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3.1 Introduction

3.1.1 The context of decision making

The aim of this chapter is to set out a structured way of making decisions about upland management for wildlife. However, as most of the uplands are not managed as nature reserves, these decisions are unlikely to be taken in an vacuum and will need to be set within the context of, for example, a farming business, sporting enterprise, forestry concern or water catchment management.

The decision making process can involve a number of individuals and agencies especially where there are public monies involved. The process will also follow a number of stages, which are described in detail in the following sections. The stages one has to go through will be similar for a small parcel of land, such as a single field like a hay meadow, a management unit of a moor, or a whole farm. However, the larger the area and the greater the variety of habitats then the greater the likelihood is that more decisions will need to be taken. The stages to follow will:

- identify and describe the features of the land in question;
- evaluate these features in an international, national and local context;
- gain an understanding of how much of the site's features is dependent on land management practices;
- formulate land management objectives and prescriptions based on the requirements of the habitat and species, and factors influencing those objectives such as current farming practices;
- prepare a work plan that addresses the above to deliver biodiversity targets and hopefully integrates such management successfully within the wider land management context;
- review the effectiveness of the management regime and implement adjustments as required.

3.1.2 Economic realities

Given the precarious position of many family hill farming businesses and the long-term need to retain environmentally sustainable livestock farming in the uplands, conservation decisions need to be balanced alongside other important factors such as livelihoods. Financial incentives for agricultural products account for the great majority of support for hill farmers and these incentives have encouraged an intensive approach to farming which has had severe impacts on both semi-natural habitats and the species that depend on them. However, while still only a small proportion of the total Common Agricultural Policy (CAP) budget, agri-environment incentives attempt to address these problems by funding and encouraging a more environmentally friendly and sustainable form of land management.

A more integrated approach has been tested in the Forest of Bowland and Bodmin Moor, and through other Structural funded initiatives such as the Northern Uplands Moorland Regeneration Project in the North Pennines. For all of these areas the economic, environmental and social aspects are considered together, and advice and funding is given in the form of an integrated package.

3.1.3 Upland and hill management for biodiversity

Land management, for whatever purpose, can require a large number of decisions to be made and it is therefore necessary to determine the aims for the site, or farm or estate. This is as important for conservation as it is for agriculture or sport. A structured approach to the decision making process will result in a clearer understanding of the management priorities of the land, and the implications such priorities have on current management of the land in question and within the wider farm or land management context. It will enable farmers, land managers and funding agencies to direct their resources where they are most needed.

For many farmers, land managers and landowners detailed information on the requirements of habitats and species will come 'second-hand' from organisations such as English Nature in relation to the management of land on Sites of Special Scientific Interest (SSSIs), Farming and Wildlife Advisory Group (FWAG) for general and specific advice on farmland management for wildlife, and Farming and Rural Conservation Agency (FRCA) for advice particularly in association with funding through agri-environment schemes such as Environmentally Sensitive Areas (ESAs) or Countryside Stewardship. For the appropriate decisions to be made the individual or agency providing that advice must be aware of:

- the importance of the existing feature;
- the condition of that feature or resource;
- the conservation priorities at a both national and local level;
- the ecological requirements of the habitats and species in question;
- the management needs and how these may impact on the current land use;
- the potential to restore or recreate features;
- the potential for integration of biodiversity needs into broader land management practices.

The following sections provide a structured guide to the information required and factors that should be considered by a land manager/adviser when deciding on an appropriate management regime or restoration programme. Although it is targeted to the provision of guidelines towards management for biodiversity, similar thought processes will be required in situations where nature conservation is not the primary land use but which may be in receipt of funds to maintain or increase biodiversity.

3.1.4 Nature conservation objectives and targets for the English uplands

Nature conservation objectives, be it for small hay meadows or large moorland blocks should always take into account the wider picture and the evaluation of land holdings and individual 'sites' are described in detail under section 3.2.2.

The main reason for having objectives and targets is that they:

- clearly identify the relative importance of features so that conservation actions are driven by sound conservation priorities which safeguard these features and produce biodiversity gains;
- inform government departments, other agencies and organisations in order to gain support and share an understanding of upland priorities and issues;
- prioritise work and resources to increase biodiversity and provide a framework to make the best use of opportunities through, for example, scheme targeting of Stewardship and Wildlife Enhancement Schemes;
- relate international to national to local objectives.

English Nature proposes to produce nature conservation objectives and targets for the English uplands. They will contain the national priorities, objectives and biodiversity targets for upland habitats, species and earth heritage interests. A parallel exercise is also being undertaken by English Nature to use these objectives to identify priorities and targets for each upland Natural Area. The refinement and development of objectives has been undertaken in a framework and in parallel with other work, for example the implementation of Biodiversity Action Plans and the implementation of the Habitats and Species Directive, and addresses England's obligations regarding internationally and nationally significant habitats, species and earth heritage interests.



The relative importance of the habitats, species and earth heritage interests of the English uplands are determined by a number of criteria. They evaluate features in an international, national and local context as to whether they are:

- rare or scarce;
- threatened;
- declining;
- restricted in distribution;
- limited in extent or number;
- fragmented;
- at the edge of their range;
- representative of a particular interest;
- important in England because a significant proportion of the international or UK population, habitat or interest occurs there.

A number of common principles guide the implementation of upland nature conservation objectives for the English uplands. These are:

- to maintain the overall distribution, extent and the full range of variation of upland habitats, species and earth heritage interests;
- to ensure that the resource is maintained in a favourable condition (see Information Note 1);
- to restore areas that have been damaged in the past and seek to achieve favourable condition;
- to recreate areas of the resource with a particular emphasis on reducing fragmentation.

The following chapters describe and identify the key components and species for upland habitats along with, where known, their requirements and management prescriptions.

3.1.5 Management plans

While a structured approach to land management decision making is more likely to deliver biodiversity gains, it need not become bureaucratic or time consuming. Management plans can assist in the formulation of objectives and prescriptions, and provide a work plan over a specified period. They do provide a written record of why particular management decisions were taken and can be useful at a later date, if only to act as a reminder to oneself. Such records will also allow for continuity of thought processes when there is a change in personnel, crucial when a farmer or tenant moves on or where there

are changes in land management adviser. This handbook is, however, not intended to be a guide to the production of management plans.

It is not always necessary to adopt a very formal approach or lengthy format. Even on National Nature Reserves English Nature has moved away from time consuming and lengthy processes required to formulate management plans. It has now adopted the 'minimum format' (Nature Conservancy Council 1991) as the standard format for writing management plans. Other situations will necessitate a slightly different approach although the similar principles will still drive the preparation of the plan or management proposals.

For SSSIs, English Nature defines Conservation Objectives which defines the nature conservation interest of the site. The next stage involves the production of a Management Statement, which is intended to provide a framework to capture the short- and medium- term management needs. These are brief documents that focus on the core management necessary to protect the SSSI but are not intended to replace management plans where more detail may be required. They are in effect a summary of a management plan's key elements. Like all plans, however, they are intended to be updated and amended in the light of new knowledge and experience. They contain a number of sections - introduction, nature conservation importance, nature conservation objectives, objectives of owner/occupier, agreed objectives, agreed management actions, management records, effectiveness of agreed management actions, and maps. Changes in legislation relating to SSSI notification management are contained in the Countryside and Rights of Way Act.

For farmers and landowners considering applying for Countryside Stewardship an *Upland Survey* (MAFF 1999) is required. This is to assist in the identification of all features of environmental interest on the land holding and much of the information can be supplied in map form. Guidance is given on the amount of detail needed, which in addition to environmental features includes legal, agricultural and land use information. Scheme objectives are set out and county target statements explain which objectives apply locally and which type of land or features are a priority. Specific conservation objectives and work are then identified for individual land holdings that are eligible for the scheme.

Figure 3.1 summarises the decision making process required that will apply to most situations and which is described in Section 3.2.

Further information: Andrews & Rebane 1994; Countryside Council for Wales 1996; Hiron, Goldsmith & Thomas 1995; Nature Conservancy Council 1988; Tait, Lane & Carr 1988.

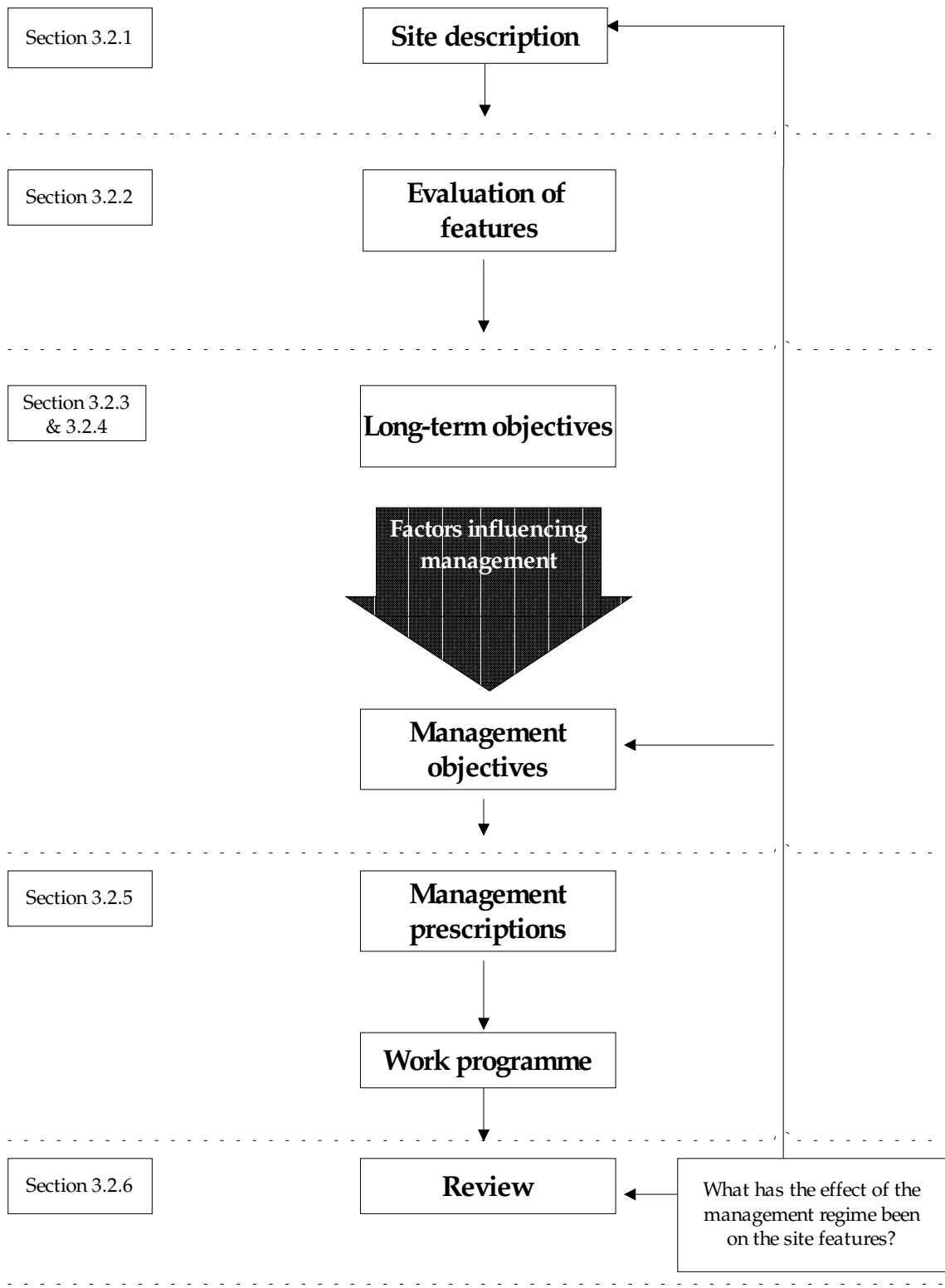


Figure 3.1. The decision making process

3.2 The decision making process

3.2.1 Describing the features of the site

The first step in the process requires some knowledge of the presence of features of nature conservation interest on the land holding. Although it is not always essential to have comprehensive information to make management decisions, some basic information is required. The type of information and the degree of detail needed will vary according to the purpose of the exercise but should address the following:

- An annotated map of the type and extent of the wildlife habitats and earth heritage features present. This can vary from broad habitat categories down to the detail of National Vegetation Classification (NVC) community types (the latter are sometimes useful but not normally essential). It is almost always worth conducting a new survey as old information is not always reliable and habitats and vegetation condition can change quite rapidly. Carrying out the survey will also aid familiarisation with the site.
- An indication of the condition of wildlife habitats present. This can be carried out at the same time as the habitat survey. Guidance on condition assessment for certain upland habitats is given in Information Note 1.
- Details (and location map) of *species of nature conservation significance* present for which specific management might be required. Guidance on which species are considered to be of such importance are given in the relevant tables in Chapters 5-10. The degree of detail required will vary with species and timescale available to undertake the assessment. However, where possible, species information should include population numbers and where known, recent trends. The presence of species of note is most likely to be highlighted from previous information and surveys but occasionally may come to light during the survey for higher plants, birds, mammals, amphibians and reptiles and certain invertebrate groups such as butterflies or dragonflies.
- The survey should also highlight other features which may need to be taken into account. Particular attention should be paid, for example, to the presence of stockproof fences, condition of boundary features, sources of pollution, landscape and archaeological interests and public rights of way.
- Past and current management practices, including information on livestock, grazing regimes, mowing practice, woodland management, burning practice, other farm or sporting management, sources of historical information, aerial photographs and old maps.
- Legal obligations associated with the land, such as sporting rights, tenancies, access, land designations such as SSSI or archaeological monuments, areas of ground covered by schemes such as ESAs, Countryside Stewardship.
- Land with the potential for restoration or recreation of wildlife features.

A number of initiatives are now adopting a whole farm/estate approach. This does not mean that all land has to be entered into an agreement but encourages a wider assessment of features of note on the

holding. This can be particularly relevant when changes to the livestock regime are proposed as there may be implications for other parts of the estate through, for example, reducing grazing pressures elsewhere.

Possible sources of site records/information: Country nature conservation agencies (English Nature, CCW, SNH, DoENI), County RSPB, Wildlife Trusts, County/District Councils, the Environment Agency or equivalent, the County Biological Records Centre, ADAS, FRCA, ESA & Countryside Stewardship project officers, FWAG advisers, the County Bird Recorder and local museums.

Further information: MacDonald *et al* 1998; Nature Conservancy Council 1990a; Pollard 1977; Rodwell 1991 to 2000; Thomas 1983; Information Note 1.

3.2.2 Evaluating the site's features

Once a description of the site or land holding has been compiled, an evaluation of the wildlife (habitats, communities and species) and earth heritage features present should be made. This is essential as it will assist in identifying the conservation priorities and consequently the management objectives later. Each habitat, species of nature conservation significance or other interest feature should be assessed as to its international, national, regional or local significance. In addition assessments should include:

- the rarity of the feature in terms of each of these four geographic scales;
- the extent of the habitat or size of the species population on the site;
- to what extent the feature has been modified by man, ie how natural is it?
- how diverse are the various species groups/communities/habitats present?
- how susceptible to change is the feature?

At the end of the evaluation a picture should appear of how significant each of the individual site features is, and in relation to each other.

Further information: Batten *et al* 1990; Countryside Council for Wales 1996; Nature Conservancy Council 1988 & 1989; Perring & Walters 1990; Ratcliffe 1977; Rodwell 1991 to 2000; Stewart, Pearman & Preston 1994; UK Steering Group 1995; county floras, the records/information sources given in Section 3.2.1.

3.2.3 Formulating management objectives

A frequent mistake is to begin to make detailed decisions about upland management before the broad objectives for management have been defined. Objectives will need to be determined for each significant interest feature, to give a clear idea of what the management of that feature is meant to achieve. The nature of the objective will depend on the condition of the vegetation or population trend of a species. Where, for example, the vegetation condition is unfavourable, or a species is in decline, then the objective is likely to want to bring about a change in the current management to bring about a recovery. In contrast, where habitats appear to be in favourable condition and species populations are stable or increasing then the objective is likely to be to maintain the current management regime. For example, where an area of heath is losing dwarf-shrub cover then the objective might be: 'to return dwarf-shrub cover to >75%'. For upland heath and blanket bog, for example, the criteria for favourable vegetation condition given in Information Note 1 could be used to identify objectives, where vegetation is the principal management concern.

Where a specific species is in decline it is useful to include specific habitat requirements in the objective, such as sward height, sward structure or species composition in addition to population levels or overall distribution on the site. This provides clearer guidelines for the management and provides a number of targets that will be easier to monitor.

3.2.4 Factors influencing management

Before arriving at final management objectives, it is necessary to take into account those factors which will influence the achievement of the long-term objectives. Factors that need to be considered include the following:

- natural processes, including natural succession, erosion and sedimentation;
- national trends in species populations - a species may be in decline for reasons that are beyond the control of a land manager, including climate change, acid deposition, cyclical fluctuations or disease outbreaks;
- the ecological requirements of species or communities;
- external factors such as pollution or grazing pressure from wild animals such as deer or rabbits;
- legal obligations - the need to maintain public rights of way, conditions in tenancy agreements, SSSI obligations;
- conflicting management objectives - management for one feature might threaten the existence of another;
- practical considerations, such as off wintering facilities required to reduce winter grazing pressure;
- conflicts of interest with other land users including other commoners;

- the availability of resources, financial and labour and conditions attached to public monies received for management.

Once those factors which influence the management have been taken into consideration it might be necessary to modify the long-term objectives or, where resources are limited, prioritise these objectives in which case the following factors should be taken into account:

- the evaluation of the national and local significance of the features present;
- the significance of the features, in terms of the site's overall nature conservation interest. For example, how do the features compare in terms of extent/population numbers? How do they rank in terms of national/local scarcity? A site may, for example support a significant proportion of the national population of a particular species, or a large area of a nationally rare plant community. A small area of a rare community might be more important than a larger area of a more common one;
- how susceptible each feature is to changes in management, or changes in the structure or composition of the habitat in which it occurs. Consider what would happen if nothing is done to halt or reverse unfavourable conditions;
- how successful the possible management options are likely to be in achieving the desired effect. For example, if vegetation condition or species numbers are in decline, or a problem species is increasing in numbers or extent, will the management option redress the problem?

By taking all the above factors into account it should be possible to arrive at a set of management objectives which can then be turned into a work programme.

3.2.5 Work programme

For each management objective appropriate management prescriptions need to be selected and followed which will achieve the desired result. Management prescriptions should be chosen after referring to the relevant sections of this handbook and other references listed in each chapter. Choices will need to be made as to stocking rates, mowing regimes and burning programmes, together with ancillary requirements such as repair of stock boundaries, blocking of grips, degrees of bracken clearance or footpath maintenance.

Once management prescriptions have been selected and the details of the prescription identified, a work programme can be drawn up. This should outline what needs to be done at what time of year and, in some instances, in what year it should be done. It is conventional for work programmes to cover five year periods although some schemes offering financial incentives for management may require land managers to enter into a 10 year agreement with a corresponding work programme. Whatever period is used a review of the effectiveness of the management is standard at the end of that period so that any shortcomings can be taken into account. In some instances reviews may be undertaken more frequently.

Some management objectives and prescriptions may, however, involve much longer time scales so it may be necessary to have a short- to medium-term work programme running together with a more long-term

programme covering, say, burning rotations and woodland restoration schemes relying on natural regeneration.

Annotated sketch maps of the site are often an effective way of keeping a record of the condition of the site when management decisions were made, the site condition which management is aiming to achieve and the management required to achieve this state. Figures 3.2, 3.3 and 3.4 give examples of this type of map.

3.2.6 Reviewing the effectiveness of the work programme

Managing land for nature conservation is not an exact science. Many of the management recommendations contained in this handbook are guidelines rather than precise prescriptions. There are many variables involved in land management, such as local climate or soil productivity, which makes it difficult to draw up rules that will fit every situation. There are, however, basic principles that will apply to most situations and that, with a little fine tuning, can be adapted to individual circumstances. For this reason alone it is important for there to be feedback from the effects of the management.

Some monitoring of the effects of management prescriptions on the vegetation and animal groups considered to be of importance should take place. Depending on the resources available and the objectives of the management, this can vary from a photographic record, through assessments of vegetation condition using, for example, the method in Information Note 1 or MacDonald *et al* (1988), to detailed monitoring programmes using quadrats and statistical analysis or surveys of specific species or groups of species. Information from monitoring should be fed back into the decision making and planning process so that modifications can be made to prescriptions where they are required. It is important to take into consideration when interpreting monitoring results that ecological change is not necessarily linear. There may be a lag period of several years before pronounced effects are noticed following a change in management regime. Some systems, however, may respond quite quickly. Also, detected changes may be caused by external factors such as abnormal weather conditions. It is usually best to monitor over a reasonable period before jumping to conclusions, unless it is very obvious that something is drastically wrong.

Record keeping can also be an invaluable aid to land management and can greatly aid the interpretation of unexpected outcomes to management operations. At the very least, basic records of what was done when, or, often more importantly, what wasn't done, and where, should be kept. The more detail that is recorded (stock type, number, timing of grazing, area burnt or felled/planted, date of mowing), the more useful the information is likely to be. Again any management that is missed in a given year should be recorded so that it can be fed into the following year's work programme.

<p>Further information: Brooks & Stoneman 1997; Byrne 1991; Goldsmith 1991; Moore & Corbett 1990; Nature Conservancy Council 1988; Pollard 1977; Rowell 1988; Sutherland 1996; Thomas 1983.</p>
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3.3 Decision making example

The example used in this chapter to demonstrate the decision making process is a 3.75 ha field of wet grassland on the edge of a lake (see Figure 3.2). It is owned and managed by a National Park Authority (NPA). Its management comes within the remit of a Park Ranger. The field lies within an SSSI, so English Nature must be consulted about appropriate management practices.

This site consists of a section of ungrazed canary reed-grass *Phalaris arundinacea* tall fen lakeshore hydrosere vegetation, with scattered willow *Salix* bushes, and a damp field of soft rush *Juncus effusus* and sharp-flowered rush *Juncus acutiflorus* marshy grassland, with stands of bladder sedge *Carex vesicaria* swamp, plus drier grassland and hawthorn *Crataegus monogyna* bushes on the landward edge. The uncommon water sedge *Carex aquatilis* grows in the lakeshore tall herb fen. An invertebrate survey has established the presence of several uncommon species in the damp grassland. There are no breeding birds present in the grassland.

The lakeshore vegetation is in good condition. The rush pasture, however, is thought to be too heavily dominated by bulky species, such as soft rush, meadowsweet *Filipendula ulmaria*, tufted hair-grass *Deschampsia cespitosa* and purple moor-grass *Molinia caerulea*.

Management of the field has varied considerably both prior to and since the NPA's acquisition in 1984. It is known to have been grazed and possibly mown prior to 1984 but was not grazed or otherwise managed in the two years immediately preceding this date. In 1985 the north-east corner was mown but the field was not cut again until 1989, when it was also intermittently grazed.

The field has been summer grazed since 1990 using beef cattle from a nearby farm. The inception of grazing has varied each year and has tended towards June or, in some years, July. Stocking density has also varied considerably, with nine beef cattle in 1990 and four in 1998. In 1999 stocking varied from seven cattle initially, to three later on in the year. In addition to grazing the field is occasionally mown in August. The cuttings are normally baled and taken off site. However, in 1994 the baled cuttings were left to decay on the upper edge of the field.

The NPA's principal management objective has been to diversify the sward and create a sward structure suitable for breeding waders such as curlew *Numenius arquata*, snipe *Gallinago gallinago* and redshank *Tringa totanus*.

The following pages and boxes discuss the long-term objectives for the field (Box 3.2); the factors that influence the management (Box 3.3); the identification and formulation of management objectives (Box 3.4); the identification of management prescriptions to deliver the above (Box 3.5); and the production of a work programme (Box 3.6). Figure 3.3 shows the desired state of the field, and Figure 3.4 identifies the management required to achieve the desired state of the field.

Box 3.1 Example: Evaluation of nature conservation significance of features present				
1. Vegetation types				
Four vegetation types are present. These have the following nature conservation interest:				
Rush pasture:	Relatively widespread locally, but nationally has undergone a significant decline in extent. Moderately species-rich stands are present, but no notable plant species present. This habitat can be of importance for breeding waders but none present. This is the most extensive vegetation type present, its composition is largely the result of grazing with livestock and, probably, annual mowing. Both practices also prevent natural succession to tall herb fen and eventually wet woodland.			
Bladder sedge <i>Carex vesicaria</i> swamp:	A localised vegetation type, both within the county and nationally. Stands are restricted to the wetter parts of the field. It is more natural in terms of species composition than the rush pasture but grazing is preventing succession to willow carr.			
Canary reed-grass <i>Phalaris arundinacea</i> tall herb fen:	A widespread vegetation type around water bodies, but of high ecological interest. Present as a broad strip along the lakeshore. Largely natural in species composition, but will develop into willow carr in the medium to long term without management.			
2. Plant species				
Water sedge <i>Carex aquatilis</i> :	A very rare species in the county, with only ten known sites. Nationally uncommon, but not classified as Nationally Scarce.			
3. Animal species				
<i>Platypalpus unicus</i>	A nationally rare Red Data Book fly			
<i>Geomyza apicalis</i>	A nationally scarce fly			
<i>Platycheirus perpallidus</i>	A nationally scarce hoverfly			
<i>Apion spencei</i>	A locally distributed beetle			
<i>Themira annulipes</i>	A locally distributed fly			
Summary of nature conservation significance:				
			Significance	
Site features	International	National	Regional	Local
1. Vegetation types				
Rush pasture		Moderate	High	
Bladder sedge swamp		Moderate	High	
Canary reed-grass tall-herb fen			Moderate	High
2. Species				
Plants:	<i>Carex aquatilis</i>	Moderate	High	
Invertebrates:	<i>Platypalpus unicus</i>	High		
	<i>Geomyza apicalis</i>	Moderate	High	
	<i>Platycheirus perpallidus</i>	Moderate	High	
	<i>Apion spencei</i>			High
	<i>Themira annulipes</i>			High

Box 3.2 Example: Formulation of objectives – 1. Long-term objectives

The lakeshore tall herb fen vegetation appears to be in an acceptable condition. There are one or two willow bushes, which if allowed to become more numerous would result in a loss of open vegetation and its conversion to willow carr, a habitat which predominates around the rest of the lakeshore. At their present extent, however, these bushes provide perching and feeding sites for birds such as sedge and reed warbler and reed bunting. A suitable long-term objective would be *the maintenance of the open tall herb fen vegetation, with no more than 5% cover of willow bushes*. Preventing succession to woodland will retain diversity to the lakeshore as a whole.

There appears to be scope for improving the condition of the rush pasture as it is largely dominated by coarse species, such as soft rush *Juncus effusus*, meadowsweet *Filipendula ulmaria*, tufted hair-grass *Deschampsia cespitosa* and purple moor-grass *Molinia caerulea* at the expense of less competitive species. Additionally there is potential for waders to breed in the field, but none are currently present. This may be due to the sward structure being uniformly tall. A suitable long-term objective would be *to create and maintain a more diverse sward, with reduced abundance of coarse species and with a structure more suitable for breeding waders, such as curlew, redshank and snipe (a mosaic of short swards and tussocks with vegetation height ranging from 5-50+cm)*. In addition to this *the existing populations of rare and uncommon invertebrates should be maintained*.

Box 3.3 Example: Formulation of objectives – 2. Factors influencing the management

- The main constraining factor which has hindered the achievement of the NPA's management objectives for this field is the difficulty of finding a grazier. This is due to the poor grazing quality of the land. The NPA does not own any stock itself. The NPA currently has a grazier for the land, but it has not always proved possible to maintain the desired grazing intensity throughout the grazing period, as the grazier periodically removes stock to better land to maintain their condition. As a result the vegetation is not grazed as hard as is desired so that little change in structure or species composition has occurred since grazing was re-introduced in 1990.
- The current management prescription is attempting to create conditions suitable for species which have not bred here for at least 10 years, possibly much longer, and does not take into account the requirements of species already present, which might have equivalent or greater nature conservation importance. Both heavy summer grazing and mowing, particularly the latter, are potentially detrimental to the invertebrate populations present as they result in a sward with few flowers, so reducing the abundance of nectar which is one of the major food sources for adult invertebrates. A recent survey identified one nationally rare hoverfly and two nationally scarce flies, along with a number of locally important species. While this could be said to be a reflection of general under-recording of invertebrates, it may also be indicative of a diverse invertebrate fauna at this site. Some of these species are nectivorous as adults.
- The size of the field dictates that it will never attract more than a few (less than five, and more likely two or three) pairs of breeding waders.
- No waders breed in the field at present.
- Scrub encroachment will occur in the ungrazed lakeshore unless management is carried out to interrupt the process of natural succession.

Box 3.4 Example: Formulation of objectives – 3. Taking the factors influencing management into account and formulating operational management objectives

Having considered the factors discussed in 2, a clarification of the management objectives and methods on the field is required:

The principal objective of the management of the field is to diversify the sward structure and reduce the dominance of species such as soft rush *Juncus effusus*, meadowsweet *Filipendula ulmaria*, tufted hair-grass *Deschampsia cespitosa* and purple moor-grass *Molinia caerulea*.

Attracting breeding waders should not be considered to be the primary objective of the management of this field as the numbers of waders that could be attracted would never be of major significance. It could, however, be a beneficial side-effect of the management and the sward structure required by curlew, redshank and snipe (a mosaic of tussocks and short turf, ranging in height from 5-50cm) would meet the requirements of diversifying the sward structure and provides a suitable guide as to what constitutes the desired sward structure.

Grazing with cattle is the best method of creating and maintaining a tussocky sward. Initially grazing should be heavy in order to effect a change in the sward structure. A minimum stocking rate of 350 Lu/ha/yr (13 cattle) from 1 June until 31 October (153 days), with the grazing density being maintained throughout this period should achieve this. Taking half the cattle off half way through, as has happened in the past, will reduce the effectiveness of this remedial management considerably. To reduce the likelihood of this taking place, a hardy breed of cattle, that will not lose condition on this poor quality grazing, is required. This high level of grazing should not need to be maintained for more than a few years (probably no more than five) before the desired sward structure has been attained. It will be important to monitor both the sward structure and species composition during this period, so that the effectiveness of the management can be assessed and changes made if undesirable changes are occurring to the species composition or the sward structure is not seen to be developing in the desired way.

Once the sward has acquired the desired structure of a mosaic of short patches and tussocks with vegetation height ranging from 5-50+cm then the stocking rate should be reduced to a maintenance level. Some experimentation, with close monitoring of the sward structure and species composition, will be required to establish exactly what the appropriate maintenance stocking rate is, but initially a rate of 200 Lu/ha/yr (seven or eight cattle) between 1 June and 31 October is suggested. Should waders start to breed in the field then the stocking rate up to mid-July will need to be reviewed and, perhaps, reduced to decrease the chance of trampling damage to nests and chicks.

Annual mowing has been used to supplement grazing in bringing about a change in sward structure, but it is not a suitable long-term management technique as it will tend to produce a uniform sward rather than a tussocky one and the sudden change in sward height that it brings about is likely to be detrimental to the invertebrate interest. Occasional mowing may, however, aid the remedial management when stock numbers fall short of levels required.

An alternative and more effective, though more labour intensive, method of enhancing the effect of grazing with mowing during the remedial management phase is to use a brush cutter to cut the vegetation around preferentially grazed areas to lead the cattle into the coarser vegetation. This would need to be done at least monthly throughout the grazing period. This should not need to be continued once the required vegetation structure is achieved. It is thought at present, however, that this would require too great an input of labour. Topping the coarser vegetation on a regular basis throughout the growing season might also be considered as an alternative. However, there would be difficulty in removing the cut material and this would be essential.

The use of mowing in any form should cease as soon as the required vegetation condition is achieved. In all cases where mowing is used the cuttings should be removed from the site. Mowing should also cease if waders start breeding in the field.

Vegetation monitoring and the use of the resulting data to direct the future course of the management regime is essential here, as the management is attempting to produce a change in the vegetation. Recording quadrats in each stand type over the remedial management phase is especially important.

It should be noted that the management is primarily aiming at changing the structure of the sward, rather than its species composition. It would be undesirable for the management regime to result in a reduction in species diversity, a general loss of characteristic fen species or a marked shift in the species composition away from the current M23 *Juncus effusus/acutiflorus-Galium palustre* rush pasture communities towards a more grassy less diverse community such as MG10 *Holcus lanatus-Juncus effusus* rush pasture, or for it to result in the replacement of *J. acutiflorus* by *J. effusus* in stands where the former is currently dominant. If monitoring detects that any of these trends are occurring then changes in the management regime should be considered.

Monitoring of the sward structure may best be done using fixed point oblique stereo photography.

Monitoring of invertebrate groups should also be carried out to ensure that the management is not having an adverse effect on the uncommon species present. In addition to this monitoring, consideration should be given to carrying out surveys of the surrounding fields to ascertain the distribution of the uncommon invertebrate species that have been recorded in the NPA's field so that the local significance of the field for these species can be assessed.

If the desired sward structure has not been achieved within five years of inception of this regime then the management of this field should be thoroughly reviewed. It should not take ten years to achieve the required sward condition; five years of the appropriate management should suffice.

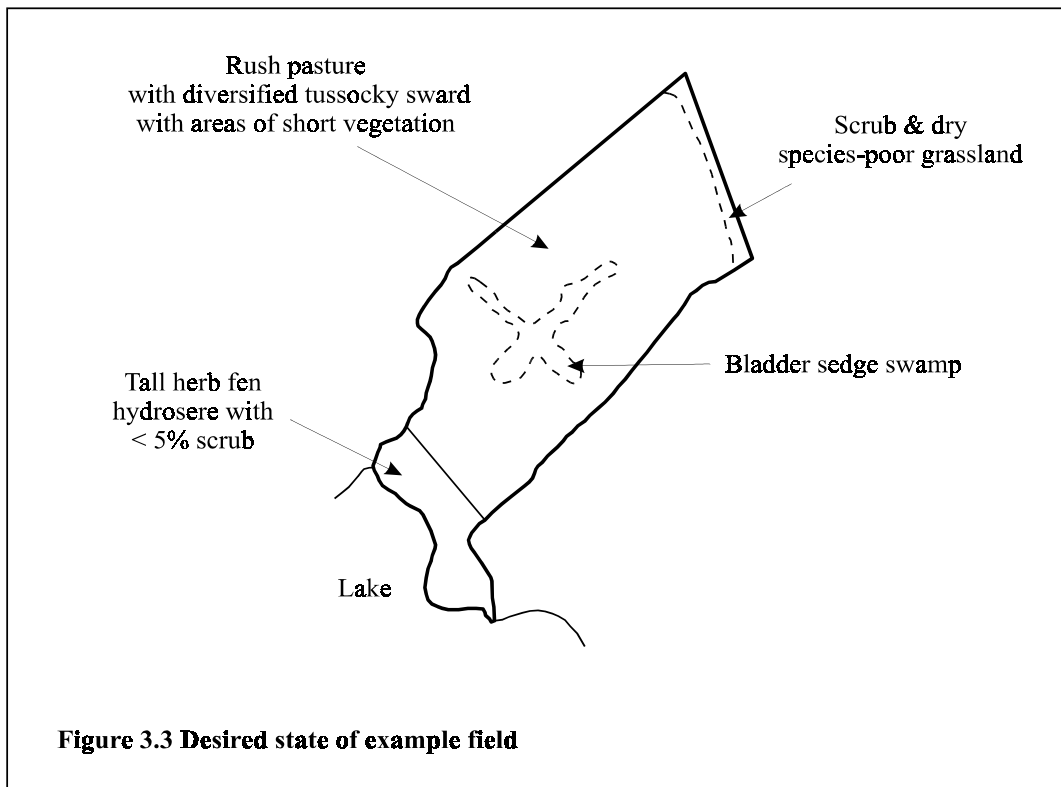
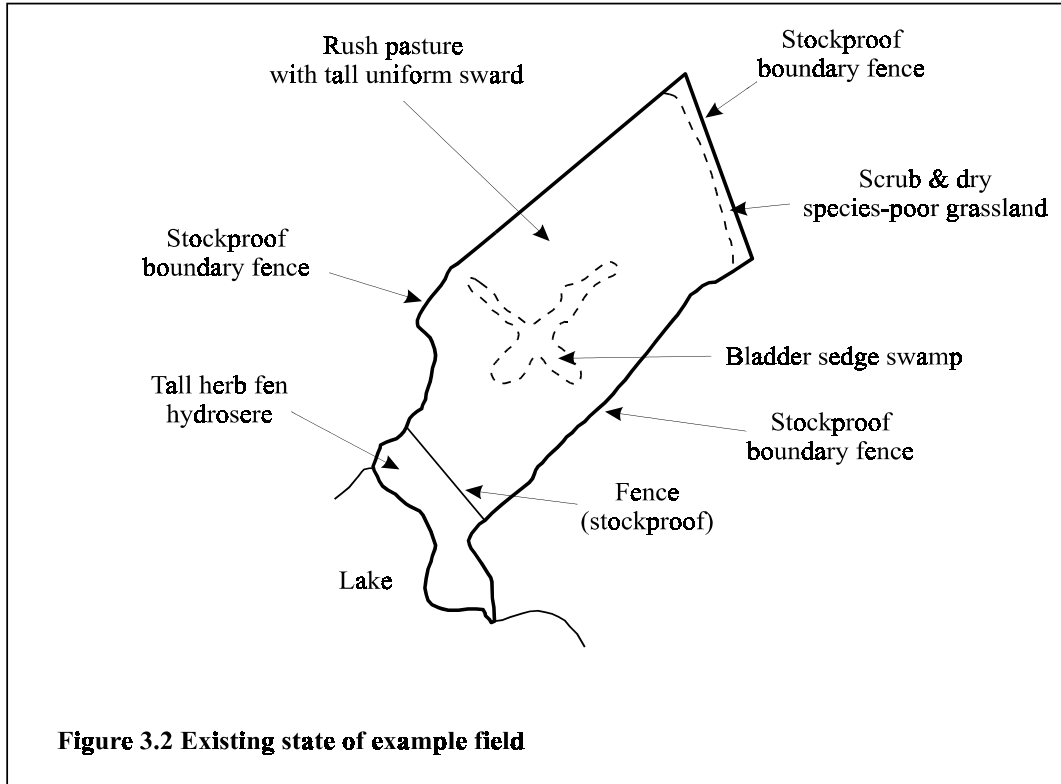
The lakeshore is largely a non-intervention zone. However, invasion by willow, which is more or less absent at present, needs to be monitored and cleared on a regular basis with treatment of stumps and the removal of felled trees.

Box 3.5 Example: An action plan with management prescriptions			
Objective	Prescription	Specification	Priority
Main field			
1. To maintain and enhance the wet meadow vegetation and provide breeding habitat for wading birds.	1. Graze to create tussocky sward structure.	13+ cattle between 1 June & 31 October	High
	2. Top sward to reduce vigour of <i>Juncus effusus</i> .	Regular (monthly/ bimonthly) topping of vegetation at a height of 15 cm and removal of cuttings during remedial management phase.	Moderate
	3. Check for presence of breeding waders.	During last two weeks of May. If waders present reduce stocking level and cease mowing between 1 June & 15 July.	High
	4. Maintain fence and water hole.	Repair/renew as required.	High
	5. Once required sward structure achieved reduce stocking to a maintenance level.	Seven or eight cattle between 1 June & 31 October.	High
	6. Monitor effect of grazing regime on vegetation composition and adjust stocking as appropriate.	Record quadrats every three years during course of remedial grazing regime. Monitor every five years once maintenance regime established.	High
	7. Monitor effect of grazing regime on invertebrate assemblage and consider adjustments to stocking if a decline in notable species is detected.	Survey unrecorded groups and repeat surveys of uncommon species every five years.	High
	8. Review management objectives and methods after five years.	If management has been unsuccessful in creating desired sward structure consider alternative management regime.	High
Lakeshore			
1. To maintain and enhance the lakeshore vegetation.	1. Prevent encroachment of willow into lakeshore compartment.	Monitor extent of willow scrub and clear willow as required. Treat stumps with a herbicide approved for use near water, eg Fosamine Ammonium. Willow scrub not to exceed 5% cover.	Moderate
	2. Continue exclusion of stock.	Maintain fence between lakeshore and main field and adjacent fields.	High

Box 3.6 Example: A five year work programme*		Year				
Job	1	2	3	4	5	
Main field						
Monitor for presence of breeding waders (Late May)	✓	✓	✓	✓	✓	
Graze with cattle at remedial stocking rate (June – October)	✓	✓	✓	?	?	
Reduce stocking rate if waders breeding (June – mid July)	?	?	?	?	?	
Mow sward (June/mid-July if waders breeding – October)	✓	✓	✓	?	?	
Maintain fence and water hole (when required)	✓	✓	✓	✓	✓	
Graze with cattle at maintenance stocking rate (June – October)				?	?	
Monitor vegetation (late June/early July)	✓		✓		✓	
Monitor invertebrate populations (summer)	✓		✓		✓	
Review management			?		✓	
Lakeshore						
Monitor willow scrub (summer/autumn)					✓	
Control scrub encroachment (winter)					?	
Maintain fence and water hole (when required)	✓	✓	✓	✓	✓	

***Note**

The example management prescriptions and work programme shown above include monitoring of the vegetation structure and species composition and invertebrate populations. The results of these programmes are used to review the effects of the management and to modify prescription specifications when necessary. A five yearly review is built into the work programme to ensure that the prescriptions are achieving the management objectives.



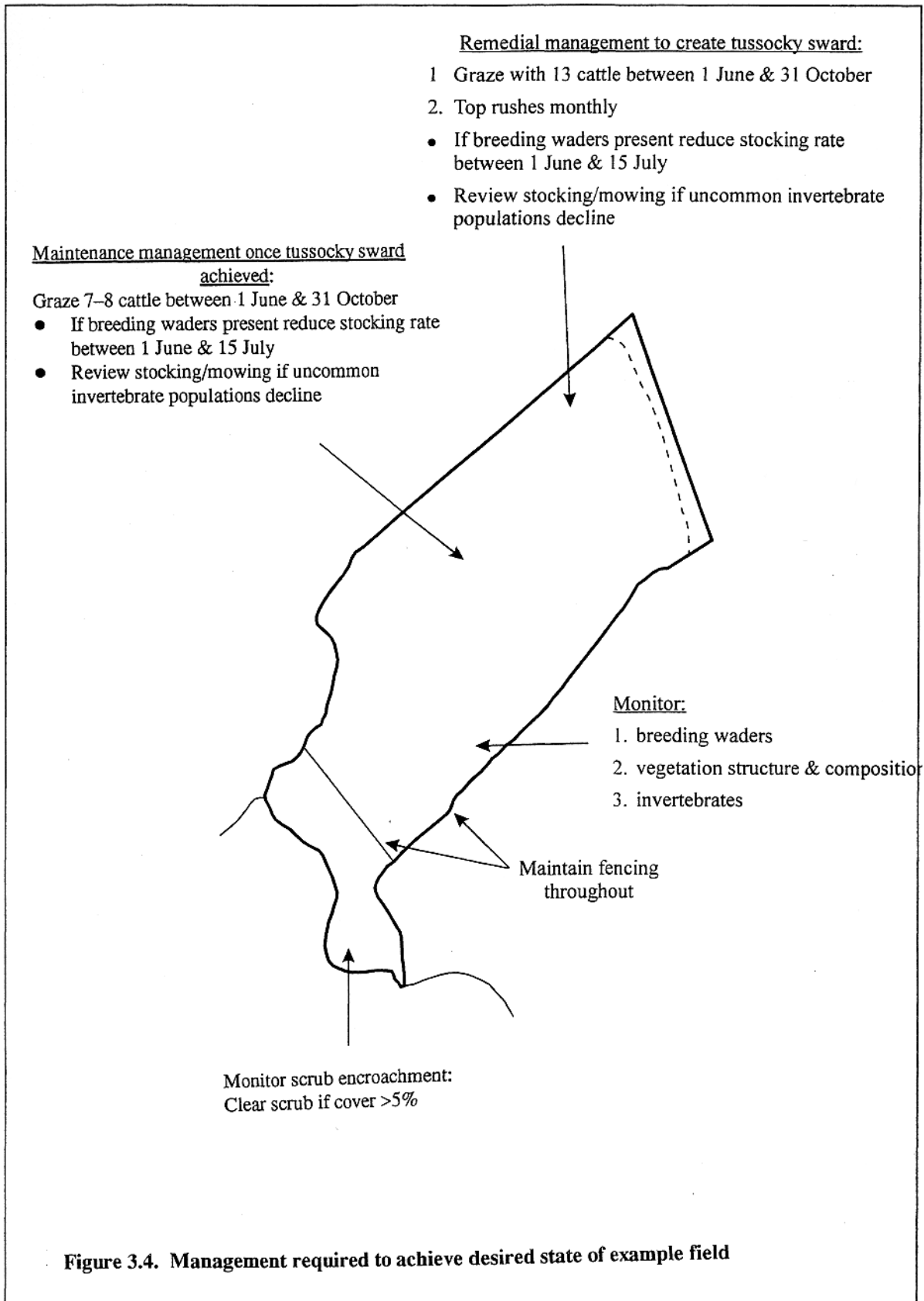


Figure 3.4. Management required to achieve desired state of example field