature conservation. On these sites a new integrated monitoring programme is being implemented. This programme will define conservation objectives, facilitate the ability of land owners to manage their sites and utilise the experience of professional conservation staff in assessing whether the conservation objectives are being achieved. Knowledge of the condition and management of SSSIs is essential to allow policies and management activities to be adjusted in order to address the new issues and challenges which inevitably arise in an ever changing environment.

The sample survey described in this report is part of this integrated programme of monitoring and reporting. It provides a more detailed assessment against which to check the results of routine monitoring and assessment work undertaken on sites. We are still learning from experience and the sample survey methodology continues to evolve.

1.2 Condition assessment of features

At the centre of the sample survey methodology is the assessment of the overall condition of the features for which the site was selected as an SSSI. This is an approach developed by the statutory conservation agencies to provide a rapid, objective assessment method which can be applied consistently across the UK. Condition assessment is a judgement made on whether the conservation objectives for a feature are being met. The approach requires clarity in the conservation objectives and well trained staff who can arrive at consistent judgements about the condition of features. The lowland heathland sample survey relied upon existing conservation objectives which vary in detail and quality. Hence the data collected were not as consistent as we would like. Nevertheless, assessments made in this way are a major improvement on previous working practice.

The sample survey is designed to take a statistically valid sample, of a particular habitat type, across the whole SSSI series. The survey compliments assessments made during routine visits to SSSIs by operational staff, and additional data is gathered on the management of each feature to

facilitate analysis of the factors influencing the condition. The methodology was developed in the light of experience from the first sample survey of grasslands, but further refinements are required as each broad habitat type poses different problems for the sample survey approach. The conclusions drawn from this survey must be viewed within the context of its experimental approach.

1.3 European context

Lowland heathland has a well documented history of decline in both extent and quality (see Farrell 1993, Tubbs 1995). Since 1800 more than 80% of lowland heaths have been lost, largely due to the impacts of agricultural reclamation, afforestation and building development. Lowland heathland is one of the most threatened habitat types in Europe (Noirfalise and Vanesse 1976). Britain supports a significant proportion of the European lowland heath resource and 13% of the world total (English Nature 1997).

There are both similarities and significant differences between the heathland communities of Britain and Europe, further highlighting the importance of British heathlands in a European context and the need to retain this geographic variation. In 1992, the European Union adopted the Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora, known as the Habitats Directive. The Directive lists 169 habitat types which are considered to be most in need of conservation at a European level. Six heathland types are listed under the heading "temperate heath and scrub", of which two are given priority status in the Directive. These are, 'Southern Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix'* and 'Dry coastal heaths with *Erica vagans* and *Ulex maritimus*', both of which are rare in England and only occur in Devon and Cornwall.

1.4 Lowland heath communities

Farrell (1993) observes that, although heaths can still be found over a wide geographic range in Britain, they are now concentrated into clusters, principally in Cornwall (especially on the Lizard), Devon, Dorset (particularly the Poole Basin), Hampshire (large areas in the New Forest), Surrey and the Breckland of Norfolk and Suffolk. Outlying areas include parts of Wales, central and northern England and the eastern lowlands of Scotland.

Though all British lowland heaths can broadly be described as "Atlantic", distinct changes in heathland composition can be traced across the regional climate zones in Britain. The National Vegetation Classification (NVC) describes the communities that constitute these heathlands (Rodwell 1991).

In the semi-continental climate of eastern England, for instance in Breckland, the heathland is characterised by *Calluna vulgaris* and *Festuca ovina* (NVC type H1). A distinctive feature of this community is the prominence of certain bryophyte and lichen species, in particular members of the genus *Cladonia*.

Heading south and west the climate becomes more oceanic with a less extreme temperature range and higher rainfall and the heaths become distinguished by the appearance of plants of oceanic West Europe such as *Erica cinerea* and *Ulex minor* (H2, H10). Further west, *U. minor* is replaced by *U. gallii* (H8). Examples of these heaths can also be found in other oceanic areas of lowland Britain such as the coastal region of East Anglia.

On the Lizard peninsula of Cornwall a very distinctive heathland type (H6) occurs in this the most extreme warm oceanic climate in Britain. Here the Lusitanian species *Erica vagans* and the more widespread *U. europaeus* are particularly prominent. The floristics of this heath are also determined in combination with the soils and geology of the headland and activities such as grazing and burning. It tends to be a relatively species-rich community and represents an example of the Ibero-Atlantic heathland alliance, which only occurs in this part of Britain.

In the cooler and generally wetter climate of the lowlands and upland fringes of the Midlands and northern England, species-poor heaths (H9) dominated by *Calluna vulgaris* and *Deschampsia flexuosa* become the dominant type. A distinctive feature of these heaths is the frequency of the mosses *Pohlia nutans* and *Orthodontium lineare*, species that are known to be particularly tolerant of high levels of atmospheric pollution. These heaths are very similar to impoverished examples found in heavily polluted areas on the near Continent.

Elsewhere in the sub-montane zone of western and northern Britain, can be found a community type that represents a transition to upland heaths. Species such as *Vaccinium myrtillus* and *Empetrum nigrum* become distinctive features in this vegetation (H12).

In the more continental areas of lowland Britain the distinctions between dry and wet heath are often very clear. However, in the more oceanic conditions of the south-west boundaries between wet and dry heath become increasingly diffuse. Transitional types of heath, often referred to as humid heaths, become prominent. Around the Hampshire Basin, for instance, can be found humid heaths characterised by *Ulex minor* and *Agrostis curtisii* (H3). In the more equable south-west, as in the dry heaths, *U. gallii* replaces *U. minor* in these humid heaths (H4). These heaths can provide a locus for the rare *Erica ciliaris*. On the wetter soils of the Lizard *Erica vagans* grows with *Schoenus nigricans* producing an unique heathland community (H5).

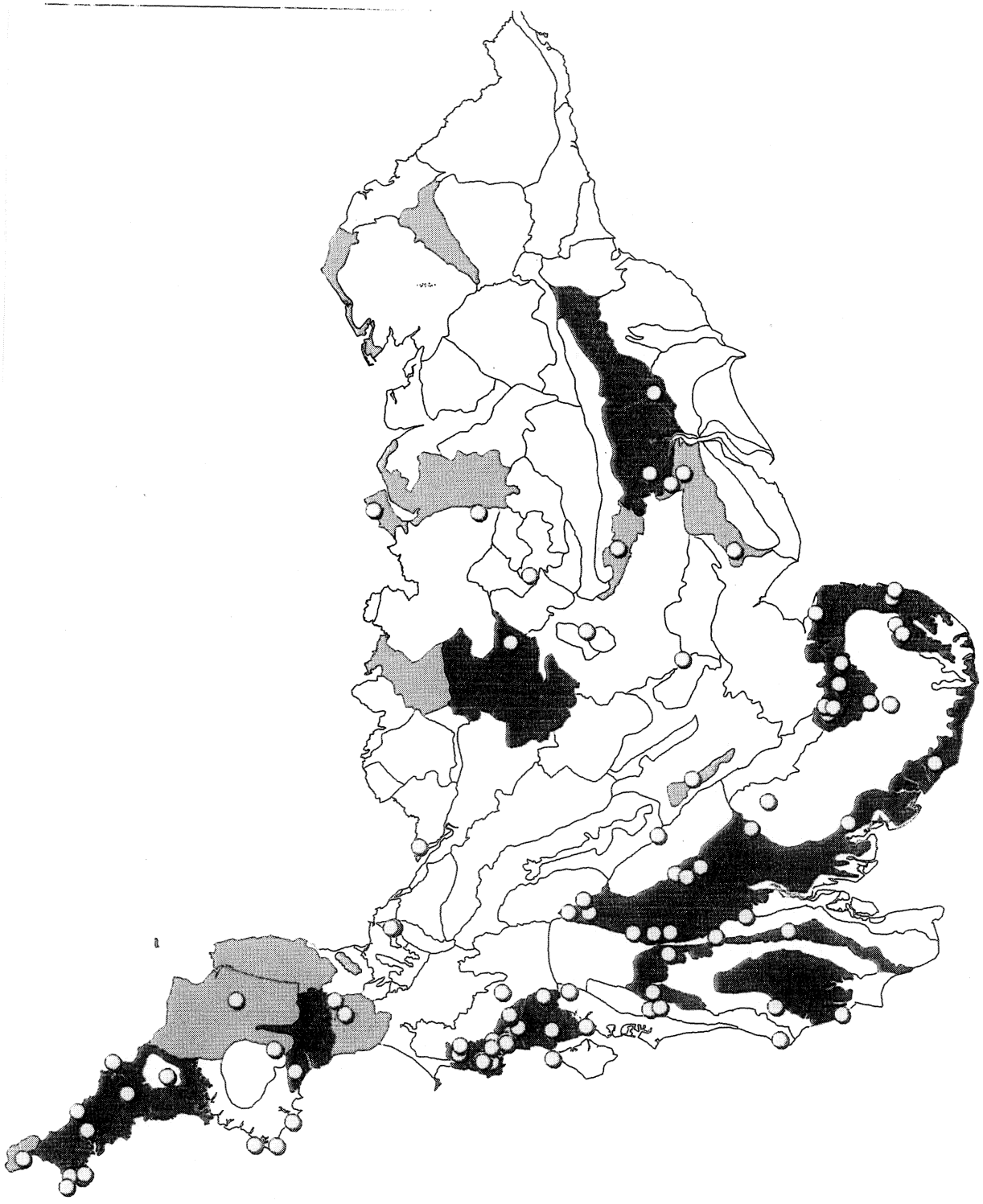
Where heathland extends onto cliff-tops and there is reasonable salt-spray deposition, stands of maritime heath (H7) with species such as *Scilla verna* and *Plantago maritima* can occur widely. Wet heaths on damp to waterlogged, acid and oligotrophic peats can be found throughout Britain. Centred on southern England, where it is a distinctive feature of the zonation between heath and mire, is the *Ericetum tetracilis* (M16) community, characterised by species such as *Erica tetralix* and *Sphagnum compactum*. This community is a locus for a range of species of restricted distribution including *Gentiana pneumonanthe* and *Erica ciliaris.* The wet heath type with *Scirpus cespitosus* and *Erica tetralix* (M15) is found on a few of the sites in this survey. It is another community with a western and northern distribution.

2. THE SAMPLE

SSSIs included in this survey were selected by a stratified random sample from the 385 SSSIs that were recorded as supporting lowland heathland on English Nature's Coredata database. The selection was stratified by the areas of English Nature's Local Teams to ensure a good geographical spread of heathland sites. The sample size was based on the probability of failing to detect a factor of known prevalence in samples taken from a very large population (Australian Bureau of Animal Health 1982). A sample of 100 SSSIs was originally selected so that any environmental or management factor affecting 5% of SSSIs supporting lowland heathland should be found on at least one of the sample sites. The sample size was ultimately reduced to 97 sites

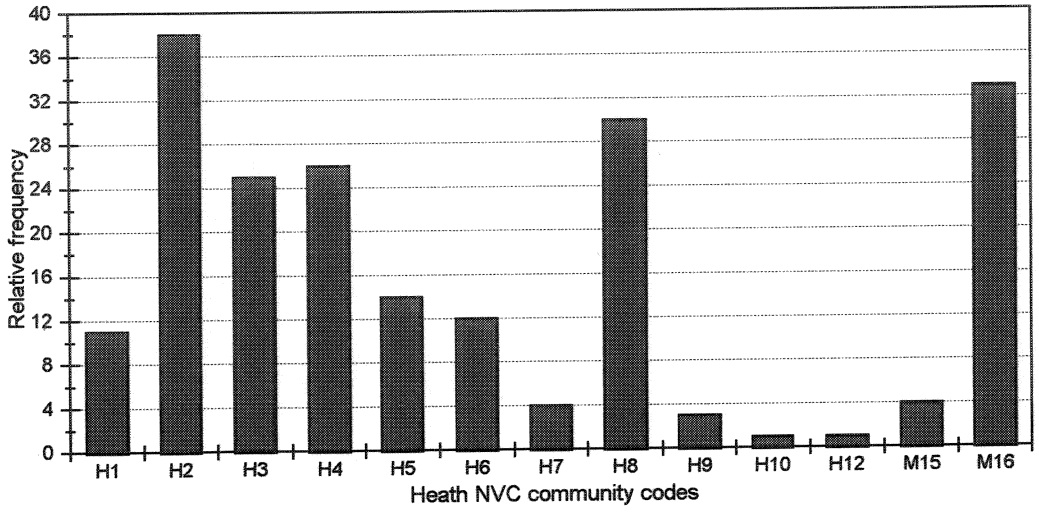
where local staff considered that heathland was a significant interest feature; survey returns were received for 93 of these. At least one (single tenure) management unit was sampled on each SSSI, with two or three units being sampled on large sites. In total, 120 units were sampled.

Figure 1. **Location of SSSIs included in the sample survey. The locations (in yellow) overlie a natural area view of lowland heath priorities (English Nature, 1997) showing heathland as a key feature (orange) or areas targeted for restoration (purple).**



NVC heath community types have been recorded on 73 of the 120 site units visited during the survey (Figure 2).

Figure 2. Frequency of heathland NVC communities. Some units have more than one NVC type,



Key to NVC community types: (H1)*Calluna vulgaris - Festuca ovina;* (H2) *Calluna vulgaris - Ulex minor;* (H3) *Ulex minor - Agrostis curtisii;* (H4) *Ulex gallii - Agrostis curtisii;* (H5) *Erica vagans - Schoenus nigricans;* (H6) *Erica vagans - Ulex europaeus;* (H7) *Calluna vulgaris - Scilla verna;* (H8) *Calluna vulgaris - Ulex gallii;* (H9) *Calluna vulgaris - Deschampsia flexuosa;* (H10) *Calluna vulgaris - Erica cinerea;* (H12) *Calluna vulgaris - Vaccinium myrtillus;* (M15) *Scirpus cespitosus - Erica tetralix;* (M16) *Erica tetralix - Sphagnum compactum.*

3. SURVEY METHODOLOGY AND ANALYSIS METHODS

3.1 Data collection

The survey consisted of two main parts: a questionnaire (Appendix 1) which was completed with the assistance of the site's owner or occupier and a site condition form (Appendix 2), completed by a local English Nature conservation officer. The questionnaire was designed to collect contextual information concerning the ownership and management of the heathland. The condition assessment form collected data on current habitat condition, indicators of change and potential or actual threats to the scientific interest. An assessment was also made of whether the management activities were appropriate in terms of type and intensity. A single management unit was investigated on small SSSIs. For large, multiple occupancy SSSIs a maximum of three tenure holders were contacted. Where the heaths were within National Nature Reserves, forms were completed by the site manager.

3.2 Definition of condition assessment categories

The condition assessment categories are those agreed between the statutory nature conservation bodies as part of the Common Standards for Monitoring Designated Sites protocol (JNCC 1997). The terms *Favourable* and *Unfavourable* now replace the terms *Optimal* and *Sub-optimal* used in the previous report on grasslands (Sketch 1995).

The 'Common Standards' protocol has been incorporated into English Nature's Site Unit Recording (SUR) system. The SUR system involves condition assessments of the interest features for which the SSSI was notified. The site unit is the operational recording unit within the site: it generally has a single broad habitat (in this case lowland heath) and is often in single ownership.

The condition assessment categories and their definitions are as follows:

Favourable - maintained	An interest feature should be recorded as *maintained* when its conservation objectives (targets) were being met at the previous assessment, and are still being met.
Favourable- recovered	An interest feature can be recorded as having *recovered* if it has regained favourable condition, having been recorded as unfavourable on the previous assessment.
Unfavourable - recovering	An interest feature can be recorded as *recovering* after damage if it has begun to show, or is continuing to show, a trend towards favourable condition.
Unfavourable - no change	An interest feature may be retained in a more or less steady state by repeated or continuing damage; it is unfavourable 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.
Unfavourable - declining	Decline is another possible consequence of a damaging activity. In this case, recovery is possible and may occur either spontaneously or if suitable management input is made.
Partially destroyed	It is possible to destroy sections or areas of certain features or to destroy parts of sites with no hope of reinstatement because part of the feature itself, or the habitat or processes essential to its

	support, has been removed or irretrievably damaged.
Destroyed	The recording of a feature as destroyed will indicate the entire interest feature has been affected to such an extent that there is no hope of recovery, perhaps because its supporting habitat or processes have been removed or irretrievably altered

The assessment is based on broad targets for those attributes which most economically define favourable condition of the interest feature. When the feature condition falls below these thresholds, remedial management action is triggered. The targets take into account the likely range of fluctuations an interest feature is likely to exhibit. Favourable condition is achieved when the interest feature falls within the target range. These targets may be small in scale, such as achieving a certain balance between grasses, forbs and dwarf shrubs or operate at a landscape scale, for example where the balance between scrub, heath and mire is the target. Other targets may relate to the heathland as the supporting habitat for key plant and animal species and assemblages

3.3 Data analysis

The categorised information was entered onto two tables of a 'Paradox' database. One table held the questionnaire data and the other the site condition data. The two tables were linked through the SSSI code and site unit number and this enables analyses to be carried out across the two datasets. The size of the dataset used in each analysis varied according to the degree of completeness of the questionnaire. Any personal information collected in the survey is confidential (under the Data Protection Act) and will not be published except in summary form.

The main factors affecting the ecological condition of heathland are well known and include: types and intensity of grazing management (Bullock & Pakeman 1997), agricultural reclamation and fragmentation (Webb 1981), urban expansion, afforestation and neglect (Farrell 1993). These human impacts on heathland condition and related socio-economic factors, such as type of ownership, have been analysed.

3.4 Constraints on the methodology and results

The sample of lowland heathland within SSSIs assumes that the sample is randomly selected from the full population of such sites and stratified in a manner likely to reflect key differences in heathland condition. The sample of SSSIs for this survey was derived from a historical database (Coredata) developed by the Nature Conservancy Council and was based upon Phase I habitat codes (Nature Conservancy Council 1990). This database has since been superseded by a new database called ENSIS, which provides more accurate information on SSSIs and includes data on NVC communities wherever these are known. It is thus likely that the sample was not based upon the full population of SSSIs containing lowland heathland and the range of biological variations may not have been fully covered.

The sample stratification was carried out by dividing the whole SSSI population into geographical areas which reflected English Nature's local team boundaries. This was judged to be the best division for operational reasons to give a representative spread of sample sites across England. Stratifying the sample by Natural Area would now be the preferred option as this would provide the most meaningful ecological spread of the sample across the range of lowland heathland in England.

Condition assessment, as an operational methodology, is still developing and relies upon clear, measurable conservation objectives for each feature on a site. At the time of the survey, assessments had to be made against existing objectives and these varied in level of detail and quality. Thus, judgements of the condition of heathlands were influenced by the variation in conservation objectives and the experience of the conservation staff in using the methodology.

The condition of lowland heathland is dependent upon a combination of a wide range of environmental and anthropogenic factors. During the analysis some factors, such as discrete management activities, were aggregated into groupings reflecting real management regimes on lowland heathland. This may have biased the interpretation of results for some of these factors.

An important feature of any habitat management regime is that the same factor may have very different effects depending on the time of year, the methodology used, the scale and intensity of the operation and its precise location. For example, on lowland heathland burning can be a positive or a negative factor, depending upon timing, extent, location and fire temperature. During analysis, the ecological significance of different activities needs to be interpreted carefully to avoid misleading interpretations of the data.

4. ASSESSMENT AND IMPLICATIONS OF SURVEY FINDINGS

4.1 Condition assessments of SSSI units in the sample survey

For clarity of presentation the number of condition categories has been reduced to four by combining 'favourable maintained' with 'favourable recovered' (Fav) units and leaving the other categories unaltered; 'unfavourable recovering' (Unfav Rec), 'unfavourable stabilised' (Unfav Stb) and 'unfavourable declining' (Unfav Dec). No heathland units in this survey were recorded in the 'partially destroyed' or 'destroyed' categories.

The overall condition of the lowland heaths in this survey (Figure 3) reflects the long history of neglect over the last fifty years, with 28% of units still in decline. One in four heathland units were judged to be in the most favourable condition for nature conservation. Just under half (47%) of the units were assessed as unfavourable but recovering or stabilised, and this reflects the efforts made in recent years to undertake remedial management and to introduce appropriate management regimes. When assessed by area, 59% of the heathland was in favourable or recovering categories (Figure 4).

Figure 3. Overall condition assessment of lowland heath (n=116 site units)

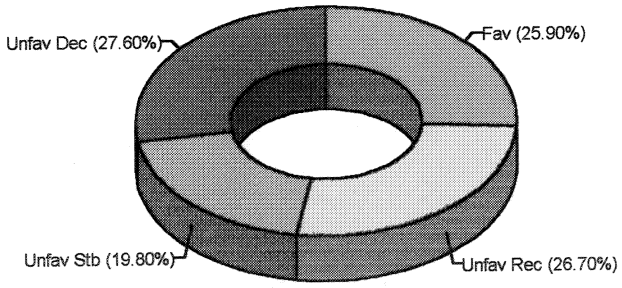
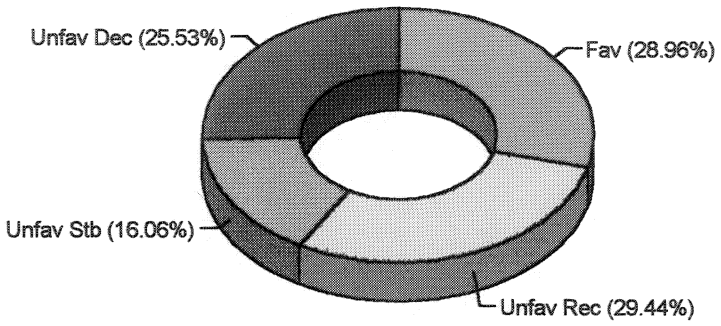


Figure 4. Condition of lowland heath expressed as a function of average total area of site units (n=116 site units)

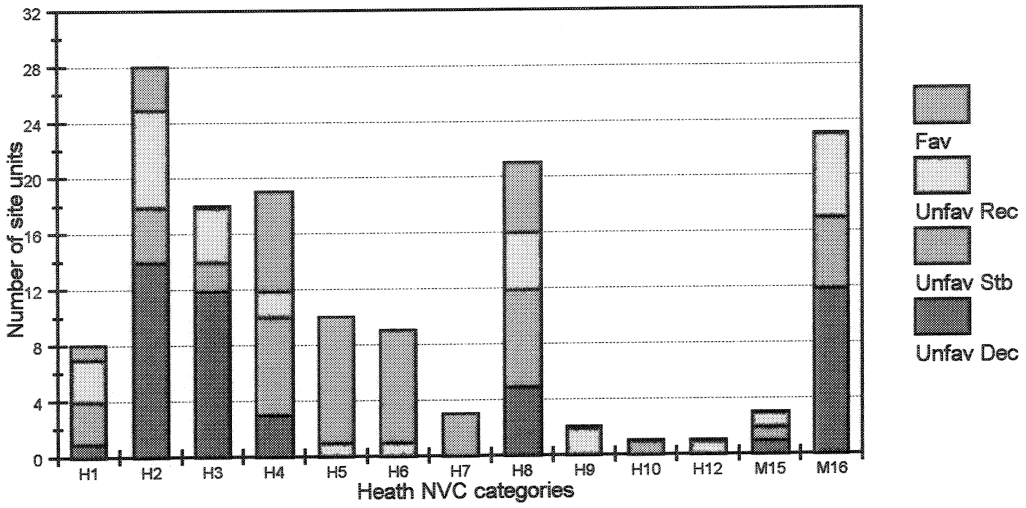


Key to Figures 3 and 4: (Fav) Favourable condition; (Unfav Rec) Unfavourable Recovering; (Unfav Stb) Unfavourable Stabilised; (Unfav Dec) Unfavourable Declining.

Applying the area based condition assessments to the entire SSSI heathland area of approximately 24,300 hectares in England (Michael, 1996) gives 7,000 hectares in favourable condition, 7,200 hectares unfavourable but recovering and 3,900 hectares unfavourable but stable. The remaining area of 6,200 hectares, which is unfavourable and still declining, is of particular cause for concern. The majority of heathland in this category is NVC community types H2, H3 or M16, the first two of which are predominantly found in the south and east of England.

The condition of the heaths can be allocated to their individual community types (Figure 5). There is no obvious relationship between vegetation community type and condition, with the possible exception of the rare and important coastal heaths including the Lizard. These NVC types (H5, H6, and H7) are predominantly in favourable condition and this probably results from climatic and edaphic factors, the activities of wild grazers such as rabbits, and the extent of nature conservation management on the Lizard peninsula.

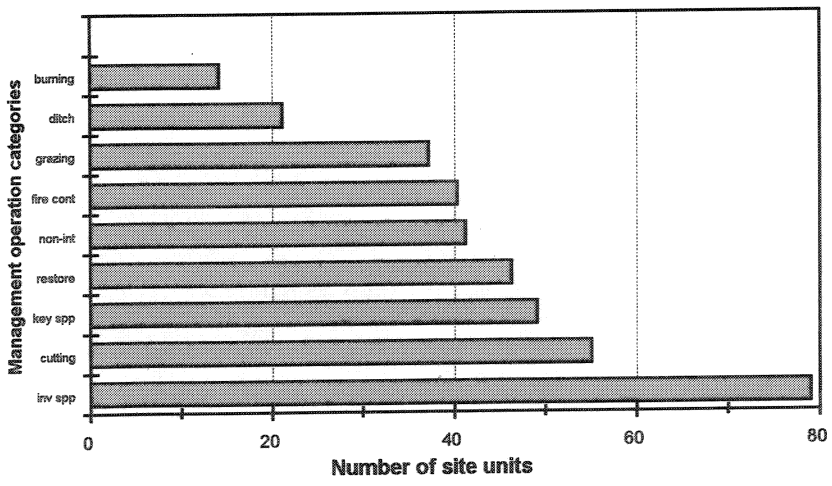
Figure 5. Condition assessments of NVC communities (n= 73 site units)



4.2 Positive management operations

Information was collected on practical management operations taking place on the sample sites. Of the heathland units sampled, 10% had no recorded management operations but more than 68% had some management control of invasive species (Figure 6).

Figure 6. Individually recorded conservation management operations on site units. A unit may have many individual operations applied to it and categories may overlap. N = 116 site units.

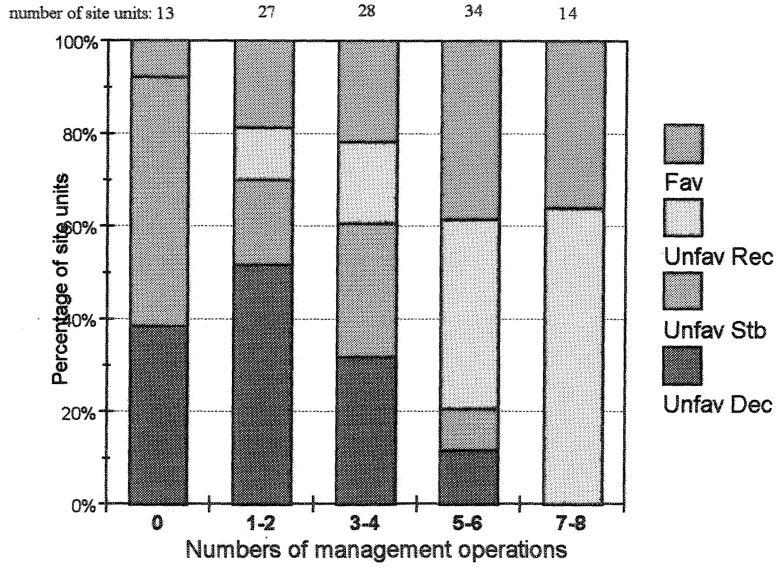


Key to management operations: (burning) controlled burning; (ditch) ditch/drain management; (grazing) controlled grazing by livestock; (fire cont) management of fire controls eg firebreaks; (non-int) non-intervention; (restore) heathland restoration management; (key spp) management for individual or assemblage of species; (cutting) cutting and mowing; (inv spp) management to control or eliminate invasive species.

Grazing with livestock is the management activity most commonly associated with achieving conservation objectives (Bullock & Pakeman 1997). However, in the sample survey approximately a third of the SSSI units appear to be grazed by domestic livestock. In some situations heathlands can be effectively grazed by rabbits and other wild animals and when these are included two thirds of site units are subject to some form of grazing.

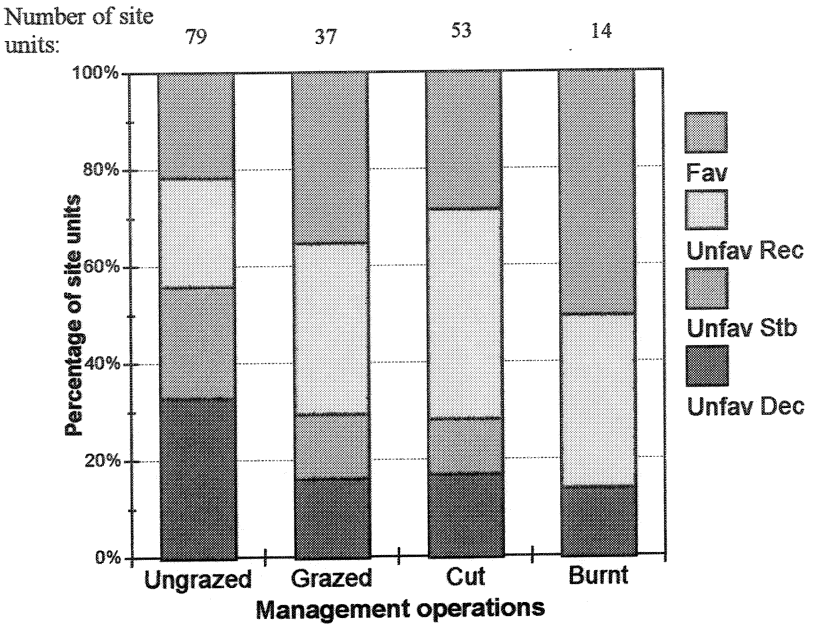
Heathlands usually require a range of different management actions in order to achieve the conservation objectives. Site units without any recorded management were in poorest condition and as the range of different management activities increases, the likelihood of achieving favourable or recovering status rises (Figure 7). There were a large number of units assessed to be in unfavourable declining condition even when there were one or more management activities taking place.

Figure 7. Condition of site units with different numbers of conservation management operations



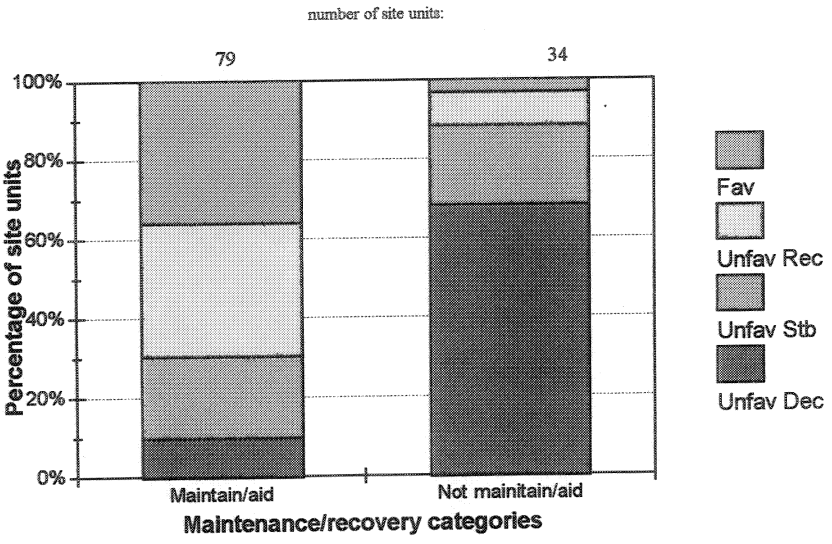
The benefits of some grazing, cutting or controlled burning on heathland are shown in Figure 8. In ungrazed heaths more than 50% of units were in unfavourable or declining condition. However, when some grazing, cutting or burning occurred, fewer than 30% of units were in these categories. The fact that just under a third of grazed heaths are either declining or in a stable unfavourable condition emphasises the need to take account of other factors such as grazing intensity, timing and recent changes. For example, it is well known that overgrazing can rapidly lead to poor condition; equally, undergrazing can lead to gradual scrub and woodland succession.

Figure 8. **Condition of site units under specific management operations**



Staff undertaking the survey were asked to make predictions of future condition based on knowledge of the current management. They concluded that more than 70% of site units would be maintained in favourable condition or should ultimately recover to that state with present management; however, 34 site units (about 30%) were expected to remain in unfavourable condition (Figure 9). Such heaths tend to have a low number of management operations - two on average - but about one in five is either grazed or belongs to some type of incentive scheme. There is no obvious pattern to the geographical distribution of these sites or the types of plant communities involved.

Figure 9. **Predicted maintenance or recovery of site condition based on a continuation of existing management**



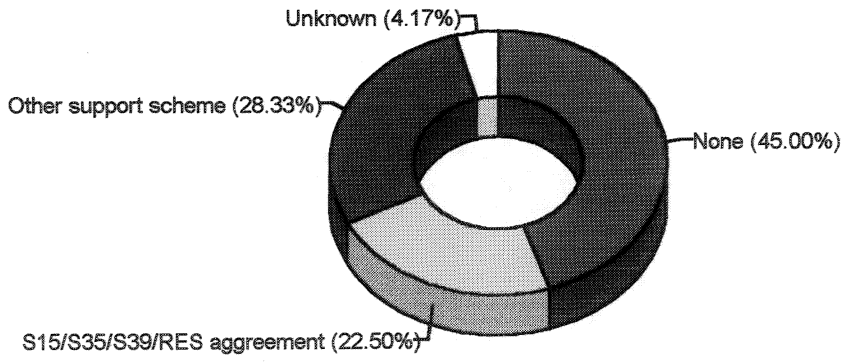
Key to maintenance/recovery categories: (Maintain/aid) current management will maintain the interest feature(s) or aid in their recovery; (Not maintain/aid) current management will not maintain the interest feature(s) or aid in their recovery.

4.3 Incentive schemes and management agreements

English Nature and other organisations offer advice and guidance on managing land for a range of objectives including access, landscape protection and the conservation of the wildlife interest. Some organisations, including English Nature, also offer management agreements or other kinds of incentive scheme to assist land managers. Payments can be made toward the annual costs of managing the land and may include capital works such as fencing.

Three examples are the Reserves Enhancement Scheme (RES), the Wildlife Enhancement Scheme (WES) and Countryside Stewardship (CSS). RES and WES are English Nature schemes. RES is designed to assist voluntary conservation bodies with the management of SSSI nature reserves; WES provides standard payments for management on specified habitat types on SSSIs. CSS is a scheme run by the Ministry of Agriculture, Fisheries and Food to assist land owners and managers with the conservation and enhancement of some key landscapes, features and habitats and, where appropriate, improvements in public access.

Figure 10. Percentage of site units with English Nature and other organisations' incentive schemes (n=115 site units)

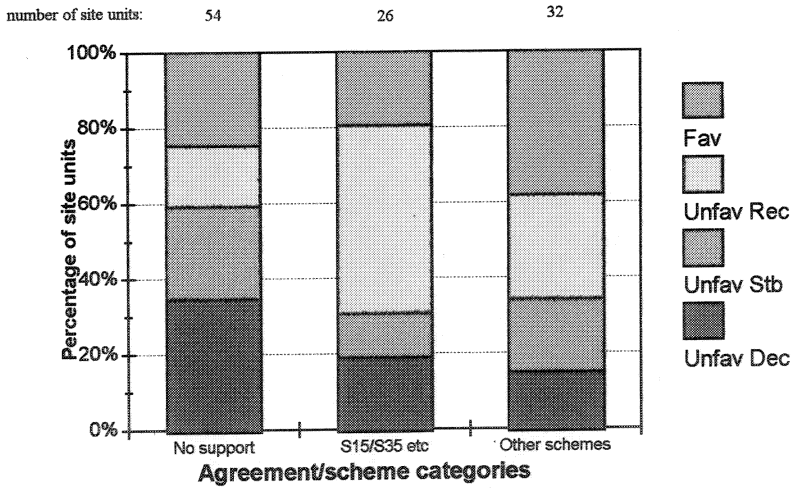


More than 50% of site units receive some form of financial support (Figure 10). This is perhaps unsurprising given that much lowland heathland has little or no agricultural value. Many land owners and managers will seek funding before undertaking any management works which yield little financial return. Almost a quarter of sites attracts funding by English Nature or local authorities under section 16 of the *National Parks and Access to the Countryside Act 1949* or

section 15 of the *Countryside Act 1968* or section 35 and 39 of the *Wildlife and Countryside Act 1981*. A further 28% receive support from MAFF (Countryside Stewardship, Environmentally Sensitive Areas, Nitrate Sensitive Areas and other schemes). Countryside Stewardship is the most common MAFF scheme, providing support in about one quarter of cases. The RES scheme (in 1996/97) provided support for the management of 1,650 ha of lowland SSSI heath at £40 per hectare. On the basis of this level of funding, the 45% of heathland SSSIs (approximately 12,000 hectares) not receiving financial support would cost approximately £500,000 per annum to bring into appropriate management.

More than 70% of heathland units within schemes are in favourable or recovering condition (Figure 11). This is expected since the purpose of the schemes is to aid reinstatement of appropriate management and bring about a recovery in the conservation interest. The units where English Nature has targeted schemes illustrate this point well, with more than 40% of site units in recovery from a previous unfavourable state. Some of the management units where recovery is not yet taking place (30%) may have only recently entered into support schemes. Repeat surveys of sites with newly introduced positive management should demonstrate an increase in the proportion of units in favourable condition or in recovery.

Figure 11. Condition of site units with or without management agreements and other incentive schemes



Almost half the site units are not covered by any form of scheme, yet 40% of these units are in a favourable or recovering condition. However, units without any form of incentive scheme also have the highest proportion of heaths in unfavourable stabilised (20%) or unfavourable declining (38%) condition. This reinforces the need for targeting occupiers of such heaths with suitable schemes to help achieve appropriate long term management.

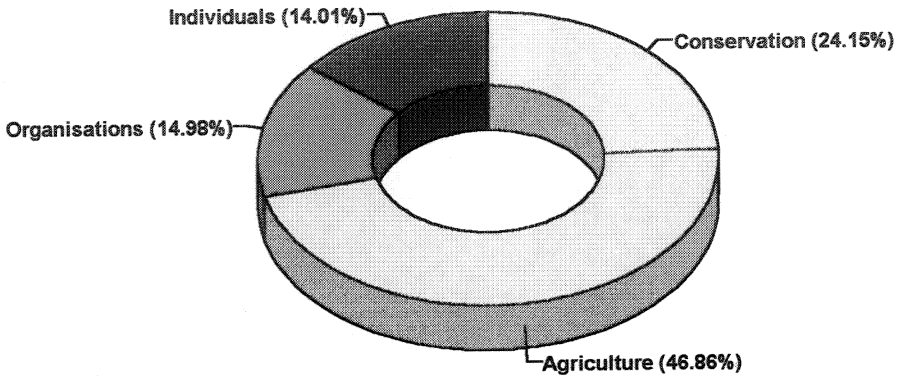
4.4 Occupier categories

Occupiers were identified for 112 survey units and grouped into four categories for the purpose of analysis. The categories are the same as those used in the lowland grassland SSSI sample survey report. *Conservation* - bodies such as English Nature, Wildlife Trusts, RSPB, the National Trust; *Agriculture* - occupiers whose main business is agriculture; *Individual* - occupiers whose

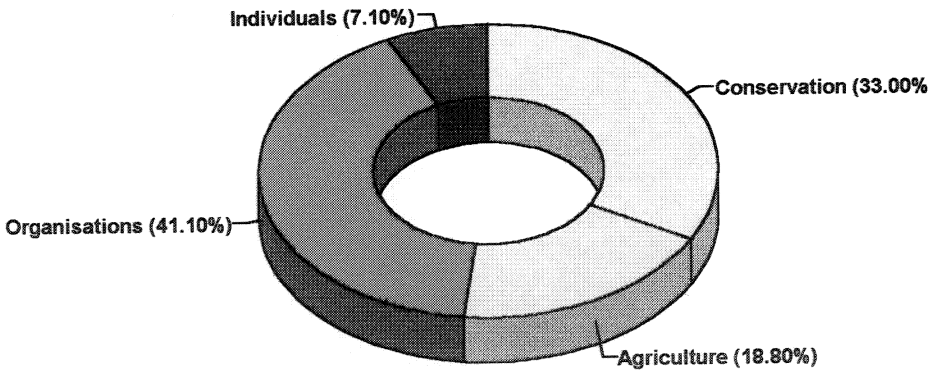
main business is not agricultural; *Organisation* - local authorities, trustees, Ministry of Defence, industry, Forest Enterprise.

Figure 12. Comparison of ownership categories in the grassland sample survey (a) and the heathland sample survey (b)

a)

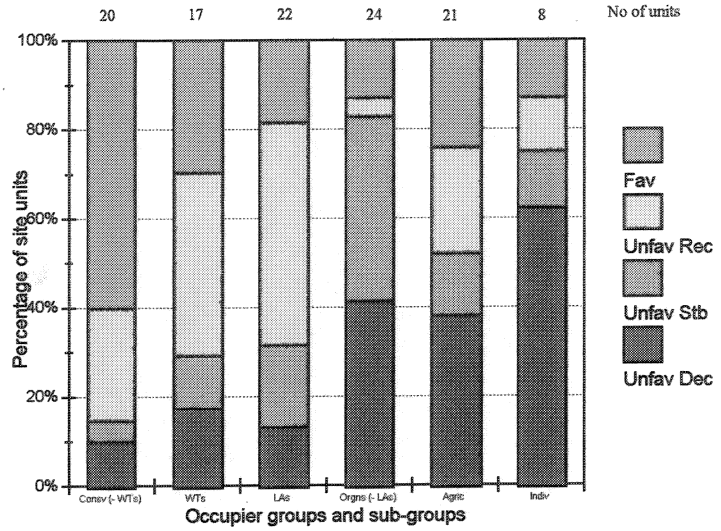


b)



The proportion of site units in each occupier category are shown in Figure 12 for this heathland survey and the previous grassland sample survey. For grasslands, agricultural holdings predominate, whilst heathlands are mainly owned by statutory bodies and other organisations. The largest holdings of heaths are under local authority control (22 units) and those being managed by Wildlife Trusts (17 units). These two large sub groups are shown split from the main groupings in Figure 13 to show their impact on heathland condition.

Figure 13. Condition of site units in different occupier groups and sub-groups



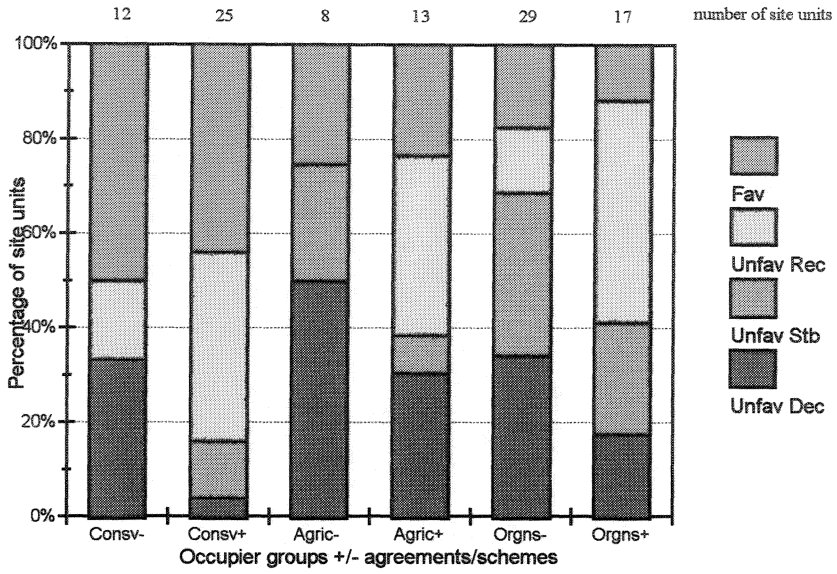
Key to occupier sub-groups: (Cons(-WTs)) conservation groups excluding Wildlife Trusts; (WTs) wildlife trusts; (LAs) Local authorities; (Organs(-LAs)) non-conservation organisations other than Local authorities

The group with the highest proportion of heathland units in favourable or recovering condition is that managed by the conservation sector. This should be expected since there is a greater likelihood of appropriate knowledge of heathland management being available and their primary objective is securing the conservation value of the sites. The condition of heaths managed by Wildlife Trusts was slightly poorer than the rest of the conservation group, which may be related to lack of resources, or recent involvement in sites with a long history of neglect. Of the 11 site units managed by English Nature, eight were in favourable condition and the remainder were recovering.

The local authority sub-group has marginally more sites in unfavourable stable or declining than the Wildlife Trust sub-group. This suggests that similar factors may be at work in both occupancy groups. Non-conservation organisations (excluding local authorities), agricultural occupiers and private individual landowners all have a much higher proportion of heathland units in unfavourable stabilised or declining condition (Figure 13).

A further analysis has been undertaken that relates occupier groups and management agreements/incentive schemes to unit condition. Figure 14 shows the analysis for three of the groups. The private individual land owners group has been excluded since only one unit was found to have an incentive scheme.

Figure 14. Effects of management agreements and other incentive schemes for unit condition in different occupier groups



Key to occupier groups: (Cons+) conservation group with management agreement/incentive schemes; (Cons-) conservation group without management agreement/incentive schemes; (Agri+) agricultural group with management agreement/incentive schemes; (Agri-) agricultural group without management agreement/incentive schemes; (Organs+) organisation group with management agreement/incentive schemes; (Organs-) organisation group without management agreement/incentive schemes.

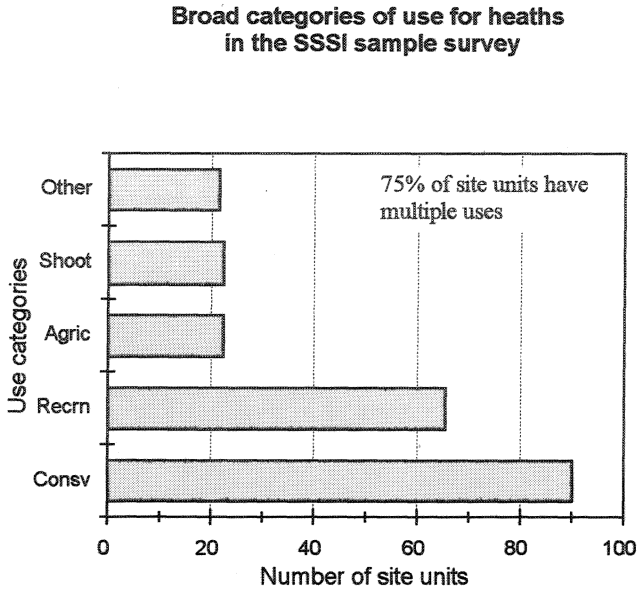
Within each occupancy group there is a clear relationship between heathland incentive schemes and recovery. For all three groups, a smaller number of units are in unfavourable declining and stable condition, and a higher number are in unfavourable recovering condition, where management agreements or incentive schemes exist.

Predictably, the majority of heathland units managed by conservation organisations are subject to agreements or schemes and have a high likelihood of being in favourable or recovering condition (85%). The anomaly of heaths without incentive schemes having marginally more favourable units than those within schemes is partly a consequence of National Nature Reserves occurring in this group. Heaths managed by non-conservation organisations or in agricultural occupancy have about one in three units in schemes of some sort. A higher proportion of those heathlands within schemes are in favourable or recovering condition than those without schemes. Targeting resources on heaths in agricultural or organisational (other than local authorities) ownership could bring real conservation benefits.

4.5 Use of the heaths

The main uses of heaths have been placed in five main categories (Figure 15). The majority (75%) of heaths have a variety of uses, with the most common combination being recreation and conservation. Attempts to analyse heathland usage as a factor influencing condition proved inconclusive because of multiple uses recorded for most units.

Figure 15 Use of heathland units (n=102 site units)



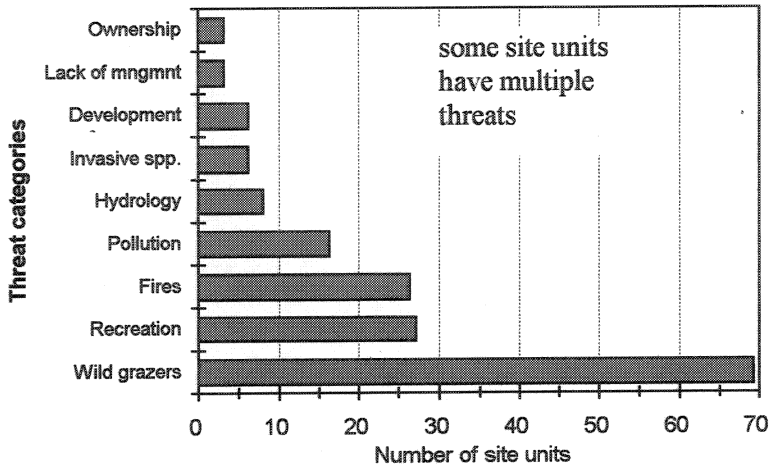
4.6 Environmental impacts

Nine categories of impact or threats to the conservation value of heathlands were defined in this study:

Ownership	owner not sympathetic to conservation, future ownership uncertain
Lack of management	neglect, cessation of grazing, public opposition to clearing scrub/woodland
Development	various detrimental activities with planning permission, eg roads, mineral extraction
Invasive species	reduction of heathland area due to (mainly) pine or birch invasion
Hydrology	lowering of water table, water abstraction, drought
Pollution	eutrophication, quarry run-off, leachates, atmospheric deposition, sewage, run off from roads, fields etc.
Fires	fire can be a positive management tool, but arson and accidental burns may cause damage if they occur at the wrong time of year or are uncontrolled
Recreation	motorcycles, off road vehicles, horses, dog walking, erosion of footpaths
Wild grazer.	largely rabbits or deer

The frequency with which these threat categories occur on site units is shown in Figure 16. The most frequently identified threats are uncontrolled fires, damaging recreational activities and overgrazing by wild animals, particularly rabbits.

Figure 16. Frequency with which threats were recorded on site units (n=56 units with threats recorded)



Many threats to heathlands (for example, rubbish tipping, motorbike scrambling and arson) are the result of third party activities and are not always amenable to direct control. Other threats, particularly changes in hydrology and pollution, usually originate externally to the SSSI and may be difficult or impossible to prevent. External threats were recorded on 50% of units, including 10 pollution incidents, such as sewage and run off from quarries and dumps. Activities under the control of land managers, such as lack of grazing, were not often recorded as threats. For example only 15 units were recorded as under threat through neglect; unsurprisingly all but one were in unfavourable condition. Two activities which were perceived as threats seem to be associated with better than average condition - recreation (almost a third of units in favourable condition) and heaths with wild grazers (one third in favourable condition). Low level informal recreational activities commonly occur on heathlands and on the basis of condition assessments appear to be sustainable. However, recreational activities can become very intensive and significant damage can occur. Similarly, grazing by wild animals such as rabbits and deer can help maintain heathland condition, but the vegetational structure can deteriorate if grazing becomes too intense.

4.7 Fragmentation

Information from English Nature's ENSIS database (86% of SSSIs covered) shows that just over half of SSSIs with heathland have less than 10 hectares of this habitat (Figure 17). The average area (107 hectares) is much higher because of a few sites with extensive heathland (seven SSSIs have more than 1,000 hectares). Fragmentation of the heathland resource into small sites, with potential management problems, might be expected to have an impact on the condition. The sample data, however, do not support this view. Figure 18 suggests that condition is unrelated to the area of heathland within the SSSI. Fragmentation of heathland is recognised to be a problem for nature conservation (Webb 1982) with small fragments lacking key heathland species. The failure of the sample survey to draw this out as a factor may result from the habitat or botanical view promoted through conservation objectives on SSSIs. Assessment of key animal species may provide a better reflection of the effects of fragmentation and the landscape scale issues of lowland heathland.

Figure 17. Size categories of heathland SSSIs

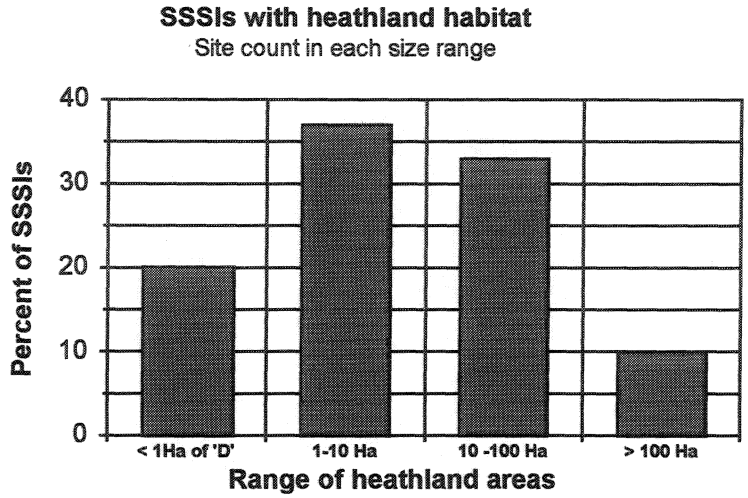
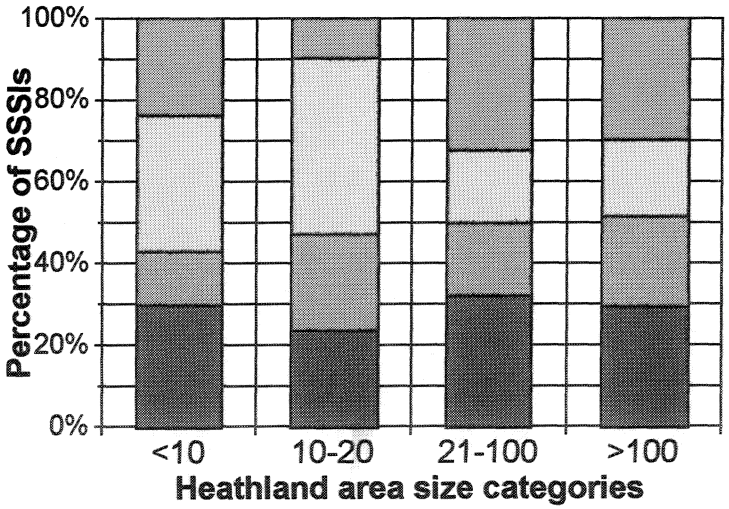


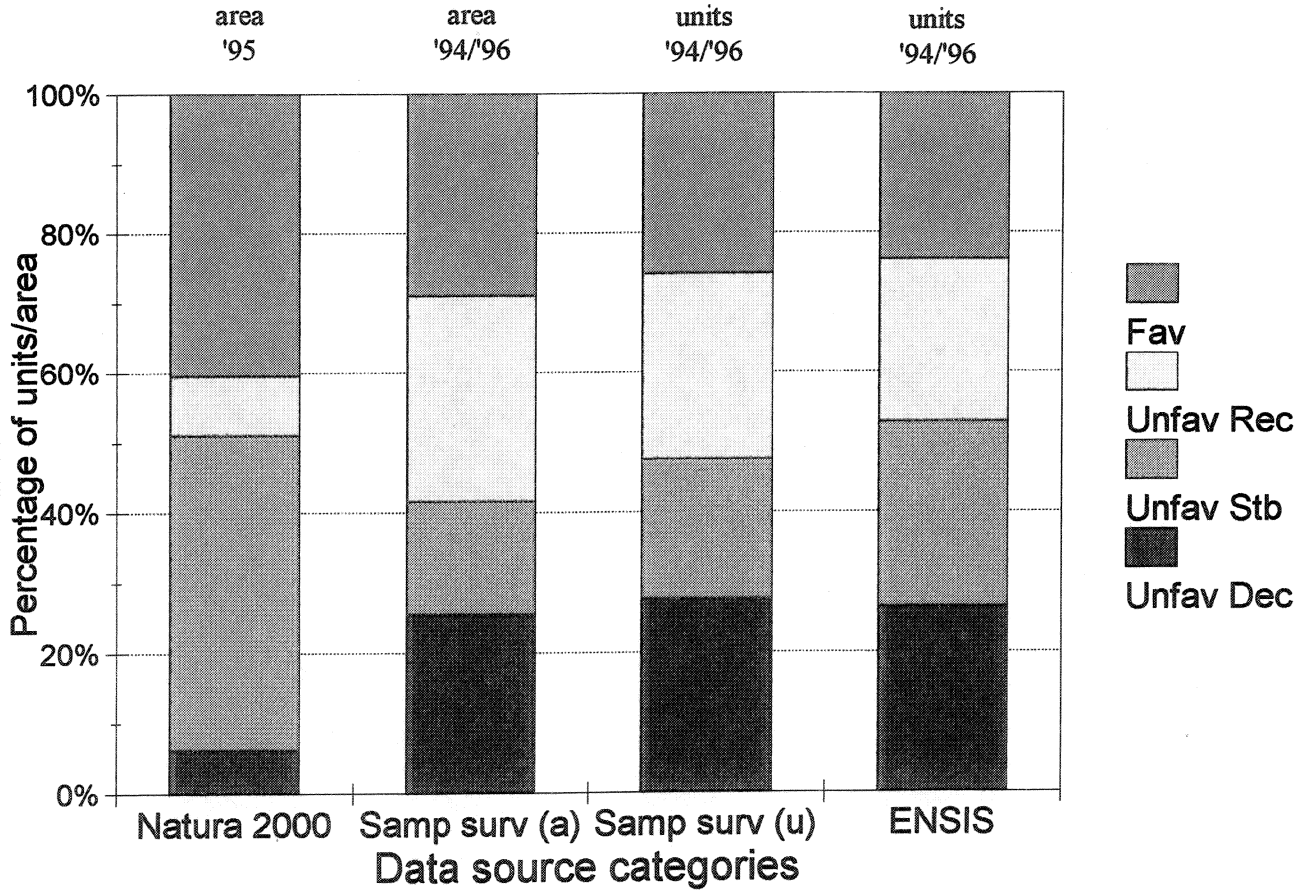
Figure 18. Condition assessments for different sizes of heathland



4.8 Comparisons with other data

A consistent view is now emerging of the condition of heathlands based on a variety of sources (Figure 19). Fairly close agreement exists between information derived from routine site visits (ENSIS database), an assessment of heathland forming part of the Natura 2000 sites and the statistical sample gathered for the lowland heathland survey. As might be expected, the Natura 2000 series of sites (Gardiner & Massey, 1996) had better than average condition with 40% of area in favourable condition and only a small proportion (6%) actually in decline. A considerable area of the Natura 2000 sites now has positive conservation management in place and whilst there is still a substantial area in unfavourable condition, the trend in deterioration has been halted or reversed. With sustained positive management over the next five years we would expect to see all of these sites move toward favourable condition.

Figure 19. Comparison of condition assessments from Natura 2000 assessments, the sample survey and routine site visits



5. DISCUSSION AND CONCLUSIONS

Lowland heathland has been recognised in the UK Biodiversity Action Plan as a priority for conservation because it is a rare habitat which is under threat. In England only one sixth of the heathland present in 1800 now remains. The UK has some 58,000 hectares of lowland heathland of which the largest proportion (55%) is found in England. The UK forms an important part (about 20%) of the international total of this habitat.

The Lowland Heathland Action Plan (Anon. 1995) identified the main factors affecting the habitat as:

- simplification of the vegetation structure due to lack of conservation management
- agricultural improvement, including reclamation and overgrazing
- encroachment of trees and scrub
- nutrient enrichment
- fragmentation and disturbance from developments.

This survey has demonstrated that the main factors with a positive impact on site condition are incentive schemes, occupier type and the nature and scope of management activities. Negative effects on condition are associated with certain categories of occupancy and consequential lack of management. Apart from neglect, environmental threats such as types of heathland usage and fragmentation had no apparent effect on reported condition.

Traditionally, grazing by livestock would have been the main form of management of heathland. The current survey shows that even on SSSI heaths, only 31% now have controlled grazing. The potential benefit of grazing as a management regime is demonstrated by the two thirds of grazed sites in favourable or recovering condition. A larger number of units were in favourable or condition where grazing was combined with other management techniques, especially cutting or controlled rotational burning. This probably reflects the implementation of a more comprehensive management plan. The threat from complete lack of management (neglect as opposed to non-intervention) can be seen in the 90% of neglected sites in unfavourable condition. Bullock & Pakeman (1997) found that conservation objectives of heathland management can be met by an appropriate livestock grazing regime. However, the reinstatement of controlled grazing is not without its own problems, often related to the location of the heath. These include vandalism of stock proof fencing, thefts of livestock and attacks by dogs. There can also be a negative public perception when areas of public open space are enclosed or where scrub and woodland clearance is carried out. The availability of stock is also a constraint given the small number (20%) of SSSI heaths in agricultural ownership.

The second factor influencing the achievement of management objectives is the occupier category. Between occupier groups there are degrees of effectiveness in carrying out the various positive management operations that produce nature conservation benefits. The survey results indicate that agricultural holdings and individual owners had the least success in achieving effective heathland management. Heaths managed by organisations (other than local authorities) are equally poor with fewer than half the management units in favourable or recovering condition. As might be expected, conservation organisations achieve better than average results (more than 70% in favourable or recovering condition). Such organisations clearly have the appropriate conservation knowledge to guide management and their overriding objective is to secure the conservation value of the site. It is of interest that local authorities appear to be equally as

effective in managing their heathland holdings, possibly because the infrastructure exists to make effective use of knowledge and gain the necessary resources.

Necessary resources include people, time and money and where they are lacking, a variety of management agreements and incentive schemes are available to assist. The results of this survey demonstrate that such schemes are important in achieving management objectives (70% of scheme heathlands are in favourable or recovering condition). The annual cost of bringing all the SSSI heathland into positive management schemes would be around £1,000,000 (at £40 per ha) compared with the estimated £500,000 invested at present.

Clearly, a number of organisations which own heathland SSSIs do not have nature conservation as their primary objective. Many of these organisations and many individual private landowners are facing real difficulties in achieving effective site management. It could be beneficial to target these key groups to elucidate whether this results from a lack of resources, lack of awareness about appropriate management, ineffective incentive schemes or other reasons such as conflicts between conservation management and other objectives.

The limitations of the survey methodology were discussed in Section 3.4 and included incomplete knowledge of heathlands within SSSIs, stratification using local team boundaries, the early stages of development of conservation objectives and consistency of condition assessments. These limitations are not thought to have significantly affected the overall results as the data are consistent with information derived from other sources. In future surveys the new ENSIS database will provide more comprehensive information on SSSIs and the development of Natural Areas provides an opportunity for a more meaningful stratification of the sample. Future surveys will also seek to refine the questions asked and in particular to provide a stronger linkage with market research on owners and occupiers and information to support policy development. The development of conservation objectives and the experience gained by applying the Common Standards for Monitoring Designated Sites (JNCC 1997) will lead to more consistent judgements over the condition of sites, especially where mosaics of communities and a variety of species interest exist.

The overall condition of SSSI heathland revealed by this survey clearly demonstrates the problems associated with achieving conservation objectives. Heathlands need continuous, appropriate management in order to maintain their conservation value. This has been recognised in the UK lowland heathland costed habitat action plan (Anon 1995). The action plan estimates show that it would cost up to £4.7 million per year by 2010 to conserve the 58,000 hectares of lowland heath in the UK. Significant progress has been made in the last few years to put in place the appropriate conservation management. English Nature has directed resources to heathland via its Wildlife Enhancement and Reserve Enhancement Schemes. A major new initiative funded through the Heritage Lottery Fund, Tomorrow's Heathland Heritage, has also been launched. All of these schemes should have a significant effect upon the recovery of lowland heathland from a position of neglect and decline.

This survey is a snapshot of events and although it cannot predict long term trends, it indicates that action to date has halted the decline in condition of a significant area of heathland. However, a programme of sustained, positive management will be required to bring all heathland SSSIs up to a satisfactory condition. The multiple use of heathlands, their very limited agricultural value and the range of threats mean that in addition to providing positive management, a variety of

policy and legislative changes are required. These changes would include stronger tests before planning permissions are awarded, improved use of environmental assessment procedures and placing a duty of stewardship on public bodies so that there is a legal requirement to maintain the special interest of the land. Sufficient resources for positive management and appropriate policy and legislative change are necessary to secure the future of heathlands in England.

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APPENDIX 1

NATIONAL SSSI SAMPLE SURVEY QUESTIONNAIRE
Lowland Heath 1994

NATIONAL SSSI SAMPLE SURVEY QUESTIONNAIRE - Lowland Heath 1994

Section 1

Complete this page before visiting the occupier and mark management unit on map overleaf.

SSSI Name:
SSSI Area:

Owner of site: Site unit number:

Occupier Name:

Address: SSSI Grid ref:

Telephone No: County:

Total area of heath within SSSI in ha:

Area of SSSI heath management unit in ha:

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

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

Countryside Stewardship Scheme
National Park Agreement
Environmentally Sensitive Area
Nitrate Sensitive Area
County Heathland Management Project
English Nature Heathland Programme Grant
Wildlife Enhancement Scheme
Reserve Enhancement Scheme
Other.....

QUESTIONNAIRE

Visit by: Date:

Specify whether areas are in Hectares or Acres
If the answer to any question is "other", please give details

2 OWNER/ OCCUPIER DETAILS

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

2.2 Are they the owner, site manager, grazier etc of the unit? .....

2.3 Total area of the holding:- give total area, and more detail as available.

Areas	Within SSSI	Outside SSSI
Total area occupied		
Owner occupier		
Full agricultural tenancy		
Short term agreement		
Other . . .		
Common grazing rights		

2.4 Do they manage any other heathlands?.....

3 WHOLE FARM ENTERPRISE

3.1 LAND USE

	Area		Area
Arable		Temporary grass	
Set aside		Permanent grass	
Forage crops		Rough grazing	
Woodland		Other . . .	

3.2 LIVESTOCK

	Numbers		Numbers
Dairy		Calf Rearing	
Beef		Sheep	
Pigs		Horses	
Poultry		Other . . .	

4 USE AND MANAGEMENT OF SSSI HEATH

4.1 Is it used for: Tick appropriate boxes

Agriculture		Recreation	
Conservation		Shooting	
Other . . .			

Further detail if needed:

4.2 Details of grazing livestock on SSSI:

Controlled grazing (type and breed)	Area grazed and approx. number/ stocking density	Approx. grazing dates
Uncontrolled grazers (rabbits, deer, etc)	Level of grazing	

4.3 Supplementary feeding on the heath: (Yes/No)
Specify:

4.4 Other management on SSSI heath:
Tick boxes and give detail of species and areas affected

Control of invasive spp.	
Fire control	
Cutting	
Drain/ ditch management	
Controlled burning	
Non-intervention	
Heath restoration	
Management for species	
Other . . .	

Details:

4.5 Management changes:

When was current management introduced?

What was the previous management?

What was the traditional management?

5 MANAGEMENT FOR CONSERVATION

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

APPENDIX 2

NATIONAL SAMPLE SURVEY OF SSSI LOWLAND HEATH 1994
Site Condition Form

NATIONAL SAMPLE SURVEY OF SSSI LOWLAND HEATH 1994

Site Condition, Management and Threats:

SSSI Name:

Please answer 1, 2 and 3 before the visit

1. Community or habitat types:
(NVC if available)

2. State the objective(s) for the heath and associated interest:
(eg from Site Objective Statement)

3. Is there a monitoring project on the SSSI?

---

4. Site Area: Any physical loss (Yes / No)

at the boundary / within the heath Area: Cause:

5. Current condition for the heath management unit (see guidance notes for definitions) - circle one option on left; give more detail on right if possible :

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

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

a) **Characteristic species:**

b) **Criteria species:**

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

7. If there is any evidence of Potentially Damaging Operations, please state PDO number(s) and describe them (see guidance notes):

PDO number:

what is happening,
legality (e.g. consented / unconsented),
likely to recur,
is PDO beneficial / no effect / damaging,
is spontaneous or managed recovery likely

8. Are there any external threats affecting the heath or associated interest?

Evidence of pollution (Yes / No)

If there is evidence of pollution affecting the heath or associated interest, please fill in a copy of the pollution recording form attached to the guidance notes.

9. 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)

10. If management is not appropriate, why not, and how could objective(s) in (2) be achieved:

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