

DRAFT FOR DISCUSSION

APPRAISAL OF NATURE CONSERVATION AND RECREATION IMPROVEMENT MEASURES AT THE ENVIRONMENT AGENCY'S ESTATES

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EXECUTIVE SUMMARY

This is the summary version from a report (prepared by Risk Policy Analysts) on a case study of an appraisal system for the Environment Agency's Beckingham Marshes estate. This is part of the Comprehensive Project Evaluation (CPE) study jointly commissioned by the Environment Agency and the Royal Institution of Chartered Surveyors (RICS).

The paper aims to describe a draft appraisal system so that it could be discussed in depth at a workshop on 14 December. The intention then is that the draft system will be refined accordingly in the light of these discussions so that it could be readily applied at the Agency's Estates and possibly to other Estates.

The Environment Agency owns about 15,300 hectares of largely agricultural land. Most of this is held for flood defence purposes. The Environment Agency is developing sustainable integrated management systems for this land, involving 'best environmental practice' and balancing the maximum environmental improvements that the Agency can encourage the tenants to achieve and their costs.

The aim of this case study is to develop an appraisal system to aid the Agency's estates managers determine which environmental measures should justifiably be implemented on their estates and to provide an objective measure of environmental performance on their estate that could be viewed alongside its financial performance.

The case study focuses on appraising the costs and benefits of a number of possible improvements in nature conservation and recreation opportunities that the estate manager had identified on the basis of a Site Management Plan for the Beckingham Marshes estate.

The study developed a novel method for measuring the benefits of the nature conservation improvements in terms of their effect on the quantity of specific asset categories (eg hedgerows, ponds), their quality and how well they are managed in comparison with a best practice ideal as set out in a FWAG/RSPB manual. The importance for nature conservation of each category and its components was determined on the basis of in-depth investigations with experts from English Nature.

A study by ADAS and the estate manager's assessments were used to estimate the costs of each nature conservation improvement option. The appraisal system was then used to estimate the cost-effectiveness of the various options for the three farms on the estate. This highlights a number of possible measures that could cost-effectively achieve significant improvements in nature conservation on specific farms on the estate (eg improved hedgerow management and extra hedge creation and pond creation on three farms). The conservation proposals for one farm could yield a 44% increase in its conservation performance and value.

The Beckingham estate is used for informal recreation by nearby residents. It is within walking distance of the nearby villages and the town of Gainsborough, where there is a shortage of open green space. The proposals would considerably enhance the recreation opportunities on the estate for these residents by, for example, creating circular walks. A survey of the literature showed that the value of such informal recreation is between £0.70 - £1.80 per person per visit.

The number of additional visitors who might be attracted by the recreation enhancements was based on estimates of residents living within about 1.5km of the estate. But this factor is difficult to estimate. The appraisal suggested that overall the benefits of the recreation measures could exceed the out of pocket costs to create and maintain the footpaths and cycleways.

The draft appraisal system presented here is essentially a prototype, with the case study its first trial application. The case study has enabled the Agency's estate manager to identify a number of specific environmental enhancement options that are worth pursuing in discussions with the farmers and other stakeholders concerned with the Beckingham estate. The case study has shown that the appraisal system has worked well to assess objectively and systematically the cost-effectiveness of various nature conservation enhancement options at individual farms on the estate. The draft system does not appear to work quite so well for recreation on account of difficulties of specifying the options and estimating the visitor numbers for them.

This trial application raises a number of important issues. The National Centre is organising a peer review of the appraisal system and a workshop on 14th December to discuss in depth these issues so as to guide our further development of this work. These are highlighted in Section 4.2.

It is now proposed, subject to additional funding being available and the views at this workshop, that the draft appraisal system in this report will be refined into a practical tool that estates managers could readily apply at all of the Agency's agricultural estates and also perhaps its other land holdings. It is hoped that the experience of this case study could also promote the development of such or similar appraisal systems to achieve environmental improvements at other estates (eg MOD, Forest Enterprise, National Trust, Duchy of Cornwall, Water companies etc).

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Dissemination status

- Internal: Circulated to the Environment Agency's Beckingham Estate Project Group and selected Agency's estates managers and FER managers; freely available on request
- External: Circulated to the RICS Steering Group and selected estates managers and major land holders, economists and policy managers at DETR, MAFF, FRCA and other interested parties; freely available on request.

Statement of Use

This report develops a draft system for appraising possible measures to enhance recreation and nature conservation at the Agency's estates. The draft system was applied to the Beckingham Marshes in this case study.

Key Words: Estates management; Beckingham marshes; agriculture; agri-environment measures; nature conservation; recreation; economic appraisal; cost-benefit analysis; multi-criteria analysis; Environment Agency.

Environment Agency's Project Manager

The Environment Agency's Project Manager for this Project Output was:
Dr Jonathan Fisher, National Centre for Risk Analysis and Options Appraisal.

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Glossary

RICS	Royal Institution of Chartered Surveyors
FWAG	Farming and Wildlife Advisory Group
RSPB	Royal Society for the Protection of Birds
ADAS	Agricultural Development Advisory Service
B/C Ratios	Benefit/Cost ratios
CPE	Comprehensive Project Evaluation
OS	Ordnance Survey
WTP	Willingness to Pay
WTA	Willingness to Accept
OPCS	Office of Population and Census Statistics
RPI	Retail Price Index
NPV	Net Present Value (benefits minus costs)
PV (Costs/Benefits)	Present Value of Costs or Benefits
CSS	Countryside Stewardship Scheme
FWR	Foundation for Water Research
CBA	Cost Benefit Analysis
H/H	Household
EM	Estates Manager

1.0 INTEGRATED ESTATES MANAGEMENT

1.1 Introduction and Background to the Project

The Agency owns or leases about 15,300 hectares of largely agricultural land throughout England and Wales. Most of this land is held for flood defence purposes. The management of this land is the responsibility of the Agency's Estates Function. In carrying out this role, the Estates Function must consider the management of potential sources of income for the Agency, for example, through the letting of agricultural land.

A satisfactory balance must be achieved between the generation of income and the requirements for conservation, recreation and access. To assist in achieving this balance a partnership has been developed between the Estates, Recreation and Conservation Functions in order to deliver a sustainable integrated approach to land management.

1.2 The Decision Context

This case study needs to be considered within the general context of decision making in the Environment Agency (the Agency) as well as the more specific context of estates management. The principal aim of the Agency is "to protect or enhance the environment, taken as a whole, as to make the contribution towards attaining the objective of achieving sustainable development that Ministers consider appropriate".

The Agency has a number of functions and associated duties. In terms of estates management, these apply to water resource control (excluding water quality), flood defence, fisheries, conservation, recreation and navigation. The Agency's principal statutory duties are outlined in Box 1.1.

- *Generally to promote, to such an extent as it considers desirable:*
 - a) *the conservation and enhancement of the Natural Beauty and amenity of inland and coastal waters and associated land;*
 - b) *the conservation of flora and fauna that are dependant on an aquatic environment; and*
 - c) *the use of such waters and land for recreational purposes.*
- *Exercise a general supervision of all matters relating to flood defence in relation to England and Wales.*
- *To have regard for the desirability of protecting and conserving buildings, sites and objects of archaeological, architectural, engineering or historic interest.*
- *To take account of any effect which proposals may have on the beauty or amenity of any rural or urban area or on any such flora, fauna, features, buildings, sites or objects.*
- *To have regard to any effect which proposals may have on the economic and social well-being of local communities in rural areas.*
- *To have regard for the desirability of preserving for the public and freedom of access to areas of woodland, mountains, moor, heath, down, cliff or foreshore or any other places of natural beauty.*

Box 1.1 Principal Duties of the Environment Agency

In addition to these duties, the Agency must take into account the likely costs and benefits, in exercising its powers. Consideration must be given to the costs and benefits to society as a whole, the effects on the welfare of people and businesses, changes in the use of resources (capital, labour and natural resources) and the impacts on the environment, including those which cannot readily be given monetary valuations.

1.3 Project Aims and Objectives

The aim of this project is to develop an appraisal system to aid the Agency's estates managers in determining which environmental measures to implement. The system will also provide an objective measure of environmental performance that could be viewed alongside financial performance.

In addition to ensuring that the Agency's estate managers are provided with the tools necessary to undertake an appraisal of alternative options, the system must also allow assessment of more subtle changes in the management of assets, particularly conservation assets.

It has therefore been important to ensure that the system can be used as both a management tool and a more formal project appraisal tool. To help signpost where beneficial changes could be made within an existing management regime, the system has applied a 'best practice' principle.

To encourage widespread take up of the system it is essential that it is widely applicable, easy to use, comprehensive and practical.

1.4 Structure of the Report

Section 2 presents an overview of the appraisal system. Section 3 describes the application of the appraisal system to the Beckingham Marshes Estate. Section 4 concludes by summarising some of the key findings arising from the case study, the key issues for discussion at the workshop and the next steps in the development of the tool.

2.0 THE APPRAISAL SYSTEM

2.1 Structure and Coverage of the System

Figure 2.1 shows the key steps involved in the appraisal system. Steps 3-5 and 7 (shaded) form the main part of the appraisal system developed and applied in this report. The other steps are routinely carried out by estates managers.

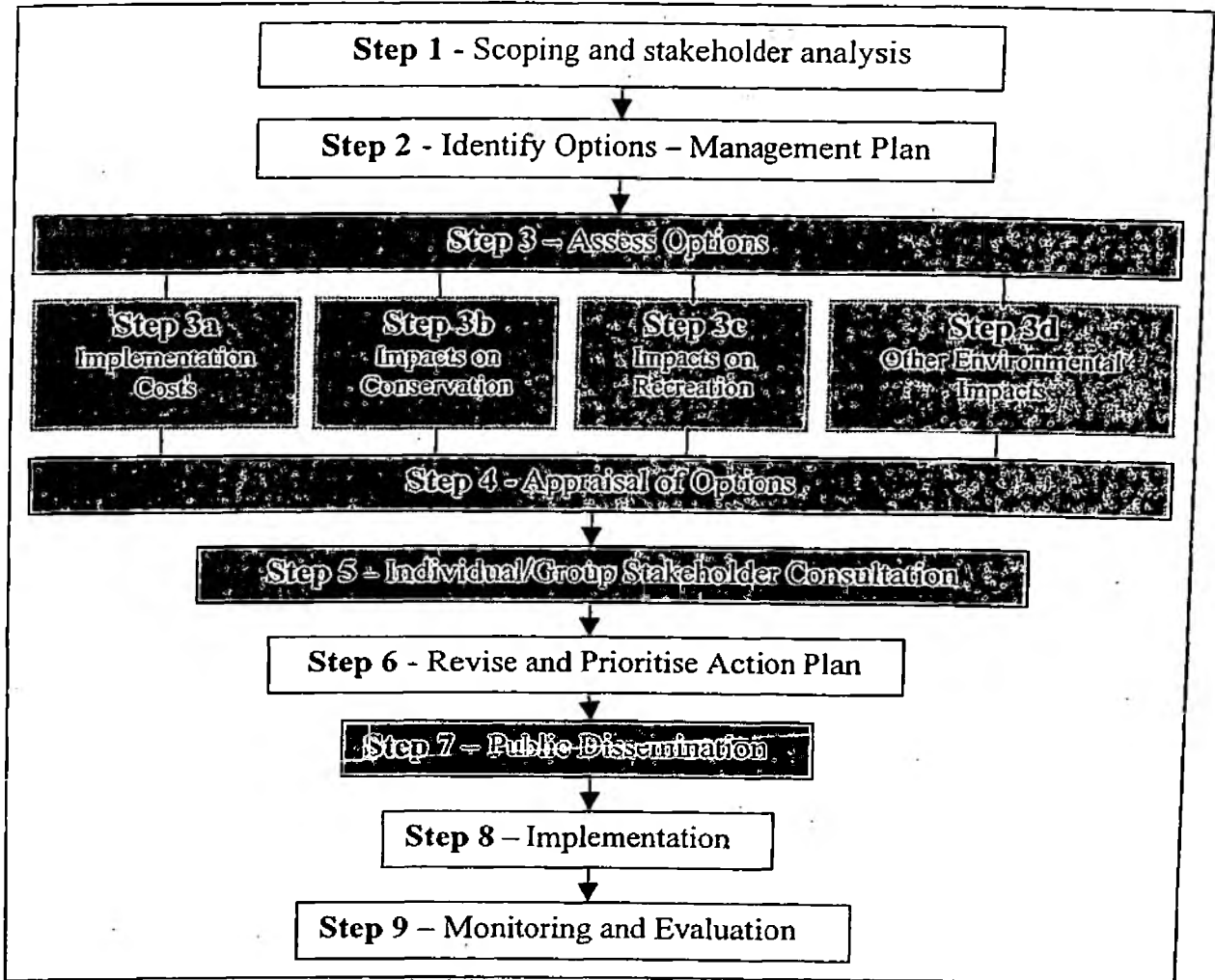


Figure 2.1 Overview of Appraisal System

Where feasible (and appropriate), the use of monetary valuations for both the costs and benefits is preferable when carrying out an options appraisal. However it is not possible to develop such estimates for the full range of issues that are the subject of this system. This is particularly true with regard to the valuation of impacts on conservation. As a result, a non-monetary assessment approach involving the use of multi-criteria scoring and weighting techniques has been adopted for Step 3b of the system.

In the assessment of the value of recreation visits, monetary values for individual visits are estimated by comparison with monetary values for similar sites. It is more difficult to estimate visitor numbers and the system aims to provide indicative estimates within the limited budgets and time available for the appraisal.

2.2 Scoping of Options and Identification of stakeholder's concerns

The identification and scoping of the options will be based on the estates managers' knowledge of the estate, supplemented as necessary by a Site Management Plan.

The identification and scoping of the key stakeholders' concerns about the estate and the options will primarily be undertaken by estates managers drawing on their existing knowledge of the estates and the key stakeholders. There are three key stages of consultation:

- a) Initial consultation prior to formulation of a draft report (Step 1 in figure 2.1)
- b) Key stakeholder consultation of alternative options and (Step 5 in figure 2.1)
- c) Wider public consultation of options and dissemination of information about actions. (Step 7 in figure 2.1)

Further details of Step 5 and 7 can be found in section 2.8. The objective of the consultation is to:

- Inform the agency's decision-making;
- Identify the key issues and concerns and relative preferences of the key parties affected and amend the action plan accordingly;
- Inform the public more widely about the Agency's proposed actions and the reasons for the proposed options and encourage positive involvement in the project.

Where it is necessary to obtain a full consideration of stakeholders' concerns, because for example, the options involve complex impacts and potentially difficult conflicts, this will be supplemented by the estates manager carrying out the following actions to clarify the issues and concerns:

- Discussions with relevant agency parties;
- Consultation with recreation and conservation groups and bodies and Local Council recreation Departments during preparation of site management plan;
- Discussion with affected farmers to clarify their concerns and assess the costs and feasibility of options.

2.3 Implementation Costs (Step 3a)

Once a series of options for changes to the management of an estate have been identified (eg from a site management plan), the costs associated with implementing these options should be estimated. Such options may cover a wide range of different activities, relating to the management of both land and buildings, and may involve significant changes in the use of resources or more subtle changes in the nature of use. As a result, a range of different cost types may need to be examined, such as those in Box 2.1 below:

Impact on tenant and landlord

These could be reflected in changes in capital land values but for the purposes of the proposed draft appraisal system should be considered as changes in the following items over the life of the measures:

- Changes in net income (eg changes in yields due to buffer strips). This will also include increases in income from (investments in) a formal recreational activity with paying visitors (eg horse riding etc).
- Costs of making one-off changes to land or buildings (e.g. creating a pond or hedge)
- Annual management or operating costs arising from the measures (e.g. the costs associated with increased hedgerow management)
- Other monetary and non-monetary impacts on tenant's welfare (eg damage and injury from vandals visiting their land), that are worth considering separately.
- Change in agri-environment grant income or change in agricultural subsidy under CAP

Environment Agency's Management and Capital Costs

These could also be reflected in changes in capital land values but for the purposes of the proposed draft appraisal system should be considered as changes in the following items over the life of the measures:

- Costs of making one-off changes to land or buildings (e.g. creating a footpath or cycle way))
- Annual management costs arising from changes in practice (e.g. the costs associated with management of cycle paths)

Box 2.1 – Implementation costs

These cost estimates should be developed using the approaches that are regularly applied by Chartered Surveyors and Agency estate managers. To be in a form that is compatible with any monetary estimates of recreation benefits (or costs), the above cost estimates need to be provided in both a discounted (and expressed in present value terms - see 2.4.7) and un-discounted form. All of the above represent the types of costs which Agency's estate managers value on a regular basis. With regard to costing of impacts on agricultural productivity and returns and some of the conservation management measures Nix (1999)¹, ABC (1999)² may be of use. Lampkin & Measures (1995)³ is a good reference for farm/field specific gross margins and standard values for hedge planting, grass margins establishment, etc. and associated maintenance costs.

¹ Nix, J. (1998) *1999 Farm Management Pocketbook*, Ashford: Wye College Press.

² Agro Business Consultants (1998) *1998 Agricultural Budgeting & Costing Book*, Melton Mowbray: Agro Business Consultants Ltd.

³ Lampkin, N. & Measures, M. (1995) *1995/6 Organic Farm Management Handbook*, Aberystwyth: University of Wales.

2.4 Assessing Impacts on Conservation (Step 3b)

2.4.1 Introduction

The conservation component of the system has been designed to be used both as a stand alone conservation management tool and as an element within other wider appraisals by estates managers. It is intended to promote 'best practice' in conservation management, as well as providing a simple and robust means of appraising and prioritising management options. It has been developed specifically for low land farmed landscapes. Other farmed or non-farmed situations may require variations to this system (see section 4.2.1).

2.4.2 Basis of the system

Current approaches for 'valuing' conservation assets usually involve finding areas of land with high conservation status, or deriving a monetary valuation for the existence of a given conservation asset. For the purposes of the conservation component of this integrated estate management system, these methods are considered unsuitable owing to the fact that:

- They require the involvement of experts;
- There is a tendency to 'value' only those assets of medium to high conservation status, ignoring the longer-term potential for the development of lower grade assets;
- In monetary valuation exercises, there has been a tendency to measure the quantity of a given asset, with little emphasis on quality.

As a result, such methods do not take sufficient account of the more subtle changes in the management of conservation assets that may allow the development of high conservation status assets over time.

Therefore our proposed system sets out to measure the conservation potential of a farm, estate or area of land in terms of:

- The quantity of different assets and whether there is 'enough' of each;
- The quality of each asset (in terms of a combination of its classification and the way in which it is managed);
- The extent of protection (e.g. separation distances between the asset and areas where chemicals are applied for agricultural reasons)
- Links with other on- and off-site assets (e.g. via complete stretches of hedgerow).

Taken together, these factors and associated measures provide an expression of conservation value in terms of a score relative to the maximum that is achievable on a given area of land. A mixture of quantitative, and qualitative measures have been applied to each of these areas to derive a multi-criteria scoring and weighting system.

The system assists the estates manager in achieving the overall aim of increasing the conservation value of the estate, in terms of ecology and biodiversity as discussed in Box 3.1.

The system assists the estates manager in achieving the overall aim of increasing the conservation value of the estate, in terms of ecology and biodiversity as discussed in Box 3.1.

2.4.3 The Example of Hedgerows

Hedgerows provide a useful example of how the system works in general. The conservation value of an area of land in terms of its hedgerows can be estimated by consideration of factors affecting the quality of hedgerows, the quantity and the connectivity. Figure 2.2 provides a simplified diagram showing how the system sets about measuring the quality of hedgerows. The value or potential of a hedge can be viewed in terms of its management and its level of protection from physical or chemical (eg spraying) disturbances.

Structure

As well as being important habitats for local ecology, hedgerows also play an important role for the movement of species over farmland and between other habitats. The system, therefore, examines the following physical characteristics of the hedgerow:

- *Connectivity* - the links it makes between different assets, even if these are not within the bounds of the area under consideration.
- *Continuity* - the number of breaks in the hedgerow which could impede movement of species.
- *Enoughness* - These factors are combined with an expression of the asset in terms of total length of hedgerow relative to the area under consideration.

Management

A hedgerow managed according to best practice management principles will reach its full potential over time. Thus you can measure how well the existing hedgerow (and its associated margin) is managed. This can be combined with quantitative data concerning the size, of both the hedge and the associated margin, to determine the quality of the hedge (and associated habitat potential).

Protection

The next consideration is how well the hedge is protected from agricultural practices, which may impact on its full potential in terms of biodiversity and conservation. To do this you should analyse the distances between physical and chemical activities and the hedgerow.

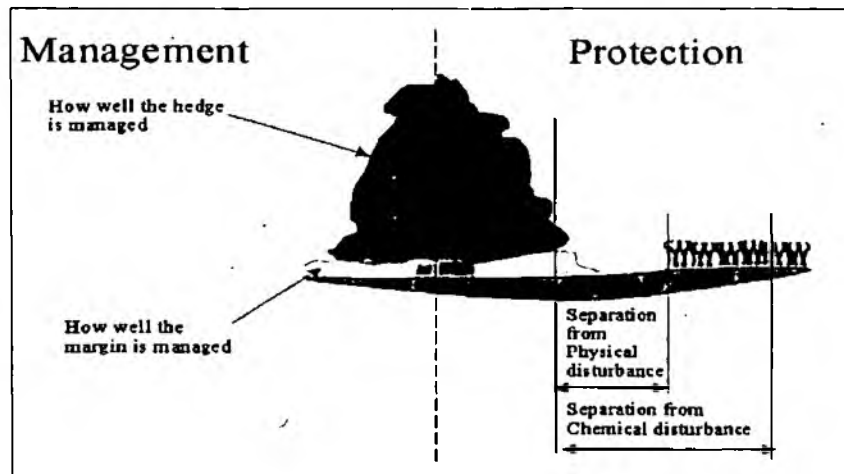


Figure 2.2 Factors of Importance to the Quality of Hedgerows

2.4.4 Structure of the System

The principles outlined in this example have been applied to all of the assets under consideration. In terms of the overall structure, conservation value is currently broken down into five categories of asset. Each of these five assets is broken down further into the various components of value. This is illustrated in Figure 2.3.

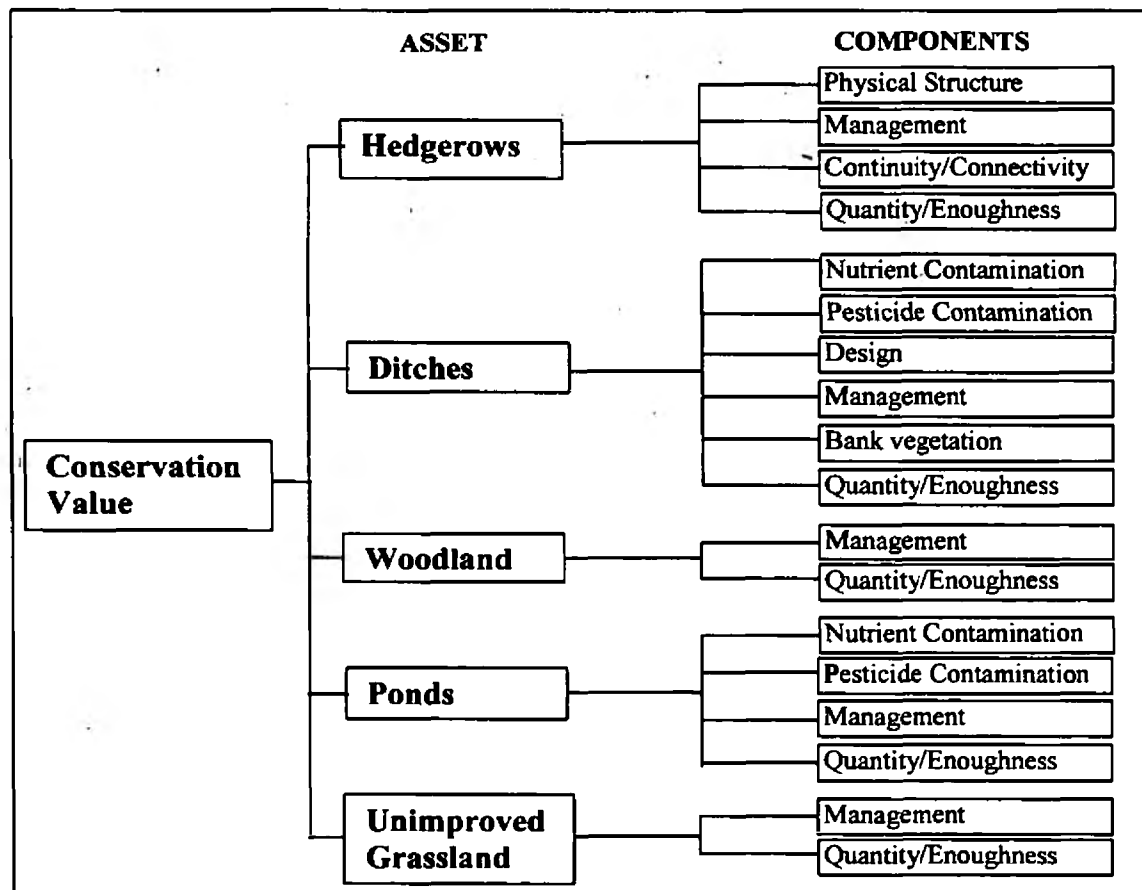


Figure 2.3 Structure of the System for Hedgerows

Obtaining scores for each component

For each of the value components (e.g. structure, management, enoughness) of an asset, scores are awarded up to a maximum of 100. Guidance on calculating the scores for each component of each asset is given in Annex I. In all cases, 'best practice' management has been extracted from the FWAG/RSPB farm conservation management manual⁵. This provides both appropriately expert views on the ideal management of assets and a manual which users of this system can refer to for further information on improvements to conservation management. Other measures have been derived specifically for this system and weights have been derived from appropriately qualified experts from English Nature.

Assessing the relative importance of the components

In order to obtain an overall score for each asset, the relative importance of the components needs to be assessed. This is done using the set of weights in table 2.1 below. These weights were developed with the assistance of a team of experts at English Nature. Details of how these weights were obtained are given in annex IV.

Table 2.1 Weighting factors for Conservation Components and Assets

Conservation Asset	Component	Relative component weighting factor	Relative asset weighting factor
Hedgerows	Quality of Structure	0.40	0.16
	Management	0.32	
	Continuity/Connectivity	0.12	
	Quantity	0.15	
Ditches	Nutrient Contamination	0.36	0.14
	Pesticide Contamination	0.06	
	Design	0.21	
	Management	0.28	
	Banks	0.03	
Woodlands	Quantity	0.06	0.26
	Management	0.625	
	Quantity	0.375	
Ponds	Nutrient Contamination	0.40	0.14
	Pesticide Contamination	0.26	
	Management	0.11	
	Quantity	0.23	
Unimproved Grassland	Management	0.77	0.29
	Quantity	0.23	

Therefore once the scores (out of 100) are obtained for each component, they are multiplied by the component weighting factors given in table 2.1 above, and then summed to obtain an overall score for each asset (also out of 100)⁶

⁵ Andrews, J. & Measures, M. (1994) *Farming and Wildlife: A Practical Management Handbook*, Sandy: Royal Society for the Protection of Birds (RSPB).

⁶ The appraisal system would be applied through the use of a simple spreadsheet model requiring the completion of various forms for recording the assessment of the scores for each asset. The weighting factors outlined above would already be included in the model.

Assessing the relative importance of the assets

In order to assess the relative importance of the assets, the figures obtained above for each asset (out of 100) should be multiplied by the asset weighting factors given in table 2.1 and summed to give an overall total (out of 100).

2.5 Impacts on Recreation (Step 3c)

2.5.1 Summary of the System

The system for assessing the impacts on recreation of a development project/change in management can be broken down into a number of individual steps as illustrated in figure 2.4 below. The steps are discussed in more detail in the following pages.

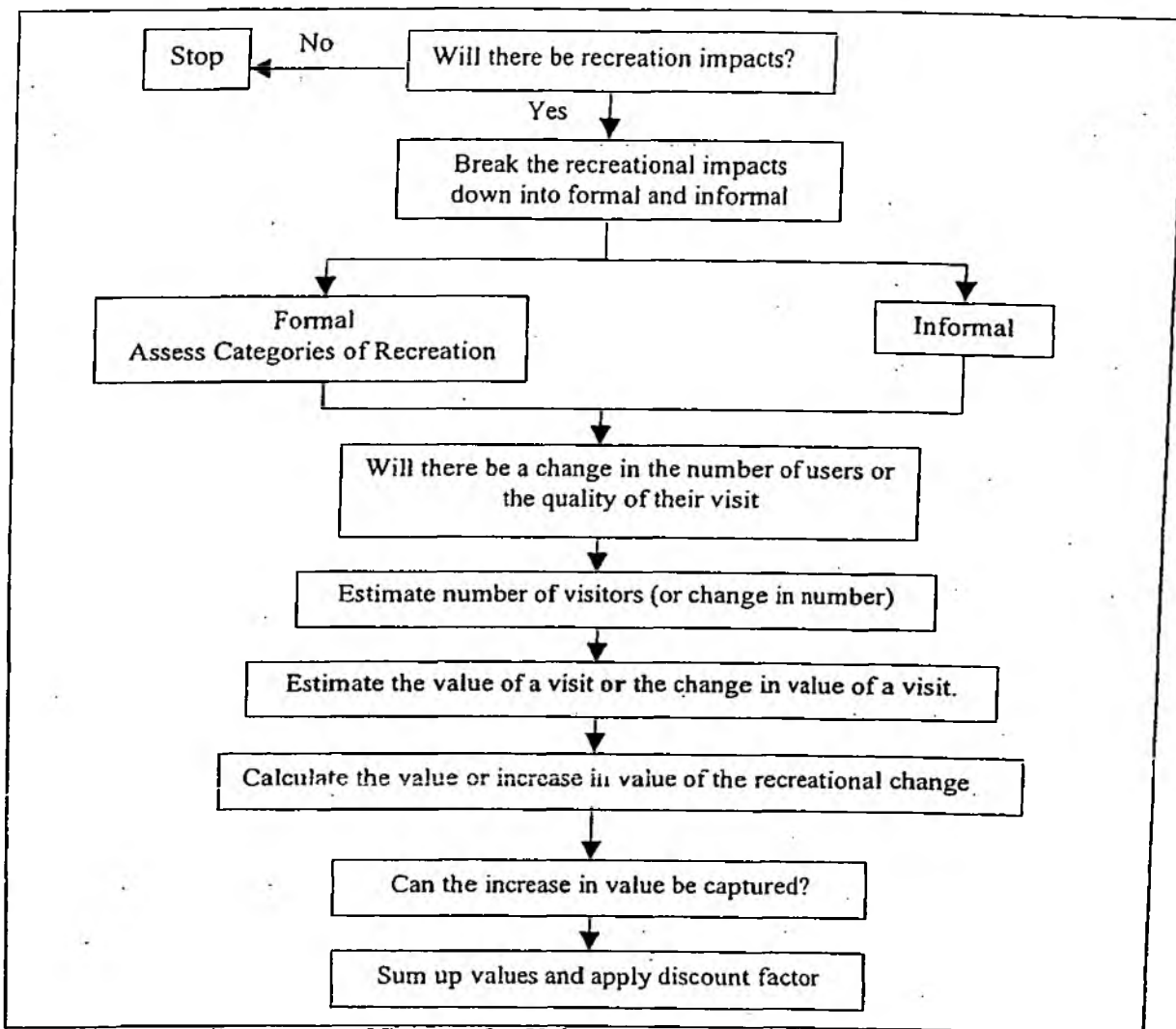


Figure 2.4 Summary of System for Valuing Recreational Impacts

2.5.2 Will there be any recreational impacts?

Any development project or management decision may have impacts on the recreational activities available at a site, for example, through the enhancement of a nature reserve. Depending on the options under consideration, three types of recreational impacts may arise:

- Creation of new recreational activities
- Improvement to existing recreational facilities
- Shift in recreational activity from one area to another

2.5.3 Formal and Informal Recreation

For valuation purposes, the system distinguishes between 'formal' and 'informal' recreation. Formal recreation can usually be characterised by the user paying a fee to participate (e.g. an entrance fee). This then can enable the provider of the recreation facility to capture (some of) the benefits for users of the facility.

As a general rule of thumb, all those types of recreation that do not fall into the 'formal' category should be classified as 'informal'. Table 2.2 outlines the main types of formal and informal recreation, although there may be other types occurring on any particular estate. Where other types are taking place, the assessor should choose the most similar type to provide the basis for valuation.

Table 2.2 *Main Formal and Informal Recreational Activities*

Formal		Informal
Angling	Canoeing	Walking/Rambling
Boating	Cycling (on/off-road)	Picnicking
Swimming	Organised off-road driving	Bird watching
Camping	Organised sports [indoor or outdoor]	Dog walking
Hunting	Archery	Watching sport (not on TV)
Horse riding	Shooting	Visiting sites of special interest

2.5.4 Visitor Estimation

Determining the number of visitors or changes in the number of visitors to a site is a difficult but important step. There are essentially three routes to determining total visitor numbers and estimating how many will be undertaking what activity:

1. The developer/manager may have a reasonable idea of the number of visitors that will be attracted to a site. This may have been assessed during the planning process.
2. Estimates of visitor numbers can be developed via consultation with interested parties such as developers or managers (outside of the planning process), analysis of tourist information and through use of existing surveys.
3. A 'sphere of influence' technique can be used, where this involves deriving the number of expected visitors based on the probable attractiveness of the site and the proximity of large populations of likely visitors; i.e. the more attractive the site, the further the distance that visitors are willing to travel.

These three approaches are explained in more detail in annex V. It should be noted that methods 1 and 2 are preferable to method 3, which relies upon the use of various techniques and formulae to predict visitor numbers.

⁷ For example the Leisure Day Visits Survey undertaken by the Countryside Recreation Network based at Cardiff University)

2.5.5 Value Selection

The methods outlined to determine visitor numbers will have provided the analyst with an estimate of the number of visitors (or increase in number) expected to visit the site in question for each of the relevant types of recreation. The next step is to select appropriate monetary values for the different types of recreation.

Table 2.3 presents a range of values converted into 1999 prices (and all in pounds and pence), taken from a variety of studies (further details of these studies can be found in Annex VI. The most appropriate value should be taken from this table. If an exact match cannot be found, attempt to choose the closest type of recreation to the one(s) on the site. The selected value should then be adjusted to account for price changes.

Table 2.3 Types of Recreation and Standard Values

Type	Value (£1999)	Sources
Informal	Low: £0.70 ; Mid: £1.80; Upper: £4.10	FWR, 1996 and 1996 Parsons & Kealy, 1994* - US lake
Game shooting	Driven pheasant £15 - £22 per bird; driven partridge £40 - £60 a brace; driven grouse £80 - £100 per brace; £50 - £65 per brace for walked up birds Values taken from farm accounting sources; checks should be made with local operators	ABC, 1999
Angling	Low: £3.80 ; Lower Mid: £6.00 Upper Mid: £16.30 ; Upper: £28.70 Lower Mid relates to high quality coarse fishing or good trout fishing Upper Mid relating to high quality trout or poor to good salmon; Upper relates to a good quality salmon fishery	FWR, 1996 Note, fees may vary widely from these figures, particularly for salmon fisheries. Clubs should be consulted
Canoeing/rowin g/boating	Low: £1.00 to Upper: £10.00 Low value relates to canoeing; Upper value relates to pleasure boating; No quality distinctions available	FWR, 1996
Coastal recreation	Low: £0.85 to Upper: £7.35 (per household per year). Low value for use of coast/estuaries; Upper for beach recreation	FWR, 1996 Green et al, 1990
Forest-based recreation	Low: £1.00 to Upper: £1.70	Bateman et al, 1996 Hanley&Common '87
Hiking	Low: £10.20 to Upper: £37.10	
Sports centre/ swimming pool	Low: £2.50 to Upper: £3.60 Low relates to small town pool; Upper to large city pool	Prince & Ahmed, 1988 Walsh et al, 1992
Cycling	Cost of bike hire per day (e.g. £10)	Gratton.&Taylor, 1985
Clay pigeon shooting	£50 - £75 per head per 50 clays (inc lunch, drinks, some instruction)	
Camping-	Pitch price - £6.50 to £12.00 per night Lower prices apply to limited facilities, higher for better facilities, larger tents...	ABC, 1999
Horse riding	Trekking charge per hour - £10 Annual lessons income per horse: £2750	ABC, 1999

In some cases, the table presents a range of values relating to different site characteristics/quality (while in others this has not been possible given the data provided in the source documents).

Values are in terms of per person/visit unless otherwise stated. Some are in terms of households/annum. If a conversion to households is required, data for specific areas can be obtained from the 1990 Census (via the Ward and Parish Monitor); however, assuming an average of 1.5-2 adults per household is likely to be appropriate.

The assessor can also use the ranges provided to reflect the change in value associated with improvements in the quality of a site. For example, informal recreation may already be provided for on a site; but landscaping, the extension of possible routes and the provision of better access, benches, picnic areas etc, may increase the value of a trip to the site. In this case, the assessor could take the difference between, say, the low and mid value to gain a measure of the increase in informal recreation value.

When the value has been selected for the relevant type of recreation, the next step is to multiply this by the expected number of visitors (or increase in number of visitors). The result should give an annual figure of the economic benefit of increasing recreational facilities at a particular site.

2.5.6 Capturable versus Non-Capturable Benefits

For the purposes of estates management, it will also be useful to identify those benefits of formal recreation activities which could be captured (i.e. they relate to a potential revenue stream) and those which could not be captured as they relate to more intangible benefit streams.

Capturable benefits	Non-capturable benefits
<ul style="list-style-type: none"> Changes in government grants or subsidies Creation of fee-based recreation activities or new income generating facilities (such as overnight moorings) 	<ul style="list-style-type: none"> Changes in the level of enjoyment gained from non-fee based informal recreational activities (e.g. walking)

Box 2.2 Capturable versus non-capturable benefits

By determining whether the benefits are capturable it shows the potential for the Agency or tenants to re-coup some or all of the financial costs imposed by a proposed management option. Where this is the case, the option is most likely to be viewed favourably, particularly by tenants.

2.4.7 Aggregation and Discounting

From following the steps above, the assessor will now have an annual sum of recreation benefits. This should now be summed over time to provide a total recreation value for the site over a relevant time period. Future impacts will need to be discounted. Discounting attempts to reflect the fact that individuals would rather have benefits today rather than at some point in the future.

There has been much discussion as to what the discount factor should be. Some argue that it should be as low as possible to avoid prejudicing against future generations. At present, we are constrained by current practice and no real accepted alternative currently exists. A traditional discounting procedure is therefore adopted. The discount rate in the UK usually varies between 6% (the Treasury rate for public bodies, including the Agency's estates) to 10% or 15% (for private companies, depending on the companies involved). It may also be useful to take a farm-based rate (say 10% or 8% or perhaps less) for use in the sensitivity analysis. The same rate should be used for discounting benefits as is used for discounting the costs of implementing proposed options.

The second element to be determined is the time period over which the development will be assessed. This should be the time period over which the measures could be expected to incur (changes in) costs and yield benefits. For standard project appraisal (particularly in the public sector), the time period is usually between 10 and 20 years and perhaps up to 50 years for long term assets. Discussions should therefore be held with the developer/manager of the site to determine the most appropriate time period for the analysis.

Once the discount rate and the analysis time period have been specified, it is possible to convert the value of annual recreation benefits into an overall figure. Table 2.4 presents an example range of this conversion factor for different lengths of project and discount factors (Annex VII provides a full set of factors). From this table, it can be seen that as the discount rate increases, the factors get smaller given that values in the future are given increasingly less weight. Note that the discount factor assumes works are carried out in year 0 and benefits start to accrue in year 1.

Table 2.4 Example of discount factors

Project Life (years)	Discount Rate and Factor*		
	4%	6%	10%
5	4.45	4.21	3.79
10	8.11	7.36	6.14
20	13.59	11.47	8.51
50	21.48	15.76	9.91

Once the discount factor has been agreed, multiply the annual sum by the discount factor to obtain the discounted sum (the so-called 'present value') over the life of the project.

2.6 Other Environmental Impacts

This case study has focused on nature conservation and recreation benefits. As part of the Agency's joint project with the RICS, RPA also carried out a case study on 'Farm and land management'— with the estate managed by Rotac Farms acting as the case study site. The environmental impacts highlighted in this report are divided into the following categories outlined below. The report describes a methodology for assessing these environmental impacts. Insert footnote reference to report.

Aesthetics

This category assesses the impacts of the farm from the point of view of those who are exposed to it and is split into three sub categories defined as amenity, heritage and noise.

- 'Amenity' relates to visual impact and aesthetic appeal of the farm.
- 'Heritage' applies to the management of any sites of heritage interest, buried archaeological features and other designated buildings, monuments or sites.
- 'Noise' looks at the management techniques to control noise.

Design

This addresses energy efficiency issues on the farm, including renewable energy sources, and the use of reclaimed building materials on the farm.

Natural Resources

This category is split into five sections:

- Resources Management covering:
 - a) soil management,
 - b) soil erosion and compaction,
 - c) cultivation management,
 - d) water management and irrigation.
- Crop Nutrition - measures relating to the application of fertilisers, slurry etc.
- Pest Control - relating to the use of pesticides for crop protection.
- Waste Management - This addresses how waste oils, plastics wastes, paper and card packaging and pesticide containers are disposed of.

Infrastructure

This impact category is primarily concerned with minimisation of interference with traffic flows, etc outside the farm.

Completing a farm audit to cover the above factors would require considerable involvement by the individual farmers - probably amounting to about 3-4 person days work. The proposed system outlined in Sections 2.4 and 2.5 could be completed independently by the Agency's estates managers. Consequently we currently propose that the Agency's tenants should be required to apply good practice regarding the above issues, but that the proposed appraisal system would not appraise 'best' practice measures going beyond good practice on these issues.

2.7 Appraisal of Options (Step 4)

2.7.1 Introduction

The Agency estate manager should now be in possession of the following information for each option:

- discounted costs of proposed works (i.e. present value costs).
- weighted unit improvement scores in conservation value for each asset and an aggregate weighted improvement score for the estate and the individual farms within an estate;
- discounted monetary benefits for recreational improvements of proposed works (i.e. present value benefits);

The next stage of the analysis is to bring together the scores and monetary valuations to decide upon the 'best' set of options (where this is defined as the options that provide the greatest net benefits, i.e. the best value for money). This could be done through a number of different approaches.

2.7.2 Conservation

The following are two ways in which the cost effectiveness of the various options can be analysed:

Comparison of improvements to assets on one site

The first level is information on the relative 'cost-effectiveness' of different conservation improvements at the asset and individual farm holding level. The assessor should first calculate the costs required to achieve a one unit increase in weighted conservation benefits for each asset type. It should then be possible to identify which assets generate the greatest conservation returns per unit of expenditure. Cross asset comparison should be undertaken with care. Where an estate comprises more than one farm holding, this type of calculation should indicate on which farm the greatest returns can be achieved.

Care must be taken when estimating the cost-effectiveness of different improvements to ensure that they properly reflect both the importance of the improvement and the area to which it relates.

Comparison of improvements to assets between sites

The following procedure can be carried out to compare the effects of improvement of assets between farms, the steps should be carried out with and without the improvement for each asset.

1. Identify the length/diameter/area of the asset under consideration
2. Set out the unweighted scores with and without the improvement
3. Multiply by the weighting factor to generate weighted scores

Weighted conservation benefits are then equal to the difference in the weighted scores with and without the improvement. The implementation costs should be divided by the weighted benefits per unit length/diameter/area of asset with the improvement.

This cost-effectiveness analysis leaves the key (\$64,000) question of how much money the estates managers should devote to securing these conservation benefits. This is explored further in the context of the specific example in Section 3.5.3.

2.7.3 Recreation

The discounted monetary benefits for recreational improvements of proposed works (i.e. present value benefits) can be compared with the discounted costs of proposed works (i.e. present value costs). It is now proposed that the costs and benefits of the recreation options should be presented as follows:

- a) Identify the specific possible recreation actions broken down by type (e.g. lengths of circular footpaths by farm, and any formal recreation measures (such as provision or promotion of horse riding and cycles) and an indication of their costs plus, if possible, sources of funding.
- b) Show which formal recreation measures (e.g. horse riding, cycle hire) might be worth seeking a private contractor or farmer to carry out on the grounds that their capturable benefits could exceed their costs (discounted at an appropriate private sector discount rate of say 8 or 10%).
- c) Show which of the informal recreation actions might be worth pursuing (i.e. where the recreation benefits exceed their costs). The estate managers might then discuss these with farmers to see if they could encourage them to implement them. The appraisal only covers the out of pocket costs for the Agency and farmers in implementing the options (eg costs of creating and maintaining footpaths). They do not include impacts on the welfare of the farmers (eg from vandals). Therefore, in their discussions with the farmers, the estates managers may wish to use estimates given by the appraisal for the excess of benefits over costs for the option as an upper estimate of what they might be able to pay to induce farmers to implement the option. This negotiation should of course also consider ways of reducing these adverse welfare impacts and whether the establishment of more settled informal recreation might reduce the problems faced by farmers (eg from vandalism, litter etc).
- d) Identify which conservation improvements (eg ponds or hedgerows) are likely to lead to increases in visitor numbers or higher quality visits. These benefits are in addition to the ecological gains associated with an improved conservation value. Therefore to estimate the extra recreational benefits associated with these conservation measures, see if these exceed the costs of the measures. If as is likely, the costs exceed the benefits, then deduct the recreation benefits from the costs and give a net cost figure which should be used to derive the cost-effectiveness scores for the conservation options.

2.8 Individual/Group Stakeholder Consultation (Steps 5 and 7)

The overall aims of the consultation process are outlined in section 2.2. This section covers the details of the recommended approach for stakeholder consultation and public dissemination.

2.8.1 Key stakeholder consultation on the options in the Draft Action Plan

The Estates Manager will carry out the following consultations on the Draft Action Plan with the following important parties:

- The tenant farmers. The EM should use the appraisal findings and estimates of the net impacts on farmer's income when discussing the conservation and recreation measures with each farmer. In respect of the recreation benefits, the appraisal would indicate the maximum that the Agency would be willing to pay farmers to compensate them for the adverse non-monetised impacts on their welfare of the recreation measures (eg from vandals and litter) - these are the impacts over and above any increased costs and income losses that are included in the appraisal. The process should be designed to identify better options to overcome these costs and problems;
- Recreation and Conservation Groups;
- Internal Agency parties and Local Authority regarding their requirements and any planning permission needed;
- Liaison with Agency staff (eg customer services) about appropriate mechanisms for wider public consultation.

We suggest it would be worthwhile holding a follow up meeting bringing together the various key stakeholders to discuss the draft revised action plan with the main priorities and outstanding options as identified by the appraisal. The aim would be to address any conflicts and seek better options and strategies that maximise the benefits and overcome as far as possible concerns (eg by farmers) regarding their potential adverse effects. It would also be designed to obtain their support for the measures and prepare for wider public consultations.

2.8.2 Public Dissemination of Action Plan Measures (Step 7)

The revised Action Plan will set out the proposed strategy and specific actions. It will show clearly when it is proposed to implement the actions, with emphasis on some measures being for immediate implementation, so that the public will be able to see soon clear results from the work. It will explain their rationale and how they have been derived (including those consulted). It will also highlight specific outstanding options and conflicts on which we are seeking views, although hopefully the stakeholder discussions above will have resolved most of these conflicts. It will also highlight certain messages for the public to ensure the overall benefits and success of the project (eg litter etc).

There could then be an information dissemination programme regarding the measures. This would aim to:

- Increase awareness and support for the launch of the project;
- Seek views on specific outstanding issues and show how we will refine the action plan accordingly;
- Put across any key messages (eg litter, stick to paths, country code etc);
- Encourage positive involvement in the project.

Possible mechanisms include a public display and open day with Agency staff and other partners available for individual consultation.

3 BECKINGHAM MARSHES ESTATE

3.1 The Estate

The Beckingham Marshes Estate (the estate) is located to the West of the town of Gainsborough and is separated from it by tidal reaches of the River Trent.

Formally a tidal marsh river floodplain, in the 1960s Beckingham Marshes became an integral part of the River Trent Tidal Reach Improvement Scheme as a controlled flood plain area. The purpose of this area is identical to that of the natural floodplain except that, by constructing control features, embankments, weirs, etc., the use of the area could be optimised to provide the maximum benefit in terms of flood control. In particular, the area is designed to provide flood protection for Gainsborough, Beckingham, Walkeringham, West Stockwith and Owston Ferry.

Some minor flood spillages may occur periodically over the area, with minimal impact on crops. However, when high tides meet a fluvial flood, water spreads across the flood plain such that in a flood with a return period of 20 years, the whole area is flooded to a depth of between two and three metres. Such total inundation occurred in 1977 and November 2000.

Much of the Beckingham Marshes is retained by the Agency for its flood storage function. The area of the estate site is approximately 566 hectares, of which 500 hectares are occupied by agricultural tenants, other land having been sold off for agricultural use. The whole site is criss-crossed with open drains discharging into the Trent.

In addition to the agricultural uses of the site, there is one commercial tenant (Pentex) operating nine oil and gas wells at various locations on the estate.

3.2 Identification of Pressures on the Land

3.2.1 Agricultural Land Use

Approximately 88% of the site is under the management of agricultural tenants. Figure 3.1 shows the site and the names and location of agricultural tenants, in addition to the state and distribution of hedgerows on the estate. In all, there are over 19 km of hedges in varying states of repair and 15 km of ditches bordering fields.

The majority of the tenants' land is under arable production. Only around 30 hectares is under permanent grassland management and it is understood this is fairly intensive.

Other than the legal requirements within the tenancy agreements, there are no conditions placed upon farmers to manage land in what could be regarded as an integrated fashion. As such, pesticides and fertilisers are used regularly as part of intensive arable production and there is concern that these agrochemicals will inevitably enter the ditch (and subsequently the river) system.

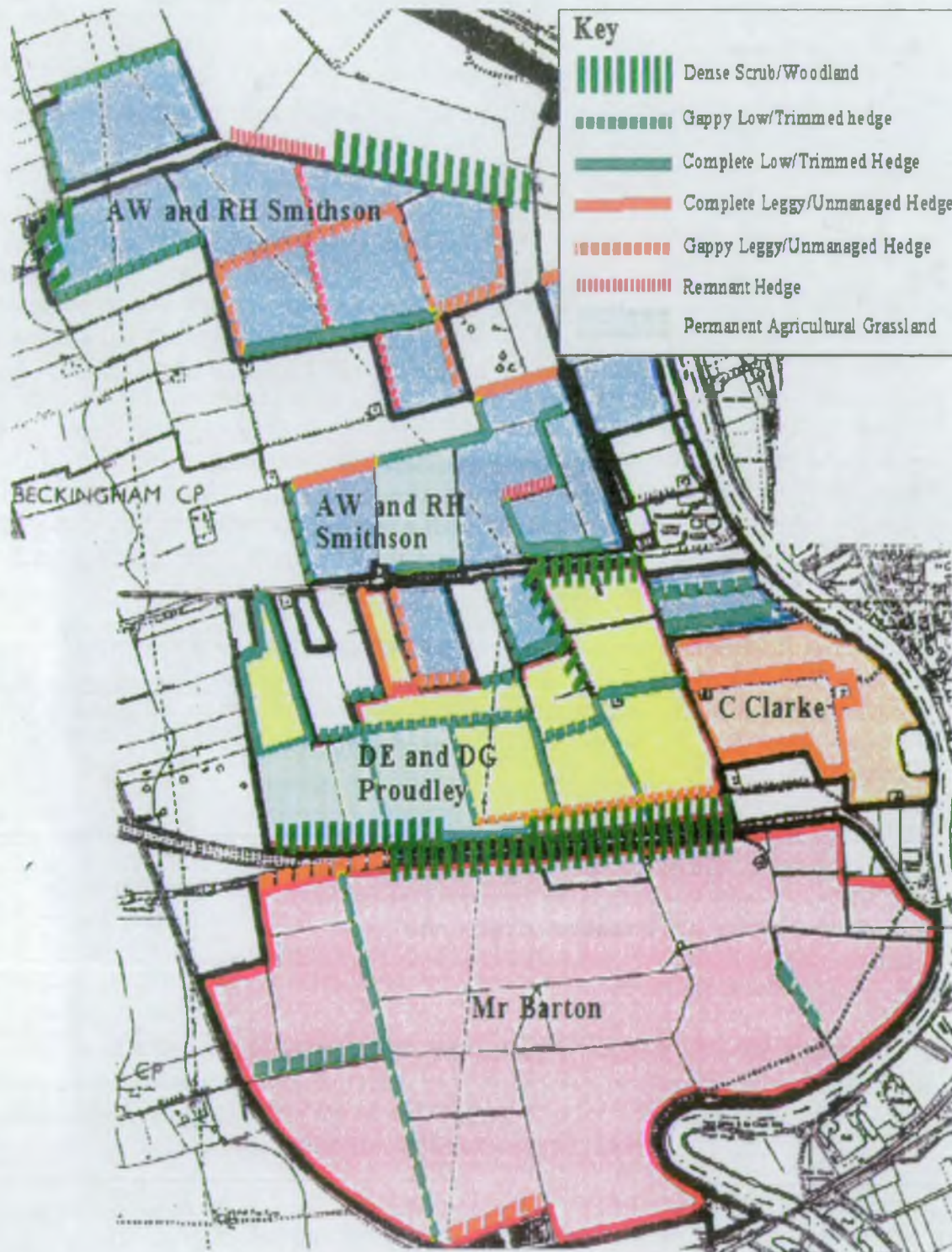


Figure 3.1 - Agricultural Tenants and Location of Hedgerows

3.2.2 Access and Recreation

Figure 3.2 shows that the site lies to the west of Gainsborough but is separated from it by the River Trent. The road bridge in the southeast corner of the site is the only convenient crossing point for walkers/cyclists. Similarly there are relatively few public access routes through the open land of the site which will also serve to limit the recreational use of the site either from Gainsborough or from the villages and conurbations that lie to the west.

Despite these issues, there are recreational uses of the site, principally walking and dog walking along footpaths and horse trekking along bridleways to the north of the site. Despite the access problems from Gainsborough described above, the majority of walkers using the riverside path on the eastern boundary of the site are thought to be from Gainsborough.

Whilst no survey of recreational demand has been undertaken, the survey and management plan has identified that, with appropriate improvements, the site is suitably placed to meet a number of local recreational requirements where these include the villages to the west of the site and Gainsborough itself.

In terms of Gainsborough, the management plan identifies that there is a shortage of green space in the town and that the estate offers the potential to address this demand. The access problems from the town are difficult to address, but provision of more footpaths, cyclepaths and links throughout the site would help to reduce the extent to which users must 'back-track' along the same route. This would increase the appeal of the site (from an access perspective) for informal recreational users and would also help to meet the needs of the residents in the three villages to the west of the site, particularly Saundby and Beckingham.

In terms of the appeal of the site for recreational users (and potentially educational users), the history of the site and its associated willow works, oil and gas wells, Trent wharfage and older industrial archaeology surrounding Dog Island, offer opportunities for interpretation and education.

From a landscape appreciation perspective, the site is much changed from the way it would have been 100 or so years ago. Construction of the flood embankment and associated drainage has permitted arable agricultural intensification resulting in the loss of hedgerows and scattered willow beds that would have been a feature of the site. As a result the landscape is much more open than it was, particularly in the south of the site and Saundby Marshes. As such, the development of conservation and associated landscape value of the site is likely to improve the interest of the site for visitors.



Figure 3.2 – Existing Access Points and Rights of Way

3.3 Local Ecology

3.3.1 Ecological value at present

The survey and management plan undertaken for the Agency⁸ concludes that the agricultural land on the estate is currently relatively devoid of wildlife interest. The conservation value of the land was assessed under categories outlined in box 3.1 below:

Diversity - The estate as a whole supports a moderate diversity of both habitats and species, and given the size of the site this diversity is much lower than would be expected.

Naturalness - The criterion of naturalness attempts to reflect the degree to which a site or feature within a site has been modified by human influence and most of the Beckingham Marshes Estate has been manipulated to a high degree for agriculture, particularly with long term drainage of the land.

Rarity - Rarity is generally assessed at local, regional and national levels. No habitats within the estate were considered rare or uncommon at a county level, although the dense willow margins of the left bank of the Trent are of local interest.

Fragility - This is a reflection of the extent to which a site or any habitats or species might be subject to change through the effects of either natural processes or external events. Many of the semi-natural habitats within the site are quite small and likely to be fragile, particularly the semi-improved grassland in the SE corner of the site.

Typicalness - This assessed whether a site or habitat is considered a good example of its particular type and is of most use when assessing long established plant communities. The site supports a moderate range of habitats typical to the River Trent and a poor to moderate range of species.

Recorded history - A recent survey has been carried out of the ecology of the site but no other regular or systematic recording or the wildlife interest of the site is known to have been undertaken.

Position in an ecological unit - Conservation value is increased when a site is close to other semi-natural habitats. The wider landscape around the site is generally agricultural and therefore poorly connected. However there are a couple of SSSI sites that make the site more interesting.

Potential value - As a large site, the potential value is high.

Box 3.1 - Ecology and Biodiversity: key characteristics⁸

The largest semi-natural habitats are outside the agricultural environment and consist mainly of:

- Improved grassland of the berm
- The willow coppice strip,
- The secondary broad-leaved woodland at Dog Island
- Saundby Ponds at the southern extent of the estate.

Baker Shepherd Gillespie Ecological Consultants (1999) *Survey and Management Plan for the Beckingham Marshes Estate.*

However, the wildlife interest of these is also limited. The diversity of the improved grassland is generally low, although it is higher in the wetter parts around Morton Point. The willow coppice strip, though covering a fairly large area, is limited in interest and potential by its thin nature, reducing its effectiveness as shelter for wildlife. The survey and management plan rightly concludes that, from a conservation perspective, the value of the site lies in its potential.

3.3.2 Barriers to enhancing ecological value

The following have been identified as barriers to enhancing the ecological value of the site:

- Impact on existing farm businesses;
- Planning requirements – There are a variety of consents which may be required should measures to enhance the ecological value of site be undertaken. Examples of this include:
 - consent from the National Grid should there be potential for trees to interfere with power lines;
 - land drainage consent or
 - consent from utilities companies to excavate near underground pipelines.
- Increased conservation value – when conservation measures are undertaken, their value may increase over time. This has led to concerns from farmers that they may be subject to increased restrictions and regulation as the features, which they may have helped to create, mature. For instance an area may be designated as a Site of Special Scientific Interest (SSSI) which could impose costs on the farmer.

3.4 Management Proposals for Beckingham Marshes

3.4.1 General Objectives

As part of the ongoing management of the estate, the Environment Agency has been investigating possible improvements to the estate and its management and has identified a number of key objectives. These objectives include maintaining and enhancing the aspects outlined below, whilst taking account of the impacts on the agricultural use of the estate and its flood defence function:

- populations of rare species;
- recreation on the Estate where this does not conflict with agricultural practice, conservation or the visual landscape or generally the quiet nature of the estate;
- fauna;
- diversity of habitats and plant communities;
- archaeological interest of Dog Island, whilst also having consideration for nature conservation interests and objectives;
- the landscape interest of the site.

Other more general objectives include fulfilling all legal and other obligations, promoting good practice in Estate usage by all parties and working with all relevant parties to contribute towards achieving sustainable development.

3.4.2 Identification of Management Actions

To assist with the identification of practical management options for the estate, the Agency commissioned a survey and Management Plan for the Estate and a report by ADAS examining the 'farm business implications for the introduction of possible environmental and conservation improvements'.

The Management Plan prepared using the Agency's Site Management Plan Methodology sets out the key management objectives for the site listed above, together with recommended actions. A full list of these actions is given in Annex VIII with a summary shown in table 3.2. Two major constraints to achieving the key objectives for the site are the agricultural management of most of the land within the Estate and the operational constraints relating to the flood storage. With regard to the agricultural management, the ADAS report recommended that the Agency should:

- maintain the tracks and grass margins which are already established;
- introduce more over-wintered stubbles on land used for set aside or peas;
- consider planting some field corners with native trees;
- consider digging a pond in the corner of one of the fields;
- introduce 2 m or 6 m margins around farm boundaries and alongside tracks;
- consider the introduction of arable reversion to grassland under the Stewardship scheme on the land currently in set aside and allow public access to this area
- consider a limited programme of hedge laying and gapping-up under the Stewardship scheme.

3.4.3 Timing of Actions

Many of the specific proposed actions require further study, discussions and consideration. It is unlikely that all of the actions will be carried out simultaneously. Table 3.2 sets out the probable timing for each actions and its costs, broken down down between 'one-off' payments and 'annual or ongoing' payments. A number of the actions could qualify for grant aid under MAFF Countryside Stewardship or similar schemes or might obtain external funding or inputs. Some actions (for one reason or another) may give rise to 'no net costs' to farmers or the Agency.

Table 3.1 Management Actions, Time Horizons and Nature/Level of Associated Costs

Action		Timing of Action (yrs)			Nature and Level of Costs*	
No	Description	0-2	2-10	10+	'One-off' Cost	Annual Cost
1	Survey for water voles and improved ditch maintenance	●	●	●		L
2	Ditch profiles enhancement	●	●		M	
3	Buffer strip creation along key ditches		●		M	M
4	Creation of grassland margins along hedges and tracksides		●		M	L
5	Management of trackside grasslands	●	●	●		L
6	Management of the Trent-side willow beds on rotation	●	●	●		L to M
7	Creation of short rotation willow coppice beds		●			L
8	Creation of small scrapes and ponds along the berm		●		M	
9	New ponds and scrapes should be monitored and maintained		●			L
10	Berm and floodbank grasslands maintenance	●	●	●		L
11	Hedge maintenance in accordance with ADAS recommendations	●	●			L
12	Hedge planting in accordance with ADAS recommendations		●		M	
13	Pond creation and enhancement on agricultural land		●		M	
14	Pond maintenance on agricultural land		●			L
15	Willow pollarding		●	●		M to H
16	Maintenance of Saundby Ponds	●	●	●		L to M
17	Creation of large scale wetland habitats			●		H
18	Interpretation: general study	●			L	
19	Maintenance of existing rights of way and associated structures	●	●	●		L
20	Creation of new rights of way (including cycle/horse tracks)	●	●		M	
21	Examine new use options for the former willow works	●			M	L
22	Commission detailed demand study for more formal sports	●			M	
23	As required, develop car parks in appropriate locations	●	●		M	L
24	Encourage the continued fishing of Saundby ponds	●	●	●		L
25	Large scale riverside recreation improvements			●	H	
26	Woodland management at Dog Island	●			M	L
27	Permanent grassland and improve access around Dog Island.	●			M	
28	Interpretation at Dog Island	●			L	
31	Survey and monitoring of rare species	●	●	●		L
32	Planting of willows on the berm	●	●		L to M	
35	Commission landscaping of well heads study (in progress)	●			L	
	Initiate and maintain	●			M	L
36	Maintenance of flood defence function	●	●	●		M
37	Maintenance of safety features and signs as necessary	●	●	●		L
40	Consultation/partnership mechanisms designed	●			L	
41	Annual review of the work programme	●	●	●		L
42	Five yearly review of the management plan		●	●		L
43	Review progress against key objectives		●	●		L
44	Maintain interpretative materials	●	●	●		L
Notes: * Key:		L = low M = medium H = high				

3.4.4 Proposed Actions

A number of the management actions listed in 3.4.3 and in detail in Annex VIII still need development or agreement with the relevant stakeholders. A number of the actions also reflect no change in management and therefore cannot be expected to result in any impacts. We have therefore extracted those actions from the management plan for which there is sufficient information (excluding 19 of the proposed actions). This reduces the appraisal to actions that are practicable for introduction within the next five years or so. Table 3.2 lists those considered in this appraisal along with a simple indication of where impacts are likely to occur. The list excludes a number of actions which are regarded as statutory duties and are, hence, not optional.

Table 3.2 Proposed Actions and Associated Impacts

Action		Impact Category		
No.	Description	Cons	Rec	Agri.
1	Improved ditch maintenance	●	○	?
2	Ditch profiles enhancement	●	○	?
3	Buffer strip creation along key ditches	●	○	●
4	Creation of grassland margins along hedges and tracksides	●	○	●
5	Management of trackside grasslands	●	○	●
11	Hedge maintenance in accordance with ADAS recommendations	●	○	●
12	Hedge planting in accordance with ADAS recommendations	●	○	●
13	Pond creation and enhancement on agricultural land	●	○	●
14	Pond maintenance on agricultural land	●	○	?
15	Willow pollard management	●	○	
19	Maintenance of existing rights of way and associated structures		●	?
20	Creation of new rights of way		●	●
21	Examine new use options for the former willow works		●	
26	Woodland management at Dog Island	●	○	
27	Permanent grassland around Dog Island and improve access		●	
28	Interpretation at Dog Island		●	
36	Maintenance of flood defence function	Statutory responsibility		
37	Maintenance of safety features and signs as necessary	Statutory responsibility		
38	Maintenance of public rights of way	Statutory responsibility		
44	Maintain interpretative materials		●	
45	Maintain rights of way and associated features		●	
Notes: Key: ● = direct impact ○ = indirect impact ? = uncertain				

3.5 Assessment of Impacts on Conservation

3.5.1 Introduction

This section describes the assessment of the impacts on conservation of the options outlined in 3.4.4. Maps and data sheets have been prepared by using information from surveys and a site visit. Given the area of the site and the number of farms to visit, it was not possible to walk along all 19km of hedgerow and 15km of ditches. Some assumptions have been made on the basis of the ditches and hedges that were inspected. Despite the use of assumptions, we believe the scenarios provide a good picture of the reality of management on the estate. The following sections briefly describe the tenant farms, the conservation assets and their management, the changes proposed, and the scores from the application of the system to each farm. Details of the scoring and the assumptions can be found in Annex III.

3.5.2 Description of the tenanted area

AW and RH Smithson

Figure 3.1 shows that the Smithson farm covers a total of around 160ha towards the north of the site. The farm consists of several blocks of fields mostly bounded by hedgerows and/or ditches. The majority of agricultural land use is arable with only about 9 ha under permanent pasture.

Table 3.3 provides the baseline scores from the conservation system, for each of the components of the conservation asset on the farm and also shows the potential for improving each asset. Sub-category scores can be found in Annex III. The Smithson farm scores 30 out of a possible 100 for the 'value' of conservation assets.

Table 3.3 Baseline Conservation Scores – Smithson

	Category Scores (out of 100)	Aggregate Score (out of 100)	Weighted Score	Potential Increase in Score
Hedgerows	30	30	5	11
Ditches	59		8	6
Woodlands	20		5	21
Ponds	0		0	14
Grassland	42		12	17

For the 8 km or so of hedgerows, the farm scores 30% for their value. Whilst the farm scored fairly highly (84%) for the quantity of hedgerows, their poor structure, lack of margins and poor management has reduced their value greatly against their potential. Also whilst there is considerable potential for connectivity from the web of hedgerows, the hedges are fairly "gappy", restricting their current value.

Ditches also score fairly well in terms of their quantity (86%) and also for low nutrient contamination (100%). However the indicators selected for nutrient contamination appear to be sensitive to seasonal variation and, as the field visit took place in the autumn, this score may reflect seasonal differences rather than good nutrient status. Conservation value of the 6km or so of ditches is reduced principally by poor design, management and probable proximity to spraying operations. In common with most of the ditches on the site, ditches are deep, steep sided and maintained in a 'V' shape. Banksides appear to be managed fairly intensively, reducing the extent to which bankside and top vegetation can and has developed as a habitat. In addition, it appears from observation that the ditches are dredged fairly regularly. Given the number of ditches, it has been assumed that this management is rotational but, as there is no evidence to the contrary, it has also been assumed that all of the ditch bottom is dredged at one time rather than leaving some for recolonisation.

There are some 2 ha of woodland/scrub on the site indicated by Agency survey maps. It has been assumed that this receives little if any management and, owing to the small areas involved, scores for quantity are low. In terms of the management of grasslands on the site, in the absence of real data on the management of pastures, a fairly intensive management regime has been assumed. However, the fairly modest score for grassland is largely due to the small area, rather than poor management. As there are no ponds on the site, the farm scores a zero for this category.

The scores and associated descriptions provide an indication of where conservation management actions should be targeted for each conservation asset. The greatest overall benefits are to be gained from woodland, grasslands and construction and maintenance of ponds on the farm. There are also a number of points available for hedgerows.

In terms of the management actions which have been proposed by the Agency, Figure 3.3 details proposed changes, including the planting of new woodland at points D, E, and F as well as the construction of a large pond at point G. Hedge planting has been proposed to renew the remnant hedging at field boundaries A, B, and C.

As well as these specific actions, there are a number of other actions that could be included in the scenario for Mr Smithson's farm. Owing to the low costs and potential benefits, we have included generally improved hedgerow management in the scenario. To keep as closely to the Agency's proposals as possible, we have not included any buffer zones or extended grass margins beside hedgerows and ditches. Increasing scores for grassland would require the conversion from arable land. This has therefore not been included in the scenario. The costs associated with the changes are shown in table 3.4. CSS payments are considered separately under the column for possible aid as confirmation of their award is still needed.



Figure 3.3 AW and RH Smithson - Future Management

Asset	Description and unit cost	Smithson Farm			Barton Farm			Clark Farm			Proudley Farm		
		Size of asset	Cost	Aid	Size of asset	Cost	Aid	Size of asset	Cost	Aid	Size of asset	Cost	Aid
Hedgerows	Planting of new hedges @ £673 per 100m	650m	£4,375 over 5yrs	£1,300	1286m	£8655 over 5 yrs	£2572				83m	£559 over 5yrs	£166
	Better maintenance and management of all trimmed hedges @ - £16 per 100m*	4,481m	£705		1861m	£293		413m	£65		3831m	£603	
	Gapping up hedge @ £67 per 10m							70m	£471	£140			
	6m buffer zone next to hedges @ £61 per 100m per yr							873m	£536				
	2m buffer zone next to hedges @ £27 per 100m per yr							290m	£85	£44			
Woodlands	Planting of woodland @ £3,375 per ha	5.5ha	£16,876 over 5yrs	£1,650							1ha	£3375 over 5yrs	£300
	Potential Foregone income		£3,399									£618/yr	
	Management @ £20/ha per year after 5th year		£110									£20 after yr 5	
Grasslands	Creation of grassland							5ha	£4970	£325			
	Creation of 2m buffer zone @ £27 per year per 100m				1400m	£383	£210						
	Tree planting @£120 per 100m (4m spacing)				1400m	£1680	£1190						
Ditches	Creation of 2m buffer zone @ £27 per 100m per yr				1620m	£444	£243						
	Creation of 6m buffer zone							1136m	£697	£398			
Ponds	Construction of pond	1 ha	£42,000	£5250				120m ²	£3120	£310			
	Potential Foregone income		£618						£7.43				
	Restoration of field pond on ditch line										100m ²	£3000	£300

Notes: * Costs offset considerably by reducing trimming frequency and associated tractor passes.

Countryside Stewardship Scheme (CSS) payments are considered separately. Costs have been drawn principally from ADAS conservation reports and the Agency's Action Plan for the estate, supplemented where necessary with data from published farm management sources.

Table 3.4 Costs of Conservation Measures (all costs are annual costs unless otherwise stated)

Barton Farm

The Barton farm covers a total of around 212 ha of arable land at the southern end of the site as shown in Figure 3.1. Table 3.5 shows the baseline scores for each of the components of the conservation assets on the farm. Table 3.5 also indicates the potential for improvements. The Barton farm scores 17 out of a possible 100 as a total aggregate score for the 'value' of conservation assets on the farm. The farm can be regarded as having low conservation value at present.

Table 3.5 *Baseline Conservation Scores - Barton*

	Category Scores (out of 100)	Aggregate Score (out of 100)	Weighted Score	Potential Increase in Score
Hedgerows	22	17	4	12
Ditches	58		8	6
Woodlands	22		6	20
Ponds	0		0	14
Grassland	0		0	29

The farm scores poorly in all aspects of its hedgerows. There are only some 2.6 km of hedgerow on the farm and, as can be seen from Figure 4.6, linkages and connectivity across the site are poor. Management is also poor and 72% of hedges are thin and trimmed heavily with little in the way of marginal vegetation.

Woodlands also score poorly owing to the small area covered and poor management. There is no grassland on the farm and no ponds, resulting in zero scores for both of these assets.

In terms of management actions, the absence of grassland and the small abundance of woodlands means that the scores suggest there is greatest room for improvement in these areas. There is also room for improvement in aggregate scores by attention to the quantity, management and structure of the hedgerow systems.

Improvements in ditches are best directed at their design and protection from pesticide contamination. Figure 3.4 highlights the proposed changes from the management plan. Though no new woodland or grassland is proposed, the proposals involve the planting of some 1286m of hedgerow. In addition to this, some 1620m of 2m buffer zone beside ditches is proposed and 1400m of 2m buffer zone beside a track leading to Saundby ponds.

We have also included better management of hedgerows within the proposals, though the system would suggest a slightly different pattern of hedge planting to create more linkages across the site. The trackside buffer zone is also not something the system would suggest as it does not provide protection to anything of conservation value and the small amount of grassland creation through this buffer zone placement might be used to greater effect elsewhere.



Figure 3.4 Barton - Future Management

Clark Farm

Figure 3.1 shows that the Clark farm consists of a small area of around 27 ha of arable land to the east of the site next to the main point of entry from Gainsborough. The farm consists of three fields mostly bounded by hedgerows and/or ditches. The farm is also adjacent to the woodland and heritage site of Dog Island.

Table 3.6 provides the baseline scores from the conservation system for each of the components of conservation asset on the farm and also indicates the potential for improvements. The Clark farm scores only 14 out of a possible 100 for the 'value' of conservation assets. The principle reason for this low aggregate score is the lack of woodland, grassland or pond under the management of the farmer. It should be noted that Dog Island has been excluded from the scores as this area does not fall within the bounds of the tenancy agreement.

Table 3.6 Baseline Conservation Scores – Clark

	Category Scores (out of 100)	Aggregate Score (out of 100)	Weighted Score	Potential Increase in Scores
Hedgerows	38	14	6	10
Ditches	59		8	6
Woodlands	0		0	26
Ponds	0		0	14
Grassland	0		0	29

The scores are respectable for ditches by virtue of their abundance and, as with previous descriptions, nutrient status. The value of ditches is mostly reduced by risk of pesticide contamination, design and management. In terms of the 1.3 km of hedges, poor current management contributes most to the lower score with hedge continuity and connectivity scoring fairly well compared with the other farms considered.

The greatest improvement in value can be achieved by pond construction and provision of grassland and/or woodland. Grassland offers the greatest potential for a single improvement in scores. There is also room for improvement in hedge management and protection of ditches from pesticide contamination.

Figure 3.5 shows the changes proposed by the Agency. These have been prepared and submitted for aid under the Countryside Stewardship Scheme (CSS). Improvements involve the establishment of 5 ha of permanent unimproved grassland at points A, B and C combined with the creation of a small pond in the new grassland at C.

A number of 2m and 6m buffer zones are also proposed in the margins of fields D, E and F. Some gapping up of hedges is also proposed. As well as these specific actions, owing to the low costs and potential benefits, we have included generally improved hedgerow management in the scenario. Table 3.4 summarises the costs of these measures. CSS payments are considered separately (under the column for possible aids) as confirmation of their award is still awaited.

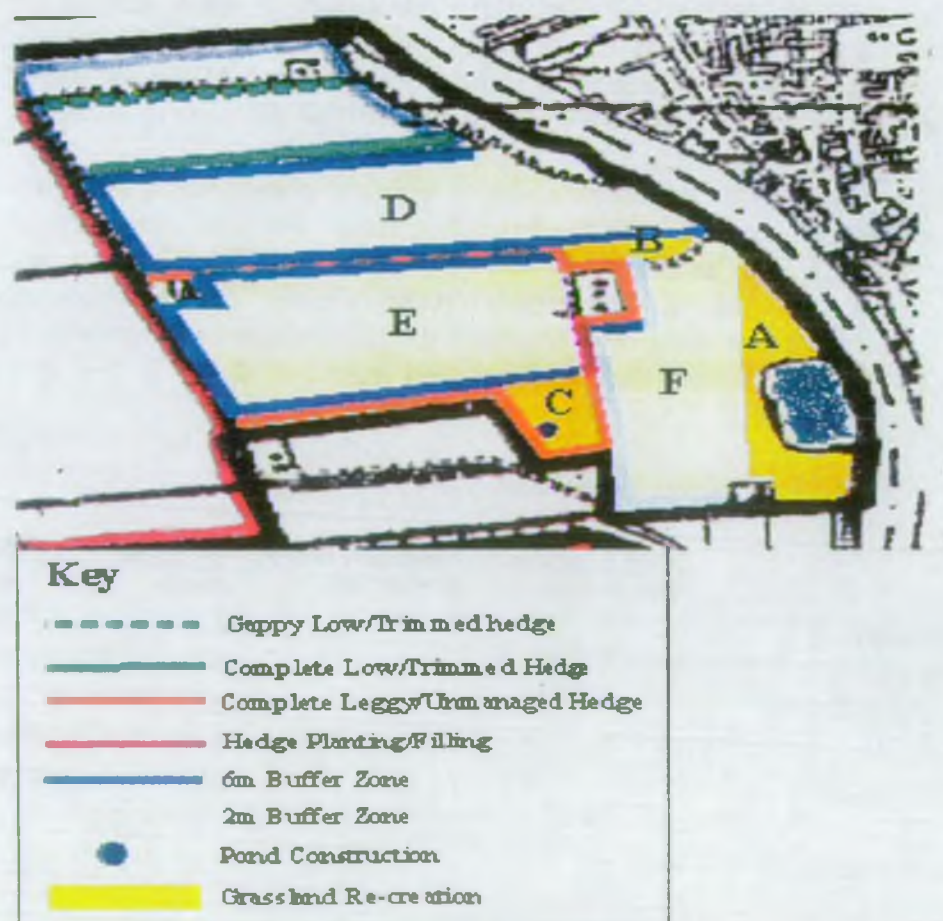


Figure 3.5 Clark - Future Management

Proudley Farm

Figure 3.1 shows that the Proudley farm covers a total of around 93 ha in the centre of the site. The farm consists of several blocks of fields mostly bounded by hedgerows and/or ditches. The majority of agricultural land use is arable in nature with around 21 ha under permanent pasture.

Table 3.7 provides the baseline scores from the conservation framework for each of the component of conservation asset. The Proudley farm scores 36 out of a possible 100 for the 'value' of conservation assets on the farm.

Table 3.7 Baseline Conservation Scores - Proudley

	Category Scores (out of 100)	Aggregate Score (out of 100)	Weighted Score	Potential Increase in Scores
Hedgerows	33	36	5	11
Ditches	61		9	5
Woodlands	22		6	20
Ponds	0		0	14
Grassland	58		17	12

With around 4.6 km of hedgerows stretching across the farm, scores for quantity and connectivity of hedges are respectable. Conservation value is, however, reduced considerably by their poor structure and management. As with other farms on the estate, the abundance of ditches results in a fairly good score for ditch conservation value, where this score is likely to be inflated by the good performance recorded for nutrient status. However, as described previously, this may be due to seasonal aspects of the indicators rather than good nutrient status. As with other ditches on the estate, greatest potential for improvement lies in design, protection from pesticide contamination and management.

There are nearly 2 ha of woodland/scrub on the site indicated by Agency survey maps. It has been assumed that this receives little if any management and, owing to the small areas involved, scores for quantity are low.

In terms of the management of grasslands on the site, in the absence of real data on the management of pastures, a fairly intensive management regime has been assumed. However, as there is a fair amount of grassland on the farm, this elevates the score to a respectable level. As there are no ponds on the site, the farm scores a zero for this category.

The greatest improvements in aggregate conservation value given by the scores can be achieved by pond construction and provision of woodland. Clearly, from the above description, there is also room for improvement in hedge management and in protection of ditches from pesticide contamination. However, of the two, improving the management of hedges offers by far the greatest potential.

Figure 3.6 highlights the proposed measures in the Agency's management plan. These propose the planting of 1 ha of new woodland at point B which complements woodland planting on Mr Proudley's farm at points D and E. In addition, restoration of an existing filled pond at point C is proposed. Hedge planting has been proposed to renew 83 m of remnant hedging at A.

As well as these specific actions, owing to the low costs and potential benefits, we have included generally improved hedgerow management in the scenario. To keep as closely to the Agency's proposals as possible, we have not included any buffer zones or extended grass margins beside hedgerows and ditches. The costs of these measures are summarised in Table 3.4. Countryside Stewardship Scheme (CSS) payments are considered separately.



Figure 3.6 Proudley - Future Management

Table 3.8 Farm Scale Improvements and relative cost effectiveness

	Asset	When	Length/ Area	Unweighted Score	Weight	Weighted Score	Benefit	Cost No Aid £	£/unit benefit/ unit length	Cost With Aid £	£ with aid/ unit benefit/ unit length*
Smithson	Hedges	Before	8826 m	30	16	480	336	-3 963	-0.12	-5 189	-0.16
		After	9476 m	51		816					
	Ditches	Before	5798 m	59	14	826	0	0	n/a	0	n/a
		After	5798 m	59		826					
	Woodlands	Before	2.0 ha	20	26	520	780	56 169	5.54	54 612	5.39
		After	13.0 ha	50		1300					
	Ponds	Before	0.0 m	0	14	0	1092	46 711	4.28	41 758	3.82
		After	100.0 m	78		1092					
	Grassland	Before	9.8 ha	42	29	1218	0	0	n/a	0	n/a
		After	9.8 ha	42		1218					
	Aggregate	Before				3044		98 917		91 181	
		After				5252					
Barton	Hedges	Before	2591 m	22	16	352	368	4 805	0.34	2 379	0.17
		After	3877 m	45		720					
	Ditches	Before	3876 m	58	14	812	28	6 923	6.38	2 837	2.61
		After	3876 m	60		840					
	Woodlands	Before	1.0 ha	22	26	572	0	0	n/a	0	n/a
		After	1.0 ha	22		572					
	Ponds	Before	0.0 m	0	14	0	0	0	n/a	0	n/a
		After	0.0 m	0		0					
	Grassland	Before	0.0 ha	0	29	0	1590	5 983	13.44	2 452	5.70
		After	0.3 ha	53		1590					
	Aggregate	Before				1736		17 711		7 668	
		After				3669					

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	Asset	When	Length/ Area	Unweighted Score	Weight	Weighted Score	Benefit	Cost No Aid £	£/unit benefit/ unit length	Cost With Aid £	£ with aid/ unit benefit/ unit length*
Clark	Hedges	Before	1331 m	38	16	608					
		After	1331 m	74		1184	576	6 820	0.89	6 189	0.81
	Ditches	Before	1473 m	59	14	826					
		After	1473 m	75		1050	224	7 994	2.42	3 433	1.04
	Woodlands	Before	0.0 ha	0	26	0					
		After	0.0 ha	0		0	0	0	n/a	0	n/a
	Ponds	Before	0.0 m	0	14	0					
		After	10.9 m	100		1400	1400	3 029	1.98	2 736	1.79
	Grassland	Before	0.0 ha	0	29	0					
		After	5.0 ha	73		2117	2117	57 006	5.21	53 278	5.03
	Aggregate	Before				1434					
		After				5824		74 849		65 636	
Proudley	Hedges	Before	4665 m	33	16	528					
		After	4748 m	54		864	336	-6 389	-0.40	-6 546	-0.41
	Ditches	Before	4066 m	61	14	854					
		After	4066 m	61		854	0	0	n/a	0	n/a
	Woodlands	Before	1.8 ha	22	26	572					
		After	2.8 ha	46		1196	624	10 502	6.12	10 219	5.96
	Ponds	Before	0.0 m	0	14	0					
		After	10.0 m	66		924	924	2 830	3.06	2 547	2.76
	Grassland	Before	21.0 ha	58	29	1740					
		After	21.0 ha	58		1740	0	0	n/a	0	n/a
	Aggregate	Before				3694					
		After				5578		6 943		6 220	
Notes: * Unit lengths used in calculations are as follows: 100 m of hedgerow; 100 m of ditches; ha of woodland; 10m of pond diameter; and ha of grassland											

3.5.3 Economic Appraisal of Conservation Proposals

Tables 3.8 and 3.9 summarise the cost of conservation options and associated benefits given by the scoring system. Table 3.8 shows the size of the asset affected, the scores before and after implementation of the proposed management actions, the costs associated with the actions and the costs per unit improvement per unit area/length of asset. This enables an examination of the cost-effectiveness of the proposed actions on each farm and for each asset.

Within these calculations, all costs are discounted over a 20 year time horizon at a discount rate of 6%, and all work is undertaken in year one. This time period has been selected owing to the need to repeat some of the actions for benefits to be realised (i.e. several require repetition on a five year basis). It also reflects a more typical time horizon for Agency appraisals. Some of the options not considered in this assessment, but identified for the estate, would require at least a 15-year time frame for both costs and benefits to be captured.

Table 3.9 Cost per Weighted Improvement Score per Unit Area (£)

Holding	Hedgerow (per 100 m)	Ditches (per 100 m)	Woodlands (per ha)	Ponds (per 10 m diameter)	Grassland (per ha)
Relative Performance - Costs Without Aid (Costs with aid shown in brackets)					
Smithson	-0.12 (-0.16)	N/a	5.54 (5.39)	4.28 (3.82)	n/a
Barton	0.34 (0.17)	6.38 (2.61)	n/a	n/a	13.4 (5.70)
Clark	0.89 (0.81)	2.42 (1.04)	n/a	1.98 (1.79)	5.21 (5.03)
Proudley	-0.40 (-0.41)	n/a	6.12 (5.96)	3.06 (2.76)	n/a

The key results have been summarised in Table 3.9, to allow a quick comparison of the relative cost-effectiveness of the proposed actions across the five assets and four holdings. This table illustrates where the greatest conservation increases per unit expenditure can be achieved.

Table 3.10: Summary of Improvements and Costs Across Estate

Holding	Area (ha)	Weighted Improvement	Improvement normalised by Farm Area	Total Cost Without Aid	Total Cost With Aid
Smithson	158.3	2208	901	£98 917	£91 181
Barton	109.0	1933	543	£17 711	£7 668
Clark	27.5	4317	306	£74 849	£65 636
Proudley	93.0	1884	452	£6 943	£6 220
Totals	387.8		2203	£198 420	£170 705

Table 3.10 shows the potential improvements for all measures at each farm. An estate-wide improvement score is obtained by normalising the total weighted improvement score, for each holding, by the percentage area of that holding out of the total estate area and adding these normalised scores across the four holdings. This total normalised improvement score could then be compared against those of other options to examine the balance between costs and benefits at this higher level.

The greatest returns in terms of improved hedgerow management would be gained on the Proudley holding, with some of the proposed actions actually resulting in net savings. Mr Smithson would also experience cost savings under the proposed management actions. These savings occur as the actions proposed relate to less intensive management, including reduced tractor passes and the costs associated with these. In contrast, the changes in management would result in cost increases for both the Barton and Clark holdings. On the Barton farm this is associated with extending the length of hedgerows and relating losses in production area. On the Clark farm the hedgerow buffer zones would remove areas from production.

For ditches, the most cost-effective improvements would be achieved on the Clark holding with these costing significantly less per 100 m of ditches than the works proposed on the Barton holding. On both farms, buffer zone conservation proposals for ditches offer only a moderate increase in conservation value. The system suggests that changes in ditch profiling and management could achieve similar increases at, potentially, less cost. Costs per unit improvement differ widely depending on the award of grant aid, which helps to reduce the costs associated with removing strips of land from production.

Owing to the more extensive woodland planting that is proposed on Mr Smithson's farm, relative to Mr Proudley's, the benefits of tree planting are higher and yield a better return per unit expenditure. The woodland could also be used for game shooting which could recoup a significant proportion of the costs.

Pond creation provides the 'best' value on Mr Clark's land owing to the 100% improvement in conservation scores in this area. It has been assumed here that the pond is managed optimally according to the guidelines set out in the FWAG/RSPB Farm Management Handbook. The costs per unit improvement are significantly less than for either the works proposed on the Smithson or Proudley holdings. However, the costs per unit improvement on the Smithson farm relate more to the costs of the measures proposed rather than a low rate of benefits, so it may be worthwhile investigating other measures (e.g. a smaller sized pond).

According to the framework, the greatest improvement in conservation scores on Mr Barton's farm is provided by the establishment of grass tracks. However, these benefits are achieved at a fairly high cost per unit improvement per area affected, with the figure for the Barton holding being more than twice those for the Clark holding. For both holdings the costs are relatively high, resulting from the removal of significant areas of land from production.

Overall, the conservation proposals on Mr Clark's farm result in a three fold increase in conservation value. These are by far the highest improvements experienced on any of the other farms.

How much to spend on Conservation Improvements?

This then leaves the \$64,000 question of how much in total should the estate manager spend on conservation improvement measures on the estate. There are the following possible ways of tackling this subject:

- a) See whether the unit cost estimates (given above in Table 3.9 above) for specific assets and improvement measures could be compared with the unit costs of other programmes such as the Biodiversity Action Plan or MAFF Agri-Environment schemes.
- b) See whether the unit cost estimates can be compared with any estimates of the values of the benefits of such conservation improvements.

3.6 Assessment of Impacts on Recreation

3.6.1 Recreation at present and outline of options for improvement

Whilst no survey of recreational demand has been undertaken specific to this research, the ADAS survey and management plan have identified that, with appropriate improvements, the site is suitably placed to meet a number of local recreational opportunities.

The management plan identifies that there is a shortage of green space in Gainsborough, and that the estate offers the potential to address this demand. Whilst the access problems from the town are difficult to address, the provision of more footpaths, cyclepaths and links throughout the site would help to reduce the extent to which users must 'back-track' along the same route. This would increase the appeal of the site for informal recreational users. Such links across the site would also help to meet the needs of the residents in the three villages to the west of the site, particularly Saundby and Beckingham.

There are also opportunities for formal recreational activities such as cycling and horse riding. Indeed, there are proposals for the development of the old willow works to provide a recreation centre for the site. There are also opportunities for interpretation at the site to increase the interest and educational value of the site.

In its current state, Beckingham is considered to be a local park (and hence, attracts people from a radius of 500m with each adult visiting about 15 times per year).

Two proposals have been developed with the aim of increasing recreation benefits:

Option 1 - Large Park

With improvements to the informal recreation potential of the site through the creation and/or improvement of footpaths and cycleways, it is considered to act as a large park and, hence, should attract people from a radius of 1500m with each adult visiting about 16 times per annum.

Option 2 - Honeypot site

As option 1 but with additional improvements to the willow works, which can then be used as a centre for more formal recreational activities (cycle hire, horse riding, etc.) and also act as an interpretation centre, the site is predicted to become a honeypot site. This would attract visitors from a wider range (equivalent to adults within a 3000 metre radius visiting about 17 times per annum).

The impact of these options on levels of informal and formal recreation are investigated in the following sections.

3.6.2 Access and Recreation Proposals

Figure 3.7 shows the proposed increased footpath and access provision. As can be seen from this map, much of this additional access provision is for both walkers and cyclists (and possibly horse riders as well) and is to be accommodated on existing tracks and footpaths. This provides a great range of circular routes for all, many leading to and from the main access point from Gainsborough itself and many around Dog Island, where interpretation of heritage is proposed. At a farm level, the following points can be made:

- the proposed foot/cycle paths running around the outside of the Barton farm are likely to be a major attraction as they provide a circular route accessible from both the east (Gainsborough) and the west (Saundby). They also have the added attraction of running along the river and going past the Saundby ponds;
- the proposals to improve the foot/cycle paths, which would provide a circuit around the Clark farm and increase access to Dog Island and the proposed open area, should also increase the recreation value of the site; the open access area is likely to also act as a major attraction for people from Gainsborough;
- the proposal to provide a footpath on the west side of the Proudley farm may be of value in increasing access from Beckingham to other parts of the estate; but this is likely to lead to less overall gain in recreation value; and
- similarly, the proposals to create (non-tenant) concessionary footpaths to the north of the Smithson farm are also likely to yield less extra benefits than those proposed for the southern half of the estate. These proposals would also allow the creation of a circular route, expanding the use of the existing footpaths and public right of way.

Interpretation is planned at other sites as well, possibly the willow works and Saundby ponds. Table 3.11 lists the works to be carried out along with their estimated costs, drawn from Agency documentation.

Table 3.11 Recreation Proposals and Associated Costs

Description	Cost	Grant Aid
Footpath creation/improvement	£5,000	
Concessionary foot/cycle path creation on tenanted land (2,065m)	£384 /yr	£919.50 /yr
Open access (5ha)	nil	
Cycle track creation (excluding concessionary)	£4,540	
Interpretation	£5,000	

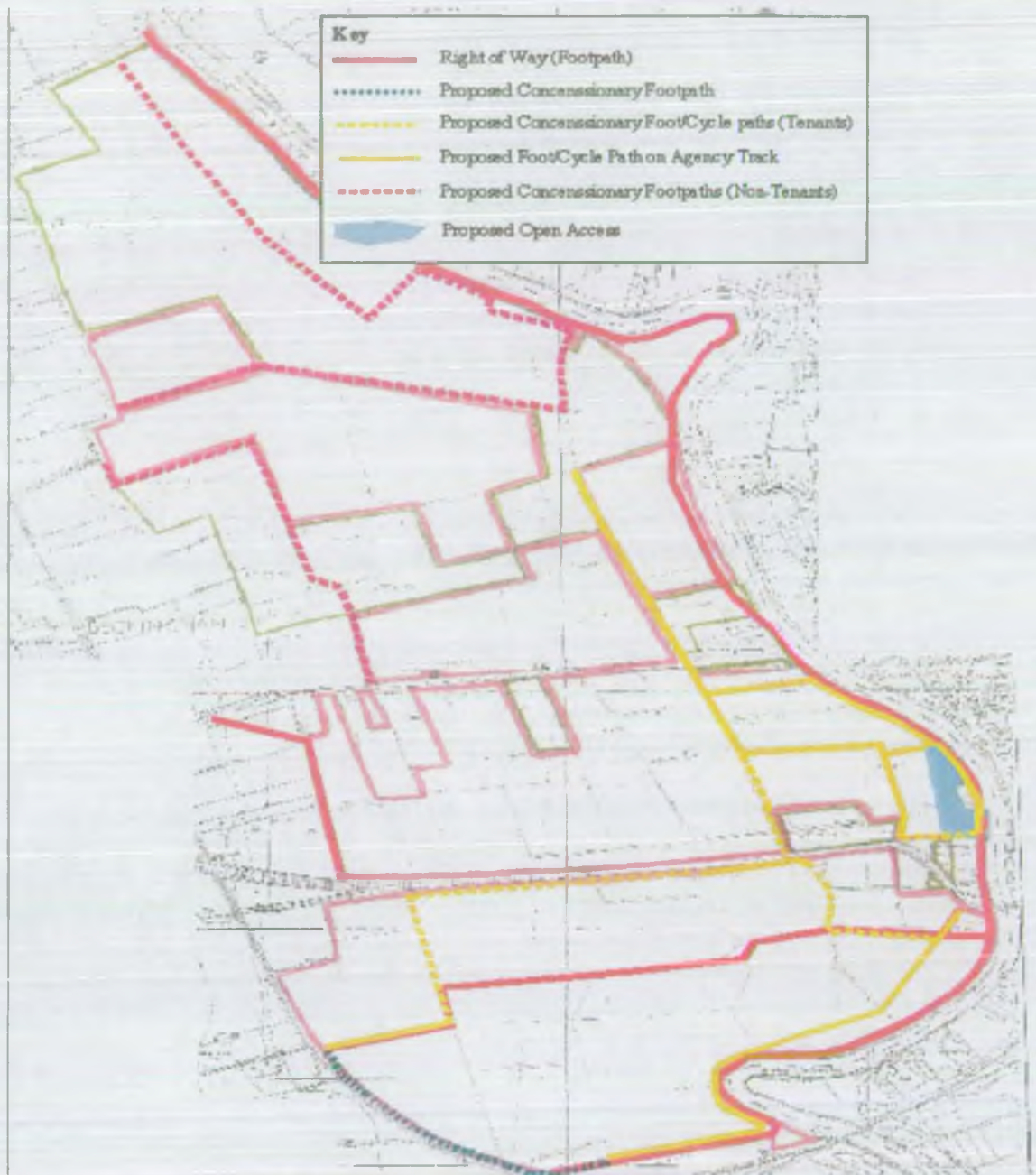


Figure 3.7 Proposed Changes in Access Provisions

3.6.3 Potential Visitor Numbers

It may be possible to identify those footpath/cycle path proposals that are likely to generate the greatest level of recreation benefits on the estate. However the desk-top methodologies currently available for predicting visitors to a site, such as the Beckingham Estate, are too crude to allow the value associated with each component to be determined. As a result, it has been necessary to consider the proposals on the whole option using the system set out in Section 2.

Table 3.12 presents the estimated visitor population for Beckingham as a local park site (i.e. its current state). These figures have been estimated by measuring the areas of influence from access points to the Beckingham Marshes estate, rather than the distance from the estate itself. This should improve the accuracy of the estimates since access is only possible for a large number of people in Gainsborough via the A631 road bridge over the River Trent.

There is a range in the estimated visitor population, from 1,200 to 1,500. This reflects the difference between the two methods used. For the parishes of Beckingham, Saundby and Walkeringham, the differences between the two methods are quite small. The major disagreement is for Gainsborough, as the maps do not always show clearly how many houses there are in a row of terraced houses and some houses may, therefore, not be counted. In addition there is no way of counting individual flats using the house counting method, so these are counted as one house (and hence assumed to contain only one household).

These uncertainties would result in an underestimate using the house counting method compared with the area covered method. The sphere of influence covers the town centre of Gainsborough, where there may be a considerable number of flats, together with numerous terraced streets. West of the river (covering Beckingham, Saundby and Walkeringham), the area is more rural. The results for Gainsborough are therefore expected to be the most inaccurate, which is demonstrated in Table 3.12. The area covered method relies on a reasonably accurate estimation of the total area, and so is also subject to uncertainty. Table 3.13 presents the visitor estimates for Beckingham under Option 1

Table 3.12 Estimated Local Visitor Population for Beckingham as a Local Park

Ward/Parish	Counting houses			Estimating areas	
	No. Houses	No. per h/h-	Predicted no. of visitors	% of h/h falling within zone	Predicted no. of visitors-
Gainsborough South-West	490	1.86	910	30%	1 300
Beckingham/ Saundby	80	2.03	160	20%	180
Walkeringham	42	2.03	85	12.5%	90
TOTAL			1 200*		1 500*
Notes: - calculated using OPCS (1994): Ward and Civil Parish Monitor - Lincolnshire and OPCS (1994): Ward and Civil Parish Monitor - Nottinghamshire * all predicted visitor numbers are given to 2 significant figures to reflect the degree of uncertainty					

Table 3.13 Estimated Local Visitor Population for Beckingham under Option 1

Ward/Parish	Population >16-	% of h/h falling within zone	Predicted no. of visitors*
Gainsborough East	5 090	50%	2 500
Gainsborough North	4 582	25%	1 100
Gainsborough South-West	4 191	95%	4 000
Beckingham	906	95%	860
Saundby	62	95%	60
Walkeringham	720	90%	650
Bole	110	50%	110
TOTAL			9 300
Notes: - from OPCS (1994): Ward and Civil Parish Monitor - Lincolnshire and OPCS (1994): Ward and Civil Parish Monitor - Nottinghamshire			
* all predicted visitor numbers are given to two significant figures to reflect the degree of uncertainty			

For option 2, the sphere of influence is 3 km from the willow works. This area differs slightly from those used for informal recreation users since it does not consider access to Beckingham. If additional access points from Gainsborough (and east of the river generally) are not included as part of the site development, there may be a need to reduce the overall estimates (this is discussed further later). Table 3.14 presents the results for Beckingham under Option 2.

Tables 3.12 to 3.14 provide estimates of the total number of local visitors that may be attracted to the site under the two options. However, these figures do not represent the total number of potential visits (as individuals are likely to visit more than once per annum). As already discussed, previous research suggests that the number of visits ranges from 15 per year for a local park, through 16 per year for a large park to 17 per year for a honeypot site. This information, and the calculations of total number of trips per year by visitors for each site type are given in Table 3.15.

Table 3.14 Estimated Local Visitor Population for Beckingham under Option 2

Ward/Parish	Population >16-	% of h/h falling within zone	Predicted No. of Visitors*
Gainsborough East	5 090	33%	1 700
Gainsborough North	4 582	95%	4 400
Gainsborough South-West	4 191	75%	3 100
Morton	920	95%	870
Walkerith	54	50%	30
Thonock	30	10%	3
Beckingham	720	10%	70
Saundby	906	100%	910
Walkeringham	62	95%	60
Bole	110	40%	40
TOTAL			11 000
Notes: - from OPCS (1994): Ward and Civil Parish Monitor - Lincolnshire and OPCS (1994): Ward and Civil Parish Monitor - Nottinghamshire			
* all predicted visitor numbers are given to two significant figures to reflect the degree of uncertainty			

Table 3.15 *Estimated Number of Visits to Beckingham*

Site Type	Relevant Number of Local Adults	Visit/Adult/Annum (informal)	Total Number of Visits *
Local Park	1 200 to 1 500	15	18 000 to 23 000
Option 1 (large park)	9 300	16	150 000
Option 2 (honeypot site)-	11 000	17	190 000
Notes: * given to two significant figures - the annual number of informal visits has been used due to a lack of data on actual numbers of formal visits			

The visit numbers given in Table 3.15 assume that there are no alternative sites available to the population. Maps of the area, however, show that there are suitable alternative sites within the local area which may be of similar attraction. Hence, some of the visits calculated in Table 3.15 may be made to the alternative sites.

Table V.4 in Annex V provides adjustment factors to be applied when there are alternative sites available. Table 3.16 summarises the influence that these adjustment factors have on the total number of visits that may be made to Beckingham.

Table 3.16 *Estimated Visit Numbers Taking Account of Alternative Sites*

Site Type	Visits Estimated (from Table 3.18)	No. of alternative sites	Adjustment Factor	Estimated No. of Visits
Local Park	18 000 to 23 000	1	1	18 000 to 23 000
Option 1 (large park)	150 000	4/5	0.4	60 000
Option 2 (honeypot site)	190 000	1-2	.5	95 000
Notes: the number of alternative sites have been estimated from the maps.				

Table 3.16 provides the total number of visits predicted to be made by those living near to Beckingham. There may also be additional visits made by people who are not local to the area. Table 3.17 presents the revised visit numbers using adjustment factors given in Table V.5 in Annex V.

Table 3.17 *Estimated Visit Numbers Taking Account of Non-Local Visitors*

Site Type	Visits Estimated (from Table 3.19)	Adjustment Factor for Non-local Visitors	Estimated No. of Visits
Local Park	18 000 to 23 000	1.0	18 000 to 23 000
Option 1 (large park)	60 000	1.5	90 000
Option 2 (honeypot site)	95 000	2.0	190 000*
Notes: * this seems rather high for a site like Beckingham which is classified as a honeypot site on the basis of potential improvements. As a sensitivity check, non-local visitors will also be excluded from the calculations.			

These figures can be checked with those given in Table V.6 in Annex V which indicates that:

- the total number of recreation visits to local parks of less than five acres is usually within a range of 10,000 to 30,000. This, therefore, suggests that the estimates for Beckingham are acceptable;

- the total number of recreation visits to local parks, five to 15 acres in size, is usually around 50,000. The figures estimated here are almost twice as much; the size of the site is, however, much larger than the five to 15 acres (being approximately 566 ha) so this may not be an inappropriate estimate. It should be noted that this assumes almost 250 visits per day as an average; and
- the total number of recreation visits on honeypot sites is estimated as being between 60,000 and 250,000. The number of estimated visits for Beckingham is 190 000 which falls within this range. However, the attraction of the site may be limited to one source of formal recreation (cycling). The site may not, therefore, be a 'true' honeypot site and the number of visits estimated may be rather high. Excluding non-local visitors gives a total of 95,000 visits, which seems more reasonable.

The visit numbers given for Option 2 relate to informal recreation. There are additional uncertainties concerning estimating participation rates for formal recreation activities in this option. These are taken from the figures given section 2.4 and taking horse riding and cycling as examples of potential formal activities, the total number of potential visits can be estimated (see Table 3.18).

Table 3.18 Estimated Number of Horse Riding and Cycle Trips

Trip Type	Total Number of Visits	% of Adult Population Participating	Total Number of Formal Activity Visits
Horse riding	95 000 to 190 000	1%	950 to 1 900
Cycle trips	95 000 to 190 000	10%	9 500 to 19 000
Informal recreation			85 000 to 170 000*
Notes: * this assumes that all non-horse riding or cycling trips are informal recreation trips (given to two sig figures)			

As a check on the 'reality' of these figures, we can divide the total number of cycle trips by 365 (days) to give the total number of cycle 'hires' per day. This works out as 26 hires per day (when non-local visitors are excluded) to 52 hires per day (when non-local visitors are included), both of which seem rather high.

If access to the site is not improved, the estimated number of visits may decrease dramatically, with potentially two-thirds of the population from Gainsborough lying more than 3 km from the site. This would reduce total potential visitors from 11,000 (Table 3.14) to 5,000. The total number of visits, taking into account visit/adult/annum, alternative sites and non-local visitors would then be 85,000; excluding non-local visitors gives 43,000. This would give a total of 4,300 to 8,500 cycle trips per year, or 12 to 23 per day. Even 12 cycle 'hires' per day (every day throughout the year) may be too high, but this is considered to be the most appropriate estimate for Beckingham.

A similar argument can also be used for Beckingham as a large park (Option 1); where these figures greatly exceeded those typical for this type of attraction. Although Beckingham is much larger than a typical large park, it has few facilities. Therefore, the inclusion of non-local visitors is also considered inappropriate.

The best estimate number of trips for each site type is summarised in Table 3.19.

Table 3.19 Best Estimates of Numbers of Visits

Site Type	Numbers of Visits
Local Park	23 000*
Option 1 (large park)	60 000-
Option 2 (honeypot site)	43 000-
Notes: * Chosen since the house count method may be inappropriate for the centre of Gainsborough. - Chosen to reflect that significant numbers of non-local visitors are not considered appropriate in this case; the figures for the large park exceed the honeypot site since the honeypot site has been amended to fit within appropriate limits for formal recreation.	

Estimation of Benefits

The number of potential visits to Beckingham as a local park has been estimated as 23,000 (only the best estimates, as given in Table 3.17, will be used for the valuation of recreation). There is a range of values given in Table 2.3 for informal recreation, but the lower bound value of £0.70 per person per visit is considered most appropriate here. The total estimated value of informal recreation at Beckingham is, therefore, £16,000 per annum (23,000 visits multiplied by £0.70).

Improvements to the recreation potential of the site increase the number of visits to 60,000 per annum (from Table 3.19). The value of these visits is still likely to be low, however, since there will be few additional facilities. Hence, the value of informal recreation to Beckingham as a large park is estimated as £42,000 per annum (60,000 visits multiplied by £0.70).

As a 'check', an alternative assumption is that rather than Beckingham becoming a large park following the improvements it remains a local park, but because of the increased conservation value of the site, the willingness to pay for a visit increases to the mid value of £1.80 per trip. Taking 23,000 trips (for the local park), the per annum value of informal recreation would then be £41,000. This is very close to the estimate given above, potentially indicating that this may be a robust estimate.

For Beckingham as a honeypot site, the total recreation value is made up of cycling and horse riding trips as well as informal recreation. The value for a horse riding trip is taken as £10 (from Table 2.3), and the value of cycle hire is estimated at £20 per day. Using the numbers of trips given in Table 3.19 (43,000) as the basis gives 430 horse riding trips per year and 4,300 cycle hires. This leaves 38,000 informal recreation visits. The combined recreation/conservation improvements to the site are estimated to increase the value of a trip to the mid bound value, at £1.80 per person per visit. The total recreation value is, therefore, estimated as:

Horse riding: 430 trips at £10 per trip:	£ 4,300 per annum
Cycle hires: 4,300 hires at £10 per hire:	£ 4,300 per annum
Informal recreation: 38,000 trips at £1.80 per visit:	£68,000 per annum
Total	£76,600 per annum.

These values relate to the total recreation value of the site. To estimate the value of the improvements only, it is necessary to subtract the current recreational value (i.e. the local park) from the total value with the improvements for the large park and honeypot site. Table 3.20 summarises these calculations.

Table 3.20 The Value of the Improvements

Site Type	Estimated Recreation Value	Baseline Recreation Value (Local Park)	Value of Improvements*	Capturable Benefits
Option 1 (large park)	£42,000	£16,000	£26,000	nil
Option 2 (honeypot site)	£76,600		£60,600	£8,600
Notes: * calculated as recreational value minus the value of the local park (per annum values) and are given to two significant figures				

3.6.4 Discounting

The recreation values calculated are per annum values and need to be aggregated over the project life. This is assumed to be 20 years, which at a discount rate of 6%, gives a discount factor of 11.47. Table 3.21 presents annual and discounted recreation benefits of the improvements.

Table 3.21 Discounted Benefits

Site Type	Annual Value of Improvements	Discount Factor	Total Discounted Benefits*	Discounted Capturable Benefits*
Option 1 (large park)	£26,000	11.47	£300,000	nil
Option 2 (honeypot site)	£60,600		£700,000	£100,000
Notes: * calculated as value of improvements multiplied by the discount factor and given to two significant figures				

3.6.5 Benefits and Costs of Recreation Options

The benefits associated with increased levels of recreation can be compared with the costs of providing the improvements required under Options 1 and 2. Table 3.22 provides a summary of the costs (discounted over 20 years at 6%) associated with Option 1. The costs of Option 2 include all of the costs of Option 1, plus some of the costs of cycle track creation and the additional charges associated with providing facilities for formal recreation (not available at this time).

Table 3.22 *Discounted Costs of Improvements for Informal Recreation and Conservation*

Option	Description	Total Discounted Cost*	Discounted Grant Aid*
Option 1	Footpath creation/improvement	£4,700	£0
	Concessionary foot/cycle path creation on tenanted land (2,065m)	£4,400	£11,000
	Open access (5ha)	£0	£0
	Interpretation	£4,700	£0
	Conservation (and aesthetic) improvements	£198,420	£24,414
	TOTAL	£212,220	£35,414
Option 2	Option 1 Costs	£212,220	£35,414
	Cycle track creation (excluding concessionary)	£4,300	£0
	Improvement of willow works	not available	not available
	TOTAL	£216,520+	£35,414

Notes: * discounted at 6% over 20 years; all values are given to two significant figures

Table 3.23 compares the discounted costs given in Table 3.22 with the total discounted benefits that the improvements are estimated to generate (from Table 3.21).

Table 3.23 *Comparison of Discounted Costs and Benefit*

Site Type	Costs Without Aid	Reduced Costs With Aid	Total Benefits	B/C Without Aid	B/C With Aid	NPV Without Aid	NPV With Aid
Option 1 (large park)	£212,220	£176,806	£300,000	1.4	1.7	£87,780	£123,194
Option 2 (honeypot site)	£216,520+	£181,106	£700,000	<3.3	<3.9	£483,480	<£518,894

Notes: B/C = benefit-cost ratio, calculated by dividing the benefits by the costs

Table 3.23 shows that, for Option 1, the benefits exceed the costs by £88,000, giving an indication of an acceptable value for money. These recreation benefits should be assumed to result not only from the improvements in access but also from the improvement in the ecological and hence aesthetic value of the site associated with the various conservation actions. In this regard, actions related to woodland creation, pond improvements and creation of the open access grassland area are likely to be significant contributors to the recreation value of the site. Better hedgerow management is likely to be less important, as is ditch management; although in both cases, the importance of these actions for wildlife support may be extremely important to increasing the wildlife interest on the estate and, thus, its recreation value.

Because the costs of renovating the willow works were not available for this study, the results in terms of benefit-cost ratios and net present values for Option 2 must be treated with caution as lower bounds. As much work is needed to turn the willow works into a visitor centre (or an attraction in its own right), the results are likely to change when cost figures are added in. The increase in costs, however, would have to be very great to make Option 2 not worth considering. This indicates that both the renovation of the willow works and the extra expenditure required to create the cycle paths may be justified.

The benefit estimates for Option 2 assume that two new activities take place on the site, ie horse riding and cycle hire. The value of these benefits may be capturable by the current tenants (e.g. through the establishment of a riding centre or cycle hire facility). However, the costs involved in creating such centres may outweigh the annual benefits as estimated above. This is particularly true with regard to a riding centre (costs of stabling, horses, equipment, insurance, etc.). That said, the benefit estimates provided above relate to a fairly low level of activity - much lower than one would expect for an established riding centre which provided both livery, lessons and 'hacks'.

3.6.6 Examination of Options with Joint Recreation and Conservation Benefits

Although the above analysis considered two different options with regard to the development of recreation facilities, only one option for improvement of conservation across the whole estate was considered (with this made up of a range of management actions).

However, the system should also allow for examination of a range of different options. With this in mind, we have examined two alternative options that involve some changes with regards to the package of conservation measures considered. Table 3.24 provides costs and benefits associated with three alternative conservation management options, where two of these involve some variation from the measures already considered. Option A is the original option examined in detail in Section 3.4 Option B varies from A in that it omits the conservation works on ditches, while Option C involves introducing a package of alternative re-profiling and management measures as a substitute to existing buffer zone proposals in Option A. In all three cases, we are assuming that the option being followed with regard to the development of recreation facilities is Option 1.

Table 3.24 *Costs and Benefits of Options Assuming Changes to Ditch Proposals*

Option	PV Costs (£)	PV Benefits (£ -Recreation Option 1)	Conservation Benefit (improvement score)
Option A	£217,000	£300,000	22
Option B	£184,000	£300,000	21
Option C	£189,000	£300,000	26

3.6.7 Reporting Requirements

The above analysis was carried out in accordance with the guidelines set out in the system developed by the consultants at the start of this study. However, this approach encountered a number of problems. It appears now that the above analysis may not be the best way of presenting information on the costs and benefits of the recreation benefits. We therefore now suggest that the Workshop should focus on seeking alternative feasible and worthwhile means of carrying out the analysis and presenting the resulting information on the costs and benefits of the recreation improvement measures to estates managers rather than examine in detail any specific estimates presented in Sections 3.6.1 - 3.6.5 above.

We suggest that a preferred reporting format would include the following:

- Identify the specific possible recreation actions broken down by type (e.g. lengths of circular footpaths by farm, and any formal recreation measures (such as provision or promotion of horse riding and cycles) and an indication of their costs plus, if possible, sources of funding.
- Show which formal recreation measures (e.g. horse riding, cycle hire) might be worth seeking a private contractor or farmer to carry out on the grounds that their capturable benefits could exceed their costs (discounted at an appropriate private sector discount rate of say 8 or 10%).
- Show which of the informal recreation actions might be worth pursuing (i.e. those where the recreation benefits exceed their costs). The estate managers might then discuss these with farmers to see if they could encourage them to implement them. The appraisal only covers the out of pocket costs for the Agency and farmers in implementing the options (eg costs of creating and maintaining footpaths). They do not include impacts on the welfare of the farmers (eg from vandals). Therefore, in their negotiations with the farmers, the estates managers may wish to use estimates given by the appraisal for the excess of benefits over costs for the option as an upper estimate of what they might be able to pay to induce farmers to implement the option. This negotiation should of course also consider ways of reducing these adverse welfare impacts and whether the establishment of more settled informal recreation might reduce the problems faced by farmers (eg from vandalism, litter etc).
- Identify which conservation improvements (eg ponds or hedgerows) are likely to increase the number of visits or improve their quality. These benefits are in addition to the ecological gains associated with an improved conservation value. Therefore estimate the extra recreational benefits associated with these conservation measures so as to indicate which conservation actions are worth pursuing on the basis of their cost-effectiveness scores for the conservation benefits plus whether these extra recreation benefits exceed their costs.

3.7 Conclusions for Policy and Management Actions

A draft action plan has been produced setting out the objectives of the Agency and the management plan for the next five years. In order to implement the measures the funds need to found and agreement with the tenant farmers obtained.

3.7.1 Funding

The Clark farm applied for funding though the Countryside Stewardship Scheme in November 1999. MAFF were very supportive of the scheme which they considered was excellent, but they were uncertain as to how it would fit in with plans for the rest of the Estate. Consequently the application was turned down on the basis that applications were generally over-subscribed and other schemes were judged to provide greater environmental benefit. It was understood, however, that if the application had referred to a larger area of the Estate, it may have been accepted.

The Clark farm applied for funding again in 2000, but a decision by MAFF is still awaited. Although there are other grant-aid schemes available through MAFF some may not be appropriate if it is deemed that a public body such as the Agency will be the ultimate beneficiary, particularly if the property value is increased as a result. Schemes that are linked to capturable recreational benefits may result in increased income to the tenant farmer, whereas conservation improvements may attract prospective purchasers who are not from a farming background and thus willing to pay a premium for an attractive landscape.

Partnership funding through a charitable organisation may be possible and the RSPB have expressed an interest in supporting some conservation improvements on the Estate, with the possibility of attracting funding from local authorities or other organisations. In addition Gainsborough Regeneration Limited are promoting and developing the Trent riverside and have expressed an interest in providing a footbridge link with the Estate over the Trent. This would then provide a recreational link between the urban and rural environment.

Initial funding by the Agency for the identified improvements is currently being discussed with regional and national budget managers. One option would be to divert some of the Estate rental income into the improvements over, say, a five year period.

Agreement with farmers.

The Estates Manager is in ongoing consultation with the farmers to obtain their support for the improvements. The tenants may be willing to contribute towards the improvement by doing some of the work themselves, such as tree or hedge planting, at quiet times of the year. Incentives may be needed to encourage the farmers to take part, which could be achieved through reductions in rent. The Agency Estate's manager will also take steps to inform the tenants of conservation measures where the benefits are greater than the costs (such as those highlighted as "negative" costs in table 3.4).

4. SUMMARY OF FINDINGS AND ISSUES FOR DISCUSSION

4.1 Overview of Findings

The Agency's estate managers face the difficult task of managing income generation from the Agency's estates whilst ensuring that all the Agency's statutory duties, aims and objectives are met. Agency estate managers must therefore take account of a wide range of environmental, social and economic factors in both the day to day management of a given estate and the longer-term management of land and budgets. Accordingly this study aimed to develop and demonstrate an appraisal system, which could assist in integrated estates management.

The methodology provides both a management tool for highlighting options and formally taking account of their costs and benefits and securing value for money. It allows estate managers, with consultation of interested parties, to refine the options and prepare an integrated package of worthwhile and justifiable measures.

The draft appraisal system presented here is essentially a prototype, with the case study its first trial application. The case study has enabled the Agency's estate manager to identify a number of specific environmental enhancement options that are worth pursuing in discussions with the farmers and other stakeholders concerned with the Beckingham estate. The case study has shown that the appraisal system has worked well to assess objectively and systematically the cost-effectiveness of various nature conservation enhancement options at individual farms on the estate. The draft system does not appear to work quite so well for recreation on account of difficulties of specifying the options and estimating the visitor numbers for them.

4.2 Issues for Discussion at Workshop

This trial application raised a number of issues which we here outline and which we hope that the workshop will discuss so as to guide our further development of this work.

4.2.1 Environment Agency's Estate Managers' Requirements For An Appraisal System

The appraisal system should essentially aid estates manager's decisions. Consequently we intend that discussions at the workshop will be anchored by focusing first on the Agency's estates managers' views on:

- Their existing decision-making and assessment systems (including preparation of Site Management Plans) and how the draft appraisal system could best fit into this.
- The time and costs they have available for the appraisals and the likely scale (eg in budget terms) of the measures for which they are likely to be able to bid.
- Key differences between the characteristics of their estates and Beckingham and how these might be allowed for in the appraisal, especially in respect of nature conservation and recreation. In particular are the weightings for nature conservation features from Beckingham (in Table 2.1) applicable to their estates?
- Identify and characterise different types of estates for field trials of a refined appraisal system.

4.2.2 The Appraisal of Conservation Measures

The appraisal of conservation measures is a scoring-based system, which examines an area in terms of the potential of assets. It expresses conservation in terms of the extent to which each asset is managed to its optimum and whether there is 'enough' of each. We believe this is the first attempt of its kind to express conservation value in this structured way and that the case study demonstrates the viability of the system.

The combined use of a detailed survey map and asset-based conservation questionnaire works well. It provides a mechanism for combining data developed through ecological assessments with a more strategic analysis of the presence, structure and abundance of particular assets in a given location and the combination of all assets in this location. In addition, it highlights specific opportunities for improving nature conservation on the estate.

This case study highlights the following specific issues and areas for potentially improving the draft appraisal system on which we seek views at the workshop:

- The current coverage of environmental assets at the Beckingham Estate might limit the applicability of the approach to other estates. Further work may be required to assess the other key different conservation assets that the Agency Estate Managers identify as being important for other estates (see 4.2.1)
- The study demonstrates the value of having ecological survey data in both the development of management options and in assessing their impacts. We therefore seek views on how well we have used information from the SMP?
- Some indicators (e.g. nutrient contamination of ditches) are seasonal in nature. Therefore timing of the assessment could be important. However, other studies also encounter this problem. Therefore we should welcome views on how this aspect is covered in other such work (eg SMPs). We also seek Estates Managers' views on what time of the year they would normally like to carry out the appraisal.
- The draft appraisal system derives scores based on best practice management set out in the FWAG/RSPB handbook. We seek views on how well we have used this handbook?

- A key issue has been the derivation of relative importance weights to allow aggregation at the asset and cross-asset level. The case study demonstrates that the development of such weights is feasible. But further work might be needed on this aspect. The weights in the case study was based on a fairly small sample of conservation experts. Wider applications of the methodology might require deriving weights based on a larger sample. The weights used may not be valid in other farming/conservation contexts. Further research may be needed to develop additional sets of weighting factors applicable to other farming/conservation contexts on other estates (see Section 4.2.1). It is suggested that these weights should be gathered at a Natural Area level drawing on the biodiversity objectives for each (although the more generic national weights are still useful as a 'default'). **We seek English Nature's views on how to derive efficiently different sets of weights for the Agency's other estates in areas with different characteristics (see Section 4.2.1)?**
- This need for further sets of weights only applies to the relative importance of assets. Weights denoting the importance of, for example, structure versus connectedness versus enoughness, to derive a score for hedgerows are likely to be the same regardless of location. Geographical variation in 'enoughness' is accounted for by altering average values in the methodology where, it is suggested, these are also applied at a Natural Area level.
- The study indicates that the following nature conservation measures are likely to be most cost-effective at the Beckingham estate: improved hedgerow management and extra hedge creation and pond creation. **We seek workshop participants' views on the plausibility of these findings.**
- The appraisal system assesses well the cost-effectiveness of various measures. However, this then leaves the \$64,000 question of how much in total should the estates manager spend on conservation improvement measures on the estate. There are the following possible ways of tackling this subject:
 - (a) Compare the unit cost-effectiveness estimates (given above in Table 3.9) for specific assets and improvement measures with the unit costs of other programmes such as the Biodiversity Action Plan or MAFF Agri-Environment schemes?
 - (b) See whether the unit cost estimates can be compared with any estimates of the values of the benefits of such conservation improvements?

We seek Workshop participants' views on this issue and these options above and any other suggestions. In particular, we seek views on the options (a) and (b) above and any other suggestions for tackling this subject.

4.2.3 Assessing Recreation Benefits

The recreation methodology is based on identifying the numbers of potential increased visits to a site arising from the Agency's options and using results from other studies to value them. The key matter here is how to estimate visitor numbers. Section 2.5 considers the following:

1. The estate manager (EM) make estimates based on their knowledge of the estate;
2. The EM derive estimates through consultation with interested parties, analysis of tourist information and existing surveys;
3. A 'sphere of influence' technique that estimates the number of visitors based on the probable attractiveness of the site and the proximity of large populations of likely visitors.

At the workshop, we seek estate managers' views on the likely resources/time that they could devote to estimating visitor numbers.

We seek the estate managers' and peer reviewer views on:

- the feasibility of providing indicative estimates of visitor numbers under methods 1 or 2;
- If methods 1 and 2 could not yield quantified (approximate) estimates, then method 3 and any alternative ways of providing indicative estimates of visitor numbers - taking account of estate managers' resource and time constraints;
- Suggestions for how to monitor and evaluate actual visitor numbers?

One problem with the draft appraisal system concerns the difficulties of quantifying the effects on visits of small-scale changes in the provision of footpaths at individual farms, which is the unit used for the appraisal of the conservation measures so that any actions agreed with the farmer can then be incorporated into a tenancy agreement. Method 3 above may be applicable for a whole estate but is not sensitive enough to assess such small changes so that perhaps we can only consider qualitatively their relative importance. But if only a qualitative assessment of the recreation benefits is possible (within EM's budget and time constraints), then how can an EM justify such recreation measures? **This is a subject, which merits further consideration. We seek the peer reviewer's views on this and suggestions for alternative ways round this problem**

A related issue here is how to define, cost, deliver and manage a package of linked recreation options (eg for circular paths) where the package of measures yields significantly greater benefits and where this package covers different farms on the estate.

4.2.4 Assessing Joint Recreation and Conservation Impacts of Measures

A difficult issue is how to allow for the greater recreational benefits that might arise from the nature conservation improvement measures at specific farms (eg creation of ponds, more or better hedges, woodlands etc). Not enough is known about how much the value of recreation visits could be enhanced by such nature conservation enhancement measures. Therefore we seek the peer reviewer views on the standard values for the recreation benefits (shown in Table 2.3) and any estimates of increases in values of recreational benefits associated with natural habitat improvements.

An issue here is how to combine the findings of the appraisal of the costs and the conservation and recreation benefits of such measures? We propose that this should be tackled by identifying which conservation improvement measures (eg ponds or hedgerows) are likely to lead to increases in visitor numbers or a higher quality visits. These benefits are in addition to the ecological gains associated with an improved conservation value. Therefore the EM should estimate these extra recreational benefits associated to see if these exceed the costs of the measures. If, as is likely, the recreation benefits are less than the costs, then deduct them from the costs to give a net cost figure which should be used to derive the cost-effectiveness scores.

4.2.5 Other Environmental Impacts

As another part of their CPE study for the Agency and RICS, RPA have developed a comprehensive appraisal system for appraising a farm's other environmental impacts regarding visual impacts, aesthetic appeal, noise, soil management, erosion and compaction, water management, use of fertilisers and pesticides and disposal of wastes. However, completing such a farm audit would require considerable involvement by the individual farmers - probably amounting to about 3-4 person days work. Our proposed appraisal system outlined in Sections 2.4 and 2.5 could be completed independently by the Agency's estates managers. Consequently we currently propose that the Agency's tenants should be required to apply good practice regarding the above issues, but that the proposed appraisal system would not appraise 'best' practice measures going beyond good practice on these issues. But we seek the workshop participants' views on whether there could be any ways that the Agency's estate managers could appraise efficiently such measures concerning these additional environmental management issues.

4.2.6 Consultation and Public Involvement

Section 2.8 outlines a proposed system of consultation with key stakeholders and public information that is designed so that the Estate Manager could carry them out as part of their normal appraisal and consultation activities in order to enhance the proposed measures and the local community's support for them.

4.3 Wider Applications and Transferability of Findings

The draft appraisal system (suitably refined) could offer good opportunities for wider application both within the Agency and with other land owners who have environmental requirements or objectives (eg National Trust) and who need systematic methods to select efficient environmental improvement measures. The draft appraisal system might also be applied for other practical purposes such as:

- Monitoring progress (eg farm biodiversity planning and farm assurance);
- Monitoring care of land and resources by tenants and outside farm contractors;
- More systematic accounting for environment and aesthetics in rural property valuation; and

- Assessing quantitatively (but in non-monetary terms) the effectiveness of small incremental options to enhance nature conservation that might input into 'value for money' and 'cost-benefit' analyses by government departments and agencies.
- Measuring and monitoring 'cross compliance' within the Agenda 2000 CAP Reforms.

At the workshop, we therefore seek views of other land owners and estate managers on lessons from their own appraisal methods that the Environment Agency could learn from and how they are addressing the issues highlighted in Section 4.2 above.

4.4 NEXT STEPS

The next steps are that this report on the draft appraisal system will be discussed at a peer review meeting on 14 December 2000. The Agenda and list of the participants to this meeting is attached in Appendices A and B. In the light of the discussions at this workshop, we will then prepare Terms of reference for consultants to refine the appraisal system and then to help the Agency's estates managers field trial it at selected estates. The consultants would then finalise the appraisal system and provide training materials so that it could be applied at the Agency's estates.

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APPENDIX 1

AGENDA FOR REVIEW MEETING: 14 DECEMBER 2000

Integrated Estates Management

Brainstorming Review meeting: 14 December 2000

Venue: Moat House Hotel, Stratford on Avon:

(Second day of Environment Agency's Estates Managers Conference)

Aim of Meeting

- To review draft system for appraising nature conservation and recreation and other environmental improvement measures at the Agency's estates so as to prepare terms of reference for a follow up study to produce a refined system that could be readily applied by estates managers in practice.

It is currently proposed that this follow up study would include the Agency's estates managers carrying out trials of the refined system with assistance from consultants and then the consultants finalising the appraisal system which would be launched at a major national conference. In addition, it is proposed that there should be implementation of actual projects at Beckingham that RPA's appraisal suggested are worthwhile. It could be worthwhile using this meeting to identify how to evaluate the effects of such measures (eg check actual visitor numbers? Etc)

Objectives/Audience

- **To seek views of Environment Agency estates managers on their needs and the draft system**
- To seek views of other estates managers for major land owners on the draft system
- To peer review draft report
- To provide basis for preparing terms of reference for follow up study

Annotated Draft Agenda

1. **Objectives of meeting** and objectives of appraisal system and summary description of present draft appraisal system (CW/JF)
2. **Appraisal of Improvements at Beckingham Marshes Estate (Paul Freeborough)**
 - Situation at Beckingham: (causes of problems and opportunities)
 - Options examined
 - Findings of Appraisal and how it has helped refine and select preferred options
3. **Views of Environment Agency Estates Managers covering different estates from Beckingham (eg pastoral) with respect to:**
 - Their present decision-making and assessment systems (including preparation of Site Management Plans)
 - time and costs available for carrying out an appraisal
 - Comment on the draft appraisal system in the draft report, especially how it could be applied best in practice and best fit into their present systems
 - Key differences between their estates and Beckingham and how these might be allowed for in the appraisal,
 - esp applicability of weightings for nature conservation features from Beckingham to their case study and reasons for difference

- Identify and characterise different types of estates on which field trials need to be carried out
- 4. How our proposed system could relate to MAFF's appraisal systems for their grants programmes as well as other sources of finance and the appraisal systems needed for such partnership opportunities (eg Groundwork)

Discussion of specific outstanding elements of draft appraisal system, incorporating peer reviewers' and others comments focused on points 5 - 7 below and covering not only the ex ante appraisal but also ex post monitoring:

5. Nature conservation Appraisal

- (a) How well have we used information from the SMP? **James Gillespie (Baker Sheppard Gillespie)**
- (b) When best to assess seasonally variable problems (eg nutrient contamination of ditches/ponds)? **James Gillespie (Baker Sheppard Gillespie)**
- (c) How well based scoring system on RSPB handbook? (**Matthew Rayment (RSPB)**)
- (d) Applicability of Beckingham weightings to other estates. How derive weightings for different types of conservation enhancement at different types of estates (**Bruce Keith (English Nature)**)
- (e) Validity/Plausibility of findings: of appraisal (**Bruce Keith (English Nature), James Gillespie, Matthew Rayment (RSPB), + all**)
- (f) How determine what level of improvement measures to pay for?
 - What information/appraisal is needed to show to justify such costs? – **Colin Waugh.**
 - Scope for transferring available estimates from valuation literature to inform (f) (**Nick Hanley (Univ of Glasgow)**)

6. Appraisal of Recreation improvement measures

- How in practice to estimate beneficiaries (eg visitor numbers) for specific measures using secondary source data? How monitor/evaluate visitor numbers? (**Dominic Hogg (ECOTEC)**)
- How estimate extra value of recreation visits of nature conservation enhancement measures on estate (**Nick Hanley (Univ of Glasgow) and Dominic Hogg (ECOTEC)**)
- If not possible to estimate beneficiaries, how else to justify recreation expenditures (**Dominic Hogg (ECOTEC)**)
 - To whom (in and outside the Agency) do we need to show to justify the costs of such recreation improvement measures? – **Views of whoever decides on expenditure bids. (Colin Waugh or Eileen McKeever)**

7. Views of other estates managers (see attached participants' list)

- Interest in system and its applicability to their estates
- Best practice lessons from their own appraisal system for the Environment Agency's proposed system.

8. Overview of appraisal system (Any/All)

- Other issues/counter-intuitive findings with present draft

9. Conclusions (CW) and Next Steps (JF)

APPENDIX 2

WORKSHOP PARTICIPANTS

Integrated Estates Management

Workshop : 14 December 2000

Attendees

20 Agency Estates managers from their annual conference plus:

Eileen McKeever	EA	Head of Recreation
Martin Stark	EA	Regional FRCN manager, Midlands
Chris Marsh	EA	Recreation officer, Midlands region
Liz Galloway	EA	Environmental assessment officer
Jonathan Fisher	EA	Environmental economist
Andy Goodwin,	WSA	
Rachel Chandler	DETR	Economist responsible for rural affairs, recreation and biodiversity
Dominic Hogg	ECOTEC	
Prof Nick Hanley	University of Glasgow	
James Gillespie	Baker Sheppard Gillespie	
Nick Woolley	RICS	
Martyn Ryan	FRCA	Business adviser
Alistair Johnson	Forestry Commission	Economic adviser
Bruce Keith	English Nature	
David Saul	Defence Estates	Training estates
Gareth Maer	British Waterways	
Matthew Rayment	RSPB	Economist
James Trueman	National Trust	Project Manager - Environmental standards for agriculture
Wilma Harper	Forest Enterprise	
William Little	ADAS	Principal surveyor