NATURE CONSERVATION AND GOLF COURSE DEVELOPMENT: BEST PRACTICE ADVICE

SCOTTISH
Golf Environment
GROUP

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PREFACE

BACKGROUND

Scotland is recognised internationally as the home of golf. With over 500 existing courses, and new development continuing, golf has an important contribution to make to our natural heritage, both through its value as open, green space in the landscape, and as managed wildlife habitat.

One of the most significant challenges facing golf today is how to continue to conserve and enhance this environmental value, and to ensure that the development of new courses follows environmentally-sustainable principles. Fortunately Scotland's golf courses are among the most natural in the world, and the traditions of design and management which have evolved here are essentially environmentally friendly. By ensuring that this fine tradition is maintained and indeed built-on in future, golf developers and golf clubs have the opportunity to play a major rôle in meeting this challenge.

PURPOSE OF REPORT

This report has been prepared in response to a brief issued jointly by Scottish Natural Heritage (SNH) and the Scottish Golf Environment Group (SGEG). In broad terms, its purpose is to provide guidance on aspects of nature conservation on golf courses. The content focuses primarily on the process of new golf course development. However, as consideration of management issues is an integral part of this process, aspects of course management are also covered. The report is intended to form part of a series of guidance papers on environmental aspects of new golf development.

The guidance is aimed on the one hand at developers and designers of new golf courses, and golf clubs considering extension or re-modelling of courses; and on the other at planning authority officers, consultees and other participants in the development control process. Adoption and application of the advice will have many potential advantages both for the environment and the golfer. These include:

- Helping to ensure that the development achieves long-term conservation benefits;
- Increasing understanding among developers and designers of the environmental characteristics of proposed golf course sites from the outset, thereby assisting in the development of more natural, challenging, and attractive golf courses;
- By incorporating an ecological approach from the outset, the developer can demonstrate a practical rôle in the conservation of natural heritage, and possibly avoid protracted planning consultation;

- An environmentally sound development can be promoted as such, enhancing the marketing profile of the final product;
- High environmental quality can enhance the golfer's playing experience.
- By working with nature it is possible to reduce ongoing maintenance costs.

The report is structured as follows:

- **Introduction: sets out the principles on which a partnership between golf and nature conservation can be based**
- **Section 1: provides an overview of the natural heritage of Scotland and its principal elements;**
- **Section 2: describes the methods of describing and evaluating nature conservation elements in the field;**
- **Section 3: investigates current practice through six key case studies and additional research;**
- **Section 4: provides a summary of good practice recommendations.**

The appendices include a guide to further reading, sources of advice, and a glossary of technical terms used in the text.

INTRODUCTION

GOLF AND NATURE CONSERVATION IN PARTNERSHIP

It has been recognised for some time that the relationship between golf and the natural environment is one of mutual interdependence. How is it possible to reconcile the two interests? Images of lush, heavily-fertilised greens, fairways and tees against a backdrop of colourful exotic shrubs, so common from televised tournaments, are liable to antagonise even the most liberal conservationist. On the other hand, dense scrub, woodland and wetland, encroaching on poorly-maintained greens and fairways, would insult the sensibilities of even the most tolerant golfers. These two scenarios however represent two equally undesirable extremes of a spectrum which can be readily avoided if a little thought and common sense is employed.

In addressing the relationship between golf and nature conservation it must first be established exactly what the term nature conservation means. For many years one school of thought has advocated leaving nature to its own devices. In lowland Scotland, which is where most golf courses are located, this "laissez-faire" approach would lead to the land reverting to woodland through natural succession. Conservationists recognise this to be the case and accept that to retain diversity in our valuable ecological resources there must be a degree of intervention by man. Rough grassland, moorland and heath only remain the way they are because of the continual removal of plant material by grazing or fire, thus halting the natural succession to woodland.

Golf is believed to have originated in Scotland over 600 years ago, the earliest players seeking -out freely-draining areas of short grassland. This was to be found on coastal links and in some inland heathland situations where there was grazing by rabbits or sheep. The short grass of golf courses is no longer maintained by grazing but by mowing. In the process, biomass and nutrients are removed – achieving precisely that which represents an essential element in nature conservation practice. The bent and fescue grasslands valued for golf thrive in nutrient-poor conditions and are characteristic of areas valued for nature conservation. It is of no surprise that 30 Sites of Special Scientific Interest (SSSIs) are to be found on golf courses in Scotland although it should be pointed out that the SSSIs are not necessarily all valued because of the grassland elements.

The modern golf course is not restricted to coastal situations and the demand for new courses necessitates increasing construction of inland courses. The grass sward requirements of the game, while becoming increasingly sophisticated, in essence remain the same and can now be readily created in situations where they would not occur naturally. However it is generally agreed that the best courses are those where the designer has recognised the attributes of the landscape and has developed them rather than altering them. The same approach is adopted by conservationists in the creation of new wildlife resources.

PRINCIPLES OF AN ECOLOGICAL APPROACH

If we accept that such parallels exist between golf course development and nature conservation it is possible to set down some fundamental principles for golf course design and management which are compatible with nature conservation interests:

- The primary principle is to **work with nature**, rather than against it, to produce a viable and environmentally sustainable recreational resource. A golf course should fit into its surroundings and not be imposed on them.

- It must be recognised that golf is a popular sport and a legitimate land use which need not prejudice nature conservation considerations.

- A golf course which favours nature conservation to the detriment of the game has failed in its fundamental aim.

- Nearly all golf courses include substantial "out-of-play" areas, either formally declared as out-of bounds under the rules of play, or where a golf ball is very unlikely to come to rest. These areas represent potentially valuable wildlife reserves. Wildlife has existed in parallel with golf for centuries and can tolerate some disturbance by man and learn to exploit the resources on offer.

- Golf and wildlife can exist together and with careful thought and planning mutual benefit can be derived. Recognition of this will be to the benefit of golfers and nature conservationists alike.

- Recent initiatives in golf course design and management illustrate what can be achieved. A number of examples will be discussed in the final section of this chapter.

The following sections examine these principles in more detail and identify the primary issues to be considered in accommodating nature conservation requirements in golf course development. In addition, a practical approach to the assessment of sites for new golf course developments is described.

1 SCOTLAND'S NATURAL HERITAGE

This section places the nature conservation of golf courses in its wider context by providing a brief introduction to the natural heritage of Scotland.

NATURAL HERITAGE

What is meant by natural heritage? As defined in the Natural Heritage (Scotland) Act 1991, it includes "the flora and fauna of Scotland, its geological and physiographical features, its natural beauty and amenity". This is an intentionally all-embracing definition, emphasising the importance of the entire environment, not only certain places or species selected for their special interest. Every locality, every area of habitat, is considered to be of value, and contributes to the overall richness and diversity. This is worth remembering when we turn our attention to a particular golf course or intended golf development site. Firstly, however, it is necessary to look at the underlying geological and climatic characteristics in order to understand the basis for this diversity.

GEOLOGY AND LANDFORMS

For its size, Scotland has the most varied geology and natural landscape of any country on the planet. Rock types range from the oldest metamorphic rocks which are over 3300 million years old, to the youngest post-glacial sediments which include the gravels underlying some of our best inland courses, and the wind-blown sands of the seaside links. These rocks form the physical framework. The continual effects of natural processes such as weathering and erosion on the underlying framework determine the final landforms which we see today. These natural processes are in turn largely controlled by climate.

CLIMATE

Lying on the maritime fringes of the European land mass, Scotland has an oceanic climate, dominated by the moderating influence of the Gulf Stream. Across the country, however, climate varies widely. Rainfall ranges from 1200m per annum on the west coast to as little as 600mm on the east, while some of the mountain areas may receive more than 3500mm. Wind speeds and duration of frosts also differ widely.

Some of the most important factors influencing the diversity of the landscape which we see today are the effects of ice movement, most notably during the last ice-age which ended 10,000 years ago. The retreat of the ice resulted in a gradual warming of the land and colonisation by woodland. In the south the woodland was mainly of broad-leaved species including birch, oak, elm and hazel. In the north,

pine dominated. More recent climate change, in the last 5000 years, bringing higher rainfall and lowered temperatures, has promoted the expansion of peat-moor and heath.

HUMAN IMPACTS

Man began to dramatically change the landscape in the Iron Age with the clearance of the forests for pasture. By the time of the Roman invasion most of southern Scotland would have been cleared. Following the Roman withdrawal in the 5th century AD, the forests recovered lost ground for a time and the demand for charcoal for smelting also safeguarded their existence. With the use of coal for smelting and the increase in sheep farming, the forests were no longer of value and by the 14th century they had again declined. In time the grazing land deteriorated and deer forest and grouse moor became more extensive.

About this time, the end of the eighteenth century, the agricultural and industrial revolutions began to make their mark. Agriculture was developed on the back of imported fertilisers and land drainage. At the same time hedges were planted, windbreaks established and new crop species imported. Changes in agricultural practice have accelerated in the twentieth century causing a reduction in diversity of lowland landscape and a commensurate loss of wildlife. The formation of the Forestry Commission in order to establish a strategic reserve of woodland brought a dramatic change in the woodland resource. Established woodlands were underplanted with conifers and eventually the extensive planting of coniferous species extended into the less productive heathland and moorland grazings.

NATURE CONSERVATION

Although the natural heritage is today still under pressure from man, the impact no longer proceeds unchecked. After the war, the effects on the environment were being noticed and the emergence of a conservation ethic contributed to the formation of bodies such as the Nature Conservancy Council in 1949, and the Countryside Commission for Scotland in 1968. In 1990 the two organisations merged to form Scottish Natural Heritage. The remit of SNH is determined by government which gives it the power to discharge domestic, European and international law. The legislation which has been enacted to protect the environment is extensive.

Nature Conservation Designations

The National Parks and Access to the Countryside Act 1949 defined “Nature Reserves” as areas for the study and research of, or preservation of, flora and fauna in their natural habitat, and geological and physiographical features of special interest. **This has led to the approach of designating sites for statutory protection as a means of protecting the natural heritage.**

The Wildlife and Countryside Act 1981 is the principal statute for nature conservation on a site or species basis, this embodies both domestic and international undertakings. The principal site-based designations for nature conservation are 'Sites of Special Scientific Interest' and 'National Nature Reserves' (Figure 1). 'National Scenic Areas' are the equivalent landscape conservation designation at national level. In recent years, these designations have been augmented by numerous others - those which are of most immediate relevance to golf course development are summarised in Table 1 overleaf.

Since all of these designations may be of relevance to prospective golf course development, their existence must be checked as part of the initial survey and evaluation process which will be examined in detail in Section 2.

In addition, there are many international initiatives to which Britain is committed and which therefore affect Scotland. For the most part they are embedded in the Statutes already mentioned. The most significant development of recent years not mentioned above is the United Nations **Convention on Biodiversity** which was ratified at the 'Earth Summit' in Rio de Janeiro in 1992. The UK signed up to this convention and published its **Biodiversity Action Plan** in 1994. The objective of the Convention is to conserve biological diversity, use its components in a sustainable way, and ensure fair and equitable sharing of the benefits of this use. The signatories are tasked with identifying important components of biological diversity and the processes which might have a significant impact on their sustainable use. They are required to establish a system of protected areas, ecosystem and habitat management and rehabilitation. The Convention provides guidance on how this should be done. Local Biodiversity Action Plans are currently being prepared for species and habitats in Scotland as part of the overall UK strategy. **Golf clubs and developers can learn more about the strategy and the possible contribution they can make to biodiversity by contacting their local SNH office.**

Despite the abundant designation and legislation referred to, this in itself is not sufficient to ensure survival and maintenance of individual species and habitats. Protection will only succeed if the legal protection is supported by conservation management based on a sound understanding of ecology. Legislation is regarded by some as a heavy-handed approach. Effective education leading to practical environmental stewardship may in time reduce the need for this course of action.

Table 1: Some important natural heritage designations[1]

Sites of Special Scientific Importance (SSSIs)	**Designated by SNH under the Wildlife and Countryside Act 1981, to protect them from damage and deterioration. SNH must be consulted on any development or activity which may affect the site.**
Special Protection Areas (SPAs)	**Designated to comply with the EC Directive on the Conservation of Wild Birds 1979. SPAs are normally selected from existing SSSIs.**
Special Areas of Conservation (SACs)	**Designated under the EC Directive on the Conservation of Natural Habitats and of Fauna and Flora. SACs are normally selected from existing SSSIs.**
National Nature Reserves (NNRs)	**Declared by SNH under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981, for the purpose of study, research and preservation of flora, fauna, geological and zoological interest. Include some of the most important natural and semi-natural habitats in Great Britain.**
National Scenic Areas (NSAs)	**Designated under the Town and Country Planning legislation to protect areas of nationally important landscape quality.**
Environmentally Sensitive Areas (ESAs)	**Designated under the Agriculture Act 1986 to conserve distinctive agricultural landscapes and stewardship practices.**
Areas of Great Landscape Value (AGLVs)	**Defined by Local Authorities to safeguard areas of regional or local landscape importance from inappropriate development.**
Local Nature Reserves (LNRs)	**Declared by Local Authorities in conjunction with SNH to reflect areas of locally important nature conservation interest or amenity value and to give access to the public.**
Listed Wildlife Sites (LWSs)	**Areas of local wildlife interest notified by Local Authorities in Development Plans.**
Sites of Importance for Nature Conservation (SINCs)	**Areas of local wildlife interest notified by Local Authorities in Development Plans**
Green Belts	**Notified by a Local Authority under the Town and Country Planning legislation to protect the landscape setting of a city or town from inappropriate development.**
Tree Preservation Orders (TPOs)	**Placed by a Local Authority on individual trees or groups of trees of local scenic or amenity importance to protect them from felling or deliberate damage.**

[1] For a comprehensive list, refer to *"Natural Heritage Designations in Scotland. A Guide."* HMSO.

2. METHODS OF HABITAT SURVEY

This section outlines the standard techniques of habitat survey and evaluation currently used in the UK.

Section 1 addressed the diversity of the natural heritage of Scotland. The range of environmental variation, combined with the different human influences across the country, has resulted in an enormously complex mosaic of habitats and plant and animal communities. To help to describe these, and to understand how the natural heritage functions, ecologists have developed a way of compartmentalising the environment into discrete units. It should be remembered that this is simply as a means of establishing a common vocabulary - in reality the boundaries between one habitat and another are often blurred, with a gradual transition occurring across a broad zone.

Two techniques or methodologies have been developed which provide a consistent terminology, and are now adopted as standard for surveying and describing habitats throughout the UK. These are:

- the Phase One Habitat Survey technique; and
- the National Vegetation Classification.

These techniques can be most successfully deployed during early site assessment and appraisal. They are designed to identify the nature conservation value of the site.

PHASE ONE HABITAT SURVEY

This system has been developed for the rapid mapping of wildlife habitats over large areas of countryside. The classification is based primarily on vegetation, supported by reference to topographic and substrate elements where necessary. It is based on the assumption that the nature and condition of the vegetation embodies information about the living and non-living components of the environment.

The broad classification of habitats is:

- woodland and scrub
- grassland and marsh
- tall herb and fen
- heathland
- mire
- swamp, marginal and inundation
- open water
- coastland
- rock exposure and waste
- miscellaneous.

Most, if not all of these, occur on Scotland's golf courses. Each broad category is subdivided into more detailed components which are recognisable in the field by trained surveyors. The survey is recorded onto 1:10,000, or 1:25,000, OS maps using a standardised system of colouring and annotation. The minimum unit of recording is 0.1 ha. The 'Phase One Maps' are designed to be easily read and can be employed in planning decision making. (Figure 2)

Phase One surveys are broad-brush in their coverage of the countryside and this is recognised within the methodology. Where a surveyor identifies habitats regarded as significant, a 'Target Note' is made which indicates the need for a more detailed 'Phase Two' survey of the site at a later date. In unusual circumstances there is provision for a 'Phase Three' survey.

THE NATIONAL VEGETATION CLASSIFICATION

This represents a more academic representation of native plant systems. It is broadly equivalent to a 'Phase Two Survey' and presents more detailed information than Phase One. The classification depends on an ability to identify plant species and to assess which species are dominant in any particular situation. Effective employment of the system requires more specialised ecological training than for Phase One but the information to be derived from the employment of the approach is much greater. The classification attempts to clarify the implications of subtle changes in vegetation from one area to another and when used by experts can greatly reduce the need for exhaustive physical and chemical analysis of the site.

In the context of golf course design and management, Phase One Survey will highlight areas of importance for nature conservation and allow a description of the natural history resource of an area, whereas NVC Classification will provide detailed information on all areas which should be considered in design decision making.

EVALUATION

Ecological evaluation is a central element in the assessment of a development proposal. The 1999 Environmental Assessment (Scotland) Regulations require that proposed golf course development of more than 1ha in area or with building of more than 0.5ha require an environmental assessment.

For an ecological evaluation to be reliable, it is essential that it is undertaken by a qualified ecologist. The value of reliable, replicable methodologies cannot be overstated. It is only after a survey and report has been compiled by a trained individual that the information can be incorporated into design and management proposals or strategies for land use. Initial evaluation of the survey information should cover the following:

Status

The first consideration is the ***status*** of the site in a statutory context - does it carry any of the designations described in section 2? All designations are notified to the local authority and a first indication can be obtained by reference to the Local Plan held there and in local libraries. The Area office of Scottish Natural Heritage will also be able to provide information in more detail. In some instances reference to the Royal Society for the Protection of Birds or on occasions voluntary organisations such as the Scottish Wildlife Trust will be necessary. In each case the designation will be accompanied by a description of designation and the reasons for it. Statutory designations need not of course prevent golf course development – the course at Loch Lomond incorporates two SSSIs which have been accommodated in the design. (See Case Studies, No.2).

Habitat complement

Secondly, the ***habitat complement*** must be considered. This can be achieved by reference to a Phase One Habitat Survey if one exists for the area, or by undertaking or commissioning a survey of this nature. It is important to remember that, for an effective assessment of the ecology of a site, the survey must extend beyond the boundary. The interaction between ecosystems and between habitats is immeasurable and it is only through experience that a good understanding of survey findings can be achieved. To some extent, the ecological complexity of the site will determine the detail of survey and evaluation required. While a detailed survey itemising all the interactions may be quite time-consuming, on the other hand take 'walkover' surveys such as 'Phase One' surveys can be extremely effective in coming to an understanding of the site ecology.

3. EVALUATING WILDLIFE AND HABITAT INFORMATION

A standardised and highly respected approach has been adopted by ecologists since 1977. This is the methodology set down in 'The Nature Conservation Review'. This document was intended to catalogue the variability found in UK ecosystems and habitats and assemble in one source the knowledge amassed to that date. Its contents are still invaluable to professional ecologists. The following paragraphs describe in simple terms each of the main concepts included in the methodology, and provide a real-life example from an existing Scottish golf course. In some instances, the courses mentioned are the subject of more detailed discussion in subsequent sections of this report.

Size

The first consideration is the ***size*** of the resource. Much of our natural resources are fragmented and it is generally recognised that larger systems are more valuable than smaller ones. The term 'edge effect' is used by ecologists to refer to the processes going on at the boundary between two ecosystems or habitats. On the edges the processes are not truly characteristic of either of the two adjacent systems. If a system is small it is possible that the edge effect can penetrate throughout the system preventing the development of true type characteristics. It is commonly found that the edge can extend 25m into a woodland thus a woodland must be more than 50m across before the truly woodland characteristics can be found. Smaller systems may represent good examples but it is recognised that they may only 'appear' to be good examples. As a rule the higher up the food chain one considers the greater the area required to sustain a viable predator population.

With regard to site planning and development, size is of fundamental importance in achieving environmental quality. The minimum area required for an eighteen hole course of around 6300yards has been quoted as 40 hectares (Golf Facility Planning 1996). However this takes no account of the additional space required to allow for a whole range of factors including:

- variation in site conditions eg avoiding wet areas;
- avoiding valuable habitats;
- providing new or enhanced natural habitats, woodland grassland, heathland or others;
- retaining features of landscape or historical interest;
- providing quality of playing interest by eg variation in direction of holes, adequate visual separation, and good visual definition.

A more appropriate yardstick to apply for a course seeking to achieve natural heritage quality would be 60-75 hectares and upwards. Generally speaking, the larger the site area, the more scope for an environmentally-friendly layout. An example of a course with adequate area to incorporate natural features is Western Gailes in Ayrshire, where heathland and other coastal habitats provide the

separation between fairways, carries from tees, and out-of-play rough. This type of approach is typical of many of the more traditional layouts in Scotland.

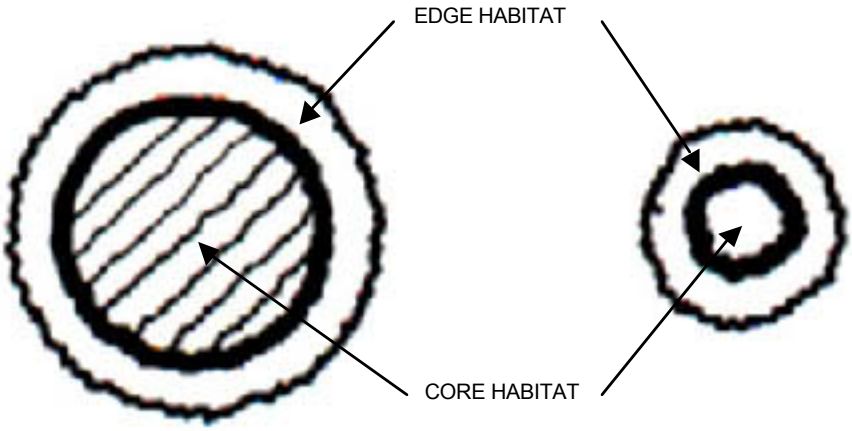


Figure1 Size and Edge (after Dramstad, Olson, and Forman 1996)

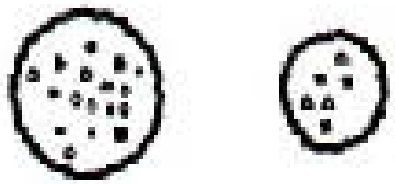
Figure 2 Large patches of heathland at Western Gailes, Ayrshire.

Diversity

The ***diversity*** of resource is the next factor for consideration. Diversity can be both good and bad depending on the cause of the diversity. Again it is a matter of professional judgement as to the nature of the diversity. Diversity is generally regarded as good provided that the components of the diverse resource are of an appropriate ecological scale. Diversity of species tends to increase with the size of

the habitat. Diversity can, in some cases, also increase with the degree of disturbance. It is important to understand that diversity cannot be assessed merely in terms of species numbers. Different habitats would naturally support different numbers of species because of the opportunities they present. Woodland of a given acreage would normally contain more species than a wetland or moorland of the same size but would not necessarily be of greater ecological value.

Figure 3 Size and Species diversity (after Dramstad, Olson, and Forman 1996)



Examples of courses illustrating habitat diversity include Linlithgow, and the Braid Hills, Edinburgh.

Figure 4 Diverse grassland and scrub habitats at the Braid Hills, Edinburgh

Naturalness

Cursory glances at ecological reports will reveal frequent use of the word natural. An ecologist will assess the degree of ***naturalness*** of a habitat, although it is fairly true to say that entirely natural habitats are very rare in Scotland. The shortage of a natural resource confers a greater value on 'semi-natural' resources which are those where native species dominate in what is recognised as a natural association. It is difficult to define semi-naturalness but it is perhaps better explained with examples.

Upland grassland is for the most part regarded as semi-natural as are coastal grasslands but motorway verges may exhibit naturalistic species composition but are not regarded as semi-natural because of their linearity and setting. The nature conservation value is affected by the degree of modification in both structure and species composition. A predominance of introduced species will invariably reduce the value as illustrated by the woodlands at Hilton Park, where the deciduous woodland is ecologically more valuable than the conifer woodland. Nature conservation will accept intervention by man as a necessary activity in the pursuit of diversity of resource. The activity becomes unacceptable when it involves major modification. Streams are particularly susceptible to modification as illustrated by comparison of the streams at Taynuilt and Inverness Golf Clubs.

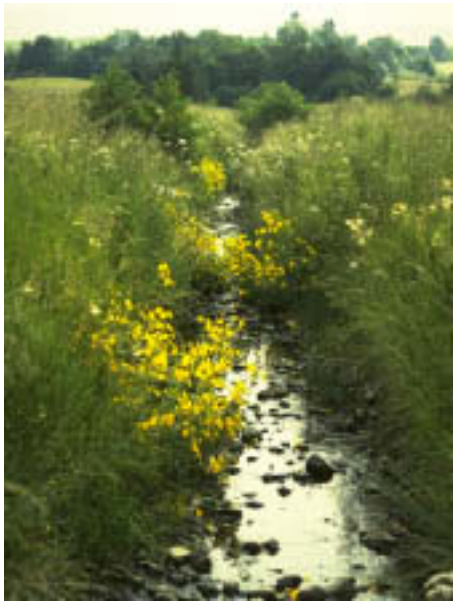


Figure 5
Taynuilt Golf Club

Figure 6
Inverness Golf Club

Rarity

Rarity**,** for some the most important reason for nature conservation, is important in the assessment of a resource whether it be at species or habitat level. Rarity implies consideration of scale. A species which is rare in one area may in fact be abundant in an adjacent habitat. The rarity of species on a national and international scale is emphasised and there is an increasing consideration of the rarity of habitat resource. Many ecologists believe that it is only by considering the habitat resource that the species-level rarity can be addressed. In broad terms a resource, be it species or habitat, which is rare at a national level will be regarded as being of greater value than one which is only locally rare. Rarity may be a consequence of an unusual set of environmental circumstances but otherwise rarity is associated with fragility. Rarity need not be a barrier to development, the Loch Lomond Dock, a very rare species, still grows on the Rossdhu site after the construction of the course.

Fragility

Fragility reflects the sensitivity of habitats, communities and species to environmental change. The factors determining fragility can be either *intrinsic* or *extrinsic*, as explained below.

- Climax vegetation (eg woodland), being the ultimate stage of ecological succession, is intrinsically stable whereas intermediate stages in successions (eg scrub) are intrinsically unstable. At Thornhill Golf Club, for instance, management provisions are necessary to prevent woody species invading an orchid-rich grassland habitat.

- Vegetation is intrinsically slower to respond to change in comparison to animal species, which have the capability to react rapidly.

- Specific environmental conditions acting on an ecological community, for example slope instability, may give an extrinsic disposition towards fragility. An example of this occurs by the streamside at Vale of Leven golf course, where the resulting soil erosion results in habitat change.

Figure 7 Stream bank instability at Vale of Leven

- However by far the most significant extrinsic factor is human activity. Virtually all natural and semi-natural systems are sensitive to human activity. Fragile sites are very often highly valued because they are seldom found intact. This can however mean that some sites are so fragile that even under optimum conservation management conditions they may not survive. This may mean that some very fragile sites are assessed as having a reduced conservation value. It is not appropriate to dismiss fragile resources just because they will be difficult to maintain.

Typicalness

It is dangerous to dwell on the matter of a habitat being an excellent example of its type. It is important to remember that ***typicalness*** is important. More often than not ecologists will encounter the typical example of a habitat rather than the ideal. The ideal is something exceptional but the value of the typical should not be overlooked. There are few examples of semi-natural habitats which exhibit little interference from human activity so we must conserve all semi-natural resources if possible and this attributes a high value to typical examples. The conifer stand at Muckhart Golf Club shown below is obviously planted and not typical native conifer woodland whereas the deciduous woodland at Burntisland in the following slide is typical of its type.

Figure 8 Norway Spruce at Muckhart Golf Club, Clackmannanshire.

Figure 9 Mixed deciduous woodland at Burntisland, Fife.

Continuity

The recorded history of a site will influence the value of the habitats. If it is possible to determine the changes which have taken place in a particular location the ecological evidence of existing flora and fauna can be put into the historic context. Many habitat resources have few records and it is only by studying those which have that we can interpret them. In ecological terms habitat ***continuity*** over

time is a significant factor in attributing a value, and historical records can give an indication of this continuity. In many cases it is possible to use the vegetation of a site to gain an insight into the history.

Recreatibility

A question which is commonly raised by ecologists regarding habitat creation projects is, "is a habitat truly being recreated or is the product simply a good facsimile?" The answer lies in the level of scrutiny applied to the results. For example it is possible to replicate grassland plant communities with proprietary seed mixes but closer examination of the soil would be likely to reveal entirely different microbial communities from a natural system. The same considerations apply to all habitat types. The complex interactions of species found in natural systems can only develop over time. The significance of resemblance to a natural system will depend on the whether the habitat is being developed as a replica system or in order to provide a resource for a particular species.

Potential

The final factor which must be considered in the Nature Conservation Review Approach, on the strength of survey and research findings, is the ***potential*** of the site. It has already been stated that most habitat types in Scotland, if left alone, would progress to woodland. This is certainly true of the land below about 700m, the natural tree line. The potential of a habitat could vary greatly with the level of intervention by man. An ecologist must assess a site in terms of the degree of management intervention necessary to achieve set objectives. In the development context the ecologist must consider proposed changes and determine whether a habitat is sustainable with good management once those changes have been effected. Once the implications have been considered the acceptability of the proposals can be determined. The pond at Dougalston Golf Club, for instance, will progress to dry land without management, thus intervention is necessary to *retain* the existing habitat. On the other hand, the woodland planting at Minto will require intervention to ensure it *develops* into valuable and diverse habitat.

Figure 10 New woodland planting at Minto Golf Club

LANDSCAPE ECOLOGY

Recent years have seen the emergence of the discipline of Landscape Ecology, which in essence specialises in the study of ecological resources on a large scale, emphasising relationships between distribution patterns and ecological processes. The terms and concepts which it has developed have proved to be particularly effective in describing golf course sites, which by definition cover tens of hectares. The most recurrent terms which are mentioned are ***patches, edges,*** and ***corridors***. The terms apply not only to the arrangement of habitats but also the perceived interrelationships. Examples of how the terms apply in a golf course situation are shown in Figures 12 and 13.

Patches

Patches are vegetational elements (for example woodland, heathland, or unimproved grassland) which show a degree of isolation analogous to islands. They can be the result of human activity where clearance, planting or introduction has taken place or they may be the result of local natural changes. The significance of patches is assessed in terms of the *number, size* and *location*. Patches may be numerous or single, as large as a forest or as small as a single tree and by virtue of their location be beneficial or deleterious. Size can affect the ecology of patches in that the larger the patch the smaller the amount of edge in proportion to size and equally the greater the amount of interior habitat. There will be larger populations of species associated with the habitat type if it is bigger. In contrast, if it is smaller or fragmented there will be more edge species which will probably be of lower ecological value. Larger patches are likely to exhibit greater habitat diversity. Species are less likely to become extinct in larger patches. Large patches of natural vegetation can be of great ecological value because of the landscape continuity they provide. Smaller patches can be of value as they can resist transfer of

disease or unwanted elements. Small patches can also act as stepping stones permitting movement of species within the landscape.

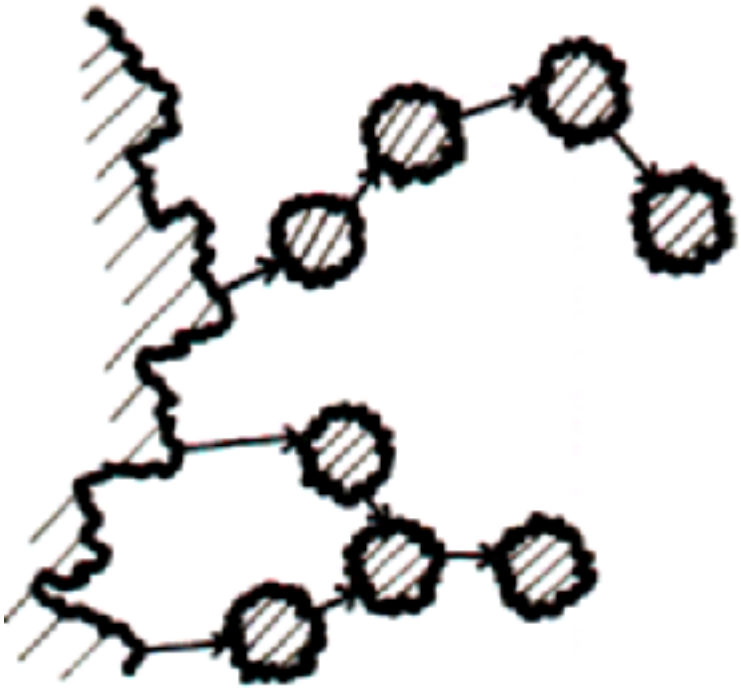


Figure 11 Patches as stepping stones ***(after Dramstad, Olson, and Forman 1996)***

The number of patches will influence the viability of species. One patch will probably exhibit low genetic diversity with a tendency to develop genetic homogeneity - more than one patch increases the chances of gene pool diversity. In some cases the viability of the population of a species may depend on a number of patches and it is possible that the removal of one patch may be enough to undermine the viability of the local population. In instances such as this a detailed knowledge of the ecology of individual species is important.

Figure 12 Number of patches and species diversity ***(after Dramstad, Olson, and Forman 1996)***

The issue of location is more straightforward. Patches which are closer together are more valuable than an isolated one. Those patches which are strategically placed in respect to other patches are also of greater value. For instance, one specific area of woodland on a new site may be more important to retain than others, which could in turn influence the design of the layout of holes.

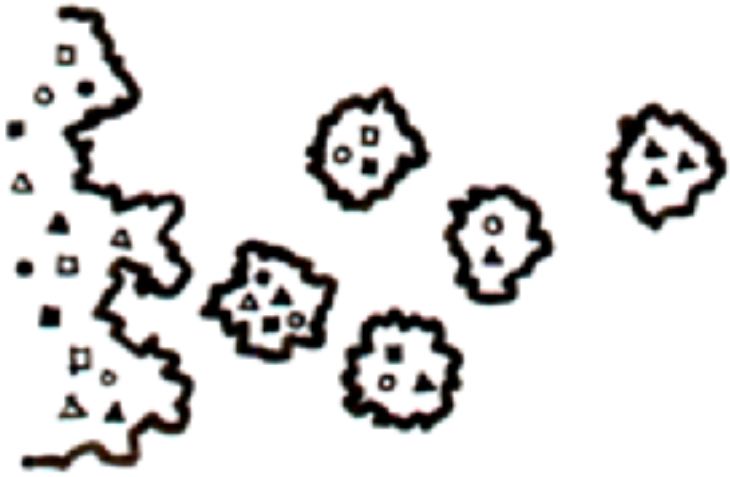


Figure 13 Proximity and species diversity ***(after Dramstad, Olson, and Forman 1996)***

Edges

Edge has been mentioned earlier but it merits more attention in the context of ecological fragmentation. Edges are areas of interaction between adjacent habitats and vegetation types. The nature of the interactions can depend on the form of the edge in terms of structure and layout. The more diverse an edge the greater its species diversity. Complexity of an edge structure will affect the way in which it works. A straight edge will promote parallel movement of species whereas a more convoluted edge will promote perpendicular movement. A softer convoluted edge will support more species as a consequence of the greater intermixing of two habitat types and the greater provision for territories (see woodland in Figure 12). Edges can have a value as a form of protection of valuable patches or habitats, very often these will be referred to as buffer zones.

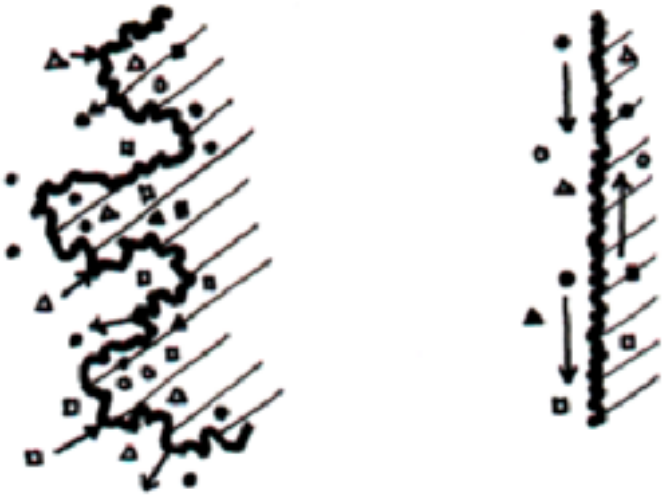


Figure 14 Edge form, species diversity and species movement *(after Dramstad, et al,1996)*

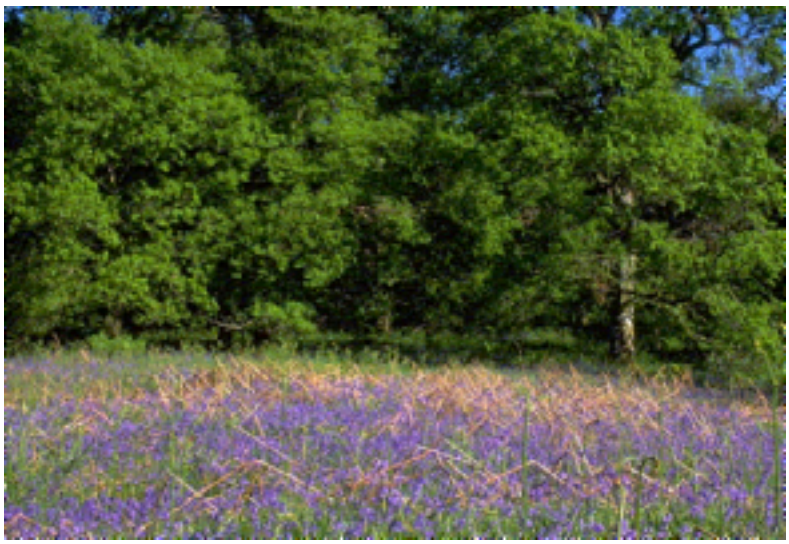


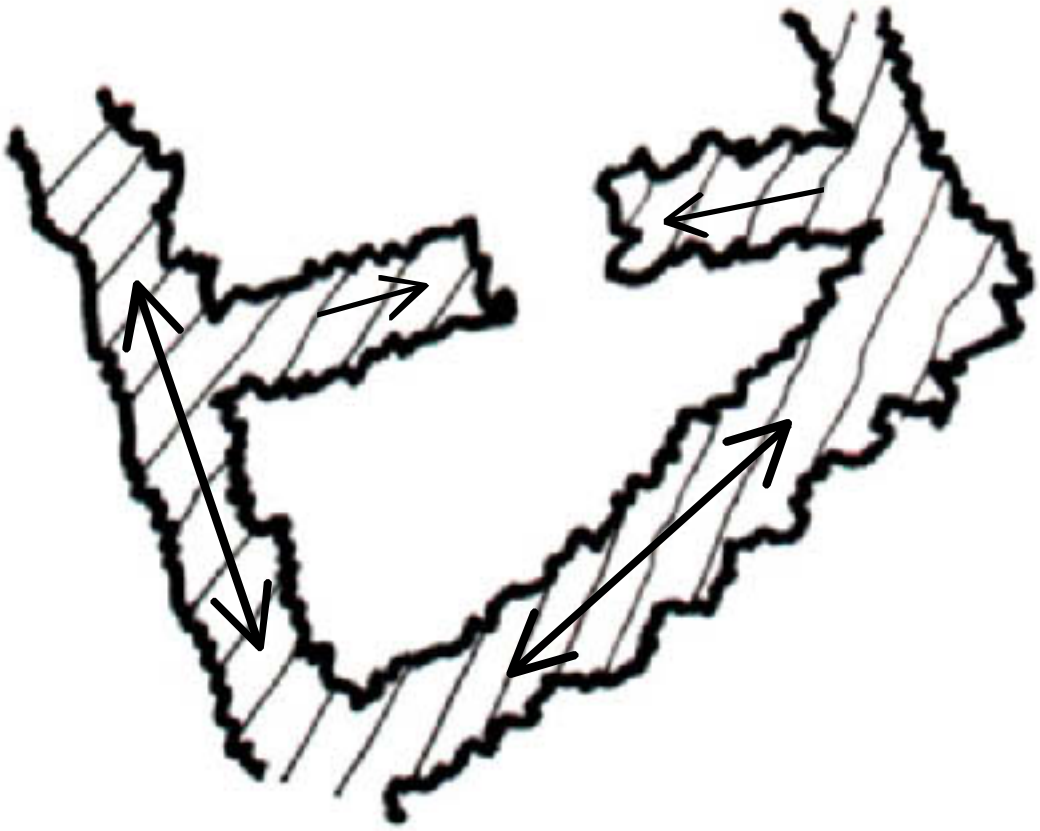
Fig15 Woodland edge with bracken and bluebells. Loch Lomond Golf Course, Luss.

Corridors

Corridors are perhaps the most familiar ecological components to the layman. Many ecologists believe that they are extremely valuable because of the increasing fragmentation of the landscape in that they provide links between fragmented resources. It is also recognised that they can also cause fragmentation of the landscape. The most important characteristics of corridors are width and connectivity. Gaps in a corridor will affect its function and the greater the gap the more species

affected. Structural and species diversity may affect the connectivity but may increase the habitat opportunity. (The woodland and heathland in Figures 12 and 13 show examples of how important corridors can be retained and enhanced on golf courses).

In the urbanised parts of Scotland's central belt, golf courses constitute a particularly significant proportion of the network of wildlife corridors at both local and regional scales. Their role in this regard has been recognised by their inclusion in urban wildlife strategies in several cities including Edinburgh, Dundee, and Aberdeen.



WEIGHT OF LINE INDICATES NUMBER OF SPECIES

Figure 16 Connectivity of corridor ***(after Dramstad, Olson, and Forman 1996)***

Fig17 Birch woodland between fairways forming wildlife corridors. Boat of Garten, Highland.

Interrelationships

The overall consideration of the interrelationships between patches, the effects of edges and the role of corridors is bound up in the consideration of ***scale*** and ***pattern***. The pattern of resources is their configuration in plan relating to connectivity and fragmentation. The scale relates to the degree of separation between elements and the level of scrutiny. Resources may be regarded as fragmented if examined closely but larger scale consideration may consider the resource as intact habitat. It is in matters such as this that professional judgement is important.

Management

The evaluation of habitats and species as discussed so far has addressed those factors which an ecologist must consider as a consequence of survey and research. The mention of management of habitats and the role of human activity brings in another dimension. The evaluation will be made in the context of a proposal for golf course development. We have already seen how management for conservation can be very similar to management for quality in golf courses. A prudent ecologist will understand that development of a golf course involves an investment of time and money to make it work. From a conservation standpoint this investment can be harnessed to protect or develop the conservation value of habitats. Very often sites of ecological value are in transition through natural succession (Figure 10), and without the investment of time and money they may degrade to a less valued habitat type. All too often no resources are available to prevent this from happening but where golf course development is proposed the resources can be made available and planning achieved

whereby the conservation and golf interests can develop in parallel. In other words development is not necessarily negative but may be, and often is, very positive, presenting opportunities for nature conservation which otherwise may only have been dreamt of.

Figure 18 Ecological succession

The recognition of opportunities for nature conservation has increased in the last two decades because of our greater understanding of ecological processes. Today we have more idea of what will happen in any set of circumstances if we interfere with plant communities. In addition we have more of an understanding of the consequences in the animal populations. This is not always a good thing. Conservation practice has learnt to implement the growing knowledge in the field of habitat creation. Today we can look at semi-natural or natural habitats and set about recreating them in other locations.

Newly created habitats may closely resemble the originals but it must be remembered that they are only facsimiles. The newly created systems can only become equivalent to the originals with time. It will depend on the system as to how long this might take. A pasture may be developed in 50 years, a fully mature woodland may take 500 years, and a raised bog may take 5000 years. Without time the habitat is not a substitute for the original. To the uninitiated observer it may seem that the two are the same and the question may then be asked, 'why is this so valuable when you can easily make a new one?

The preceding material has shown that conservation involves careful, informed management. It cannot be stressed enough that management is **not** an add-on to the process of design. Too many practitioners believe that only when planning and design have been resolved is it then possible to set down a management plan. This is not recommended. On the contrary, the development process should be regarded as one of continual refinement of a sound basic concept, with management an integral factor, given equal weighting with planning and design. Management requirements will have a bearing on

planning and design provisions and equally the design proposals will determine the nature of the management. Little is achieved, and some time wasted, if design proposals are formulated and then found not to work in management terms. It is only by implementation of careful management that designs are effected and the aims achieved.

The criteria outlined in this Section influence not just to the nature conservation interest of a course, but also its golfing challenge and the quality of its landscape. Playing golf affords the opportunity of coming into contact with nature that many of us will have little other time for. The chance encounter with wild birds and animals can be as much a topic for conversation in the club house as the putt which lips out, or the 300 yard drive. Thoughtful habitat planning and management based on thorough ecological evaluation can ultimately greatly enrich the golfing experience.

Table 2 Checklist of Habitat Evaluation

STAGE / TASK	FACTORS TO BE CONSIDERED
STATUS	All statutory and non-statutory nature conservation designations which apply to the site.
HABITAT COMPLEMENT	Information derived from Phase 1 Survey.
SIZE	Size of different habitats present in relation to viability of populations.
DIVERSITY	Ecological value in relation to number of species present and type of habitat.
NATURALNESS	Naturalness of habitats as evident from degree of modification in structure and species composition.
RARITY	Rarity of species and habitat at local, national and international level as appropriate.
FRAGILITY	Sensitivity of habitats and species to external and internal environmental change.
TYPICALNESS	Habitat typicalness is assessed in relation to its representativeness of what is found elsewhere and how illustrative it is of the overall resource.
RECREATIBILITY	How easy is it to recreate the habitat in terms of time required and ultimate success.
CONTINUITY	Changes in habitat over time where historical record available.
POTENTIAL	Habitat succession in relation to management intervention (existing or proposed under development).

4. REVIEW OF CURRENT PRACTICE

This section describes the practical application of nature conservation principles. It examines four recent golf development projects in detail, and also describes issues from a range of other sites.

INTRODUCTION

The preceding chapters have identified some of the key principles of nature conservation as applied to golf courses, but how can this theory be put into practice? This section sets out to show what can be done with the right approach and the will. Four case studies are described. They are:

1. The Duke's Course, St Andrews
2. Loch Lomond, Dunbartonshire
3. Elmwood, Fife
4. Pumpherston, West Lothian

Scotland's golf courses cover a very wide range of geographical locations and habitat types. It was not possible within the constraints of this study to examine an example from each of these. The case studies were instead chosen by initially consulting the Scottish Golf Environment Group and Scottish Natural Heritage, drawing on their specific knowledge of recent development projects, to attempt to identify a shortlist covering a representative range of development and nature conservation ***issues***. This was followed by site visits and interviews with representatives of the short-listed courses. Not all of the courses on the original shortlist have been included in the final list of four above. Some of the key issues to emerge from the remaining courses contacted are therefore included in a separate section. A short questionnaire survey was also carried out.

It will be noted that none of the four case studies could be regarded as a traditional links course, although The Duke's perhaps comes closest. Recent years have seen very few new courses being developed on linksland, reflecting a complex set of land-use factors ultimately relating to financial viability. These include the often remote location of remaining sites, and the frequency of statutory protection due to high landscape and nature conservation value. There have nevertheless been a few recent examples, and for this reason, together with the fact that re-modelling of links courses is an ongoing process, some key principles affecting links are noted in the summary diagram.

THE DUKE'S COURSE, St. ANDREWS, FIFE CASE STUDY 1

SUMMARY

TYPE OF DEVELOPMENT	▪ **New 18-hole course.**
PREVIOUS LAND USES	▪ **Arable agriculture** ▪ **Woodland.**
NATURAL HERITAGE DESIGNATIONS	▪ **No designations**
OTHER DEVELOPMENT ISSUES	▪ **Public access (existing Rights of Way)** ▪ **Historic architectural structures**
CONSULTATION	▪ **No consultation with SNH or SGEG prior to development.** ▪ **Fife Council Ranger Service consulted.** ▪ **Ongoing consultation with SGEG**
KEY CONSERVATION OUTCOMES	▪ **Surface water swales** ▪ **New habitat creation (wetland,woodland, woodland edge)** ▪ **Management plan**
OTHER COMMENTS	▪ **Heavy use of fertiliser**

BACKGROUND

The Duke's Course is owned by the Old Course Hotel, St. Andrews. The Hotel proposed the development of the course to guarantee golf to its guests. The course is located at Craigtoun, south-east of the town of St. Andrews and occupies 135 ha of land centred on the former Mount Melville Mansion House. Craigtoun Park is located within the course layout. The main adjacent land-uses are farming, forestry and a holiday park.

The land was formerly farmland, birch woodland and small stands of trees, and was bought by the hotel in 1992. Mount Melville House is 'B' listed.

The site falls from the south-east to the north-west, with an overall level difference of 74m. The golf course topography is varied with frequent distinct changes in level.

ISSUES

- No natural heritage designations.
- No ecological survey.
- Habitat protection of woodland and small stands of trees.
- Habitat development opportunities.
- Creation of grassland, scrub, woodland and wetland habitats.
- Rights of way and permissible access.
- High frequency of play.

DESIGN AND PLANNING

- A team of golf course architects was appointed in 1992.

- There were no ecologists appointed to the design team nor was there consultation with SNH. The development process was rapid. The design was prepared in 1993, construction completed in 1994 and the course opened in 1995.

- The course is described as links-style although the landscape setting is a parkland. The style refers to the specific type of golfing challenge envisaged by architect Peter Thomson - whose intention is that the course should be played "along the ground" rather than "through the air". The distinctive and pronounced earthworks were designed to shed water rapidly and out of play areas have been left unmown to increase the linksland atmosphere. Bunkering is limited with the positioning designed to give the impression of larger hazards.

- The mission statement of the course is based on the philosophy of the designers:

"To create a natural and wild style of landscape whereby a beautiful setting for golf will harmonise with a diversity of wildlife habitats and their associated fauna."

MANAGEMENT

Vision and aims

- Management policy has been drafted in general terms but implementation is dynamic and flexible, and continues to develop in response to particular challenges or issues.

- The stated aim of the plan is:

  " *To create, by careful management, a landscape which is held in high regard for both its beauty and its abundance of diverse flora and wildlife*."

Integrated Pest Management

- In response to the high level of play, there is continual application of fertiliser. It is recognised that this is not conducive to the development of a rich flora and that it is potentially damaging to watercourses. At various points within the course, for example on the third hole, swales flow into areas of surface water retention which have been developed into wetlands for use as nutrient sinks. In addition some small open-water habitats have been created for the same purpose.

- Some of the fairways have been carved out of woodland and the result is a rather abrupt and straight woodland edge. However the woodland has been taken well back out of play and the intention is to develop the edge habitat to increase the species diversity and the habitat structure. Existing woodland is also being extended into the course to increase the connectivity between habitats. The woodland extension is being achieved through the planting of seedlings selected from the existing woodland. The planting is undertaken at varied spacing to simulate natural woodland and diversify habitat structure.

- The soil on which the course is constructed is relatively fertile which means that where it has been disturbed and left unseeded or turfed for golf, invasive species tend to dominate. Dense growth of thistle and other ruderal weeds in some areas detracts from the aesthetics of the landscape and also restricts species diversity. There is an overall policy of minimising the use of herbicides and this is demonstrated in the manual removal of the thistles at convenient times in the slack spells in the course management routine.

- Several species of birds feed on the course. Wherever possible flower heads are left on herbaceous species to permit winter feeding for species such as finches. Raptors also hunt over the land and these are encouraged by the placement of nest boxes, in particular for owls, kestrels and sparrowhawks.

- Areas of invasion by *Rhododendron ponticum* occur which are highly undesirable in the context of species diversity of the woodland and woodland edge. The policy is to reduce the spread of this species as it competes with more desirable ground flora. Large areas are to be maintained outwith the golf play areas to aid the winter migration of Greenfinch.

Education and communication

- Course manager works closely with the Fife Council Ranger Service and has also consulted the Scottish Golf Environment Group.
- Conservation is regarded as sufficiently important to merit the production of promotional material which explains the conservation policy.

SUMMARY OF GOOD PRACTICE ELEMENTS

- **Swales used to direct surface water run-off**
- **Wetland "nutrient sinks"**
- **Woodland edge design**
- **Woodland habitat connectivity**
- **Transplanting of in-situ seedlings to form new woodland habitat**
- **Hand-weeding (IPM)**
- **Raptor nest boxes**
- **Rhododendron control**
- **Promotion and communication**

The retention and enhancement of the diverse range of natural habitats on the site have been instrumental in creating the distinctive look and playing characteristics of the course.

LOCH LOMOND GOLF CLUB CASE STUDY **2**

SUMMARY

TYPE OF DEVELOPMENT	▪ **New 18-hole course.** ▪ **Further 18 holes under consideration.**
PREVIOUS LAND USES	▪ **Parkland.** ▪ **Woodland.**
NATURAL HERITAGE DESIGNATIONS	▪ **NSA** ▪ **Two SSSIs**
OTHER DEVELOPMENT ISSUES	▪ **Presence of woodland listed as Long-Established Semi-Natural Woodland** ▪ **Presence of valuable plant communities and species** ▪ **Presence of bat populations**
CONSULTATION	▪ **Close liaison with then Nature Conservancy Council and Countryside Commission for Scotland (SNH precedent bodies)** ▪ **Ongoing consultation with SGEG.**
KEY CONSERVATION OUTCOMES	▪ **Retention of wetland SSSI** ▪ **Management of parkland SSSI** ▪ **Management plan**
OTHER COMMENTS	▪ **High profile championship-standard course** ▪ **Aesthetics very important**

BACKGROUND

The site is located at Rossdhu, near Luss on the west of Loch Lomond, bounded by the A82 and the loch shore. The land falls to the Loch and is for the most part shallowly sloping.

The course is located in the immediate policies of Rossdhu House, the former home of the Colquhoun family. Located at the north end of the property, it is surrounded by parkland, with trees to the south and west and a bay to the north. Bordering the A82 road is ornamental woodland with a mixture of deciduous and coniferous species. Elsewhere on the site is birch woodland, coniferous plantation, a walled garden and bog. A burn runs through the north end of the site and much of the north of the site is susceptible to flooding.

The soil is heavy which when considered in conjunction with the climate means that surface water removal is an issue. The local rainfall is high (in excess of 1500mm). The water level of the Loch fluctuates significantly throughout the year.

Although open to the Loch on its eastern side, the site is effectively visually contained from the A82. Adjacent land uses are also separated from the course by the road. The site itself has been used in the past for pasture, forestry and shooting. The parkland comprises grassland with large specimen trees, mostly oak. Cattle and sheep have been grazed over the land. Plantation woodland is of coniferous species, primarily spruce. Shooting is mostly of pheasant. The management prior to the construction of the golf course was very low-key. The woodland elements of the site have provided cover for the game birds and have a dense shrub layer for this purpose.

ISSUES

There are many nature conservation issues for this site including:

- two SSSIs;
- NSA (and potentially National Park) designation;
- woodland listed as Long Established Semi-Natural Woodland;
- Designed landscape included in Inventory of Gardens and Designed Landscapes;
- very valuable bryophyte communities;
- presence of the Loch Lomond Dock, a very rare species,
- extensive areas of invasive, exotic vegetation;
- important bat populations.

The golf club itself is very exclusive. The business concept is based on an international membership; and the course has already achieved a high profile through televised tournaments. There is therefore continuous pressure on the course manager to maintain the standard of presentation of the course at a very high level.

DESIGN AND PLANNING

- The primary intent was to construct a golf course of international repute. The setting was recognised as being spectacular and providing the opportunity to produce a course of championship standard.

- The landscape quality and the ecological status of the land were great assets. The list of designations attached to the site required sensitive treatment. In addition to this, the intended stature of the course required careful attention to detail.

- An Environmental Statement was prepared for the development following a formal Environmental Assessment procedure under the planning regulations. Ecological and landscape conditions were attached to the consent.

- Currently, there is also a proposal for a second course to be developed to the south of the existing. The SSSI and NSA designations are pertinent to this development proposal and must be considered in the decision-making process. In addition, this second application, should consent be obtained, will have nature conservation conditions attached to that consent.

- SNH have been involved in both the existing and the new applications.

MANAGEMENT

Vision and aims

- The club has recently produced a conservation management plan. The initiatives included in the plan are primarily derived from the club and are approved by SNH.

- The philosophy of management implementation is to divide the course into discrete areas and to carry out management on an area-by-area basis. The timing of dealing with areas is determined by the urgency of required action.

Wetland

- Wetland located on the shore of the loch constitutes one of two SSSIs within the area of the course. The course layout avoided this area because of the wet soil conditions and the susceptibility to inundation, and there has been no attempt to drain the land.

Woodland

- The second SSSI includes some of the parkland trees, valued for the communities of ferns which grow within the canopy. The trees have been retained and there is a planting programme designed to ensure continued tree cover within the parkland. There have been some changes in landform within the SSSI which do not appear to have affected the trees in the short-term.

- The woodlands have been neglected for decades and it is recognised that there has to be some intervention both for the purpose of guaranteeing woodland cover but also for public safety. Wherever it is possible to do so without affecting play, trees felled are left to decompose in-situ in order to diversify habitat opportunity.

- Replacement planting stock to date has been bought in from wholesale nurseries but it is recognised that there is an extensive genetic reserve on the course which could be put to good use. The maintenance team have collected seed from the indigenous trees and established a tree nursery for future planting.

- Much of the woodland has an extensive shrub layer which would normally be encouraged, however much of the shrub layer is made up of *Rhododendron ponticum.* This is an undesirable, invasive, alien species and there is an ongoing campaign to eradicate the species from the course. It is recognised that this is unlikely but the short-term aim is to dramatically reduce the area it covers.

Landscape Character

- The creation of fairways, greens and tees has resulted in a colour change but this is mitigated by the visual containment of the site. Elsewhere, attention has been paid to retaining the landscape quality of the site. The policy of conservation of the landscape is in accord with the aim of nature conservation.

Education and communication

- The course manager works closely with local conservation organisations and has encouraged the building and erection of bat boxes within the woodlands to encourage the important bat populations of the course.

SUMMARY OF GOOD PRACTICE ELEMENTS

- **Preparation of Environmental Statement as a statutory requirement**
- **Retention of undisturbed areas of wetland, including SSSI**
- **Re-planting programme in parkland SSSI**
- **Indigenous tree nursery**
- **Rhododendron control**
- **Bat boxes**

The Loch Lomond Golf Club has quickly become established as one of the foremost inland championship venues in the British Isles. Through hosting the Loch Lomond Invitational tournament, which has European Tour status, it has gained widespread media coverage and praise for its high standard. The quality of the landscape setting and the diversity of wildlife habitats, particularly the wetlands, are key factors which are regularly commented on. The development of the Loch Lomond site has shown that a formula which combines the highest calibre of architectural input, ecological design and management, and course presentation, is not only eminently possible, but arguably has set the new "industry standard" which all future projects should aspire to emulate.

ELMWOOD COLLEGE, FIFE

CASE STUDY **3**

SUMMARY

TYPE OF DEVELOPMENT	▪ **New 18-hole course.**
PREVIOUS LAND USES	▪ **Arable agriculture.**
NATURAL HERITAGE DESIGNATIONS	▪ **No designations**
OTHER DEVELOPMENT ISSUES	▪ **Presence of hedgerows and hedgerow trees** ▪ **Mammal populations**
CONSULTATION	▪ **SNH consulted early in development process.**
KEY CONSERVATION OUTCOMES	▪ **New habitat creation (woodland, meadow, scrub, hedgerow)** ▪ **IPM policy** ▪ **Management plan**
OTHER COMMENTS	

BACKGROUND

The course has been developed by Elmwood College, which includes in its academic programme courses in greenkeeping. The course was developed as a training and teaching facility which would also have the potential to generate income. It is intended that it will be run as a pay-and-play facility, and on a season-ticket basis. The estimated usage level is 30,000 rounds per annum.

The course covers c. 45ha and is located 3km south of Cupar on a gentle, south-east facing slope. Adjacent to the course are hospital grounds, farmland and the main East Coast railway line. The course is bisected by a minor road.

The land was originally farmed for arable crops and is classified as Land Capability Class 2. The soil is sandy-loam with pockets of boulder clay and has a high fertility.

ISSUES

- No designations.
- Fertile farmland.
- Existing degraded hedgerows.
- Lapwing and Partridge nesting and Buzzard feeding on land.
- Brown Hare and Red Squirrel on or adjacent to site.
- Opportunities for habitat development.
- Woodland, meadow, scrub and hedge creation.

DESIGN AND PLANNING

- The development process was instigated in 1994. Goldie, Wright Architects, Dundee were appointed as planning consultants. The staff of the College were involved in the production of a management plan to accompany the application. The plan was written in accordance with the SNH guidelines and reviewed by SNH as part of the planning application consultation process.

- Planning consent was approved with the management plan undertakings included as formal planning conditions. Implementation was broadly in accordance with the plan but there were local variations in the course layout to accommodate detailed topographical changes.

MANAGEMENT

Vision and aims

- In the Management Plan, the stated aim for nature conservation is:

"to enhance existing habitats and create new ones through careful management."

- The policy throughout the course is to monitor the progress to enable modification of maintenance practice to achieve the desired outcome.

- The environmental considerations extend beyond issues of habitat creation into matters of golf course maintenance. The policy is to reduce this activity to the lowest level of intervention necessary to permit golf.

- New habitats were proposed from the outset and grant aid was sought to support this.

Woodland

- Woodland Grant Scheme funding was obtained from the Forestry Authority for 8 ha of mixed woodland (20,000 trees) comprising birch, ash and rowan. In addition 1.5km of hedgerows were planted with mainly hawthorn and dog rose.

Grassland

- Wild flower meadows were proposed within the course but it was recognised that the land was too fertile to achieve good results. The course manager therefore decided that it was necessary reduce the fertility quickly to prevent the grasses taking over the sward. To this end the farm was invited to cut the rough for silage thus taking nutrient away and this has had the effect of reducing the fertility and with it the vigour of the grasses.

Turf management

- Irrigation is only used in the absence of natural precipitation and then only to those areas specifically in play. The hours of irrigation are recorded. A similar approach is taken with drainage in that it is only applied to the areas in play. Fertiliser and pesticide use is sparing as part of an Integrated Pest Management policy. The application policy is to use only what is necessary and then specific materials in the minimum amount required.

Education and communication

- The effects of all developments and operations are monitored and the results are discussed among the College staff and SNH and modifications made to practice in order to optimise wildlife and environmental benefit.

SUMMARY OF BEST PRACTICE ELEMENTS

- **Early consultation with SNH**
- **Integration of Management Plan with development process**
- **New Habitat creation**
- **Use of WGS Funding**
- **Low-key drainage design – no piped drainage in out-of-play areas**

The course at Elmwood is a good example of how a site in a relatively open agricultural landscape can be transformed into an interesting setting for golf, at the same time significantly enhancing its nature conservation value. The development concept of a relatively modest, pay-and-play layout has been shown to have been appropriate in the circumstances. Its popularity has already been proven with 15,000 rounds played in 1998 and twice this number forecast for 1999.

PUMPHERSTON GOLF CLUB CASE STUDY **4**

SUMMARY

TYPE OF DEVELOPMENT	▪ **Extension of existing course from 9 to 18 holes.**
PREVIOUS LAND USES	▪ **Derelict land (Former oil-shale works)**
NATURAL HERITAGE DESIGNATIONS	▪ **No designations**
OTHER DEVELOPMENT ISSUES	
CONSULTATION	▪ **SNH and SGEG consulted at outline planning stage.**
KEY CONSERVATION OUTCOMES	▪ **New habitat creation – wetland, grassland, scrub & woodland.**
OTHER COMMENTS	▪ **Land returned to productive use.**

BACKGROUND

The course is located in West Lothian, adjacent to Livingston New Town.

The development discussed here is an extension of an existing nine hole course to eighteen holes.

The site is located in an area of agricultural land adjoining derelict oil shale operations. The extension of the course was conceived as a means of reclaiming contaminated derelict land to productive use. This was necessary as the site was, at one time, the location of the largest oil refinery in the world. It was here that James 'Paraffin' Young developed the process of extraction of petroleum products from oil shales of Carboniferous age. One consequence of this was extensive surface deposits of shale waste and contamination of the soil. The decontamination of the land was to be achieved with the ultimate return of the land to productive use.

The return of the land to use as a golf course created opportunities for conservation development. Habitat creation possibilities were envisaged before planning permission was sought and the resulting proposals were incorporated in the conditions attaching to the planning permission. Ecologists were involved in the process and the Scottish Golf Environment Group was also consulted.

ISSUES

- The primary issue is contaminated land reclamation. Involving remedial works, site decontamination and treatment of contaminated hotspots.
- Securing groundwater migration.
- Removal of high detergent, tar and oil concentrations.
- Reedbed construction for treatment.
- Grassland, wetland and scrub habitat creation.
- Water body creation.
- Preventing access to undermined areas, woodland planting, fencing and shrub screening.
- Copse planting.
- Retention of scrub and grassland.
- Encourage scrub regeneration.
- Management of access by provision of walkways.

PLANNING AND DESIGN

- The initial work on the land was designed to decontaminate the land. The land is owned by British Petroleum (BP AMOCO), the successors to Young's Paraffin and Oil Company. BP employed consultants, I R Robertson & Partners, Civil Engineers, to manage the reclamation and their own ecologists were involved in the appraisal of the site. Once the surveys were completed,

the subject of after-use of the site was addressed and a suggestion was made that golf course development should be considered.

- The feasibility of this was considered and it was concluded that extension of the existing course could be achieved. BP approached Pumpherston Golf Club with the proposal and the outline planning process was set in train. Since the existing course was also sited on contaminated land it was decided that the development would provide the opportunity to treat this problem at the same time.

- The BP ecologists recommended nature conservation initiatives of woodland, wetland, scrub and grassland creation, and encouragement of scrub regeneration. At the instigation of the golf club members the Scottish Golf Environment Group was consulted.

- Recommendations were drafted and the local authority consulted. With the close involvement of the SGEG and the BP ecologists no significant consultation with SNH was required. At the outline planning stage the recommendations of the SGEG were incorporated into the conditions.

- Glen Andrews, Golf Course Architect was appointed to work up a detailed design for the proposed extension. The construction management and planting of the course as detailed in the planning application has received financial support from the Scottish Sports Council Lottery Fund.

MANAGEMENT

Vision and aims

- A detailed planning application has been approved. Nature conservation measures will be incorporated into the conditions of the detailed consent. The primary concern is the decontamination of the land and the treatment of the ground water.

- A detailed management plan has been written as a condition of the planning consent and the provisions are being implemented by I R Robertson & Ptnrs. in collaboration with Glen Andrews, Pumpherston Golf Club and BP.

SUMMARY OF GOOD PRACTICE ELEMENTS

- **Return of contaminated land to productive use**
- **Nature conservation / habitat creation**
- **Wide-ranging consultation**
- **Use of multi-disciplinary design team**
- **Provision for access by local community**

KEY ISSUES FROM OTHER COURSES

A number of other courses were contacted during the research. Some of the key issues to emerge are discussed below.

Design and Planning

Tullybannocher

This is a course with a history of investment and failure. The original permission was granted in 1990 and the course commenced construction soon after. The enterprise failed because of the recession in Japan, the main shareholder being Japanese, and ultimately ownership of the course was obtained by Mr John Souter in 1997. The present ownership attach great significance to nature conservation and its promotion. The course is currently still under construction.

When the course was taken over in 1997 the planning permission granted in 1990 was still extant as work had commenced, there were no ecological burdens. The new owners placed ecological issues high on the agenda and established a Habitats Committee immediately. The committee approached the SGEG representative and he provided advice on the desired approach to this. Detailed ecological information was collected before decisions were made as to the best approach. The process was entirely voluntary but the product was regarded as being potentially valuable to the Scottish Golf Environment Group.

Kirkintilloch

This is the extension of an existing course. Several holes on the old course were frequently wet and difficult to play and it was decided that the extension should create additional holes to allow the club to relinquish the holes in the wet area.

Glen Andrews were appointed to design and build the extension and the SGEG representative was consulted pre-planning. A wide range of opportunities were identified for inclusion and a number included in the planning application. There was no involvement of SNH in the process but reference to SGEG was helpful. The inclusion of ecological issues in the application resulted in the ecological conditions being imposed in the consent.

Extensive habitat creation was undertaken on what had previously been farmland. A small amount of tree planting was carried out with the involvement of the Countryside Trust. Species rich grassland

creation was carried out together with development of wetland and open water in the previously poorly-drained area.

The particularly important aspect was the creative thinking in terms of change of use of the land.

Reay Golf Club

The value of this case study is in illustrating the process of development on a designated site.

The course is coastal abutting a grey dune system. Proposals were put forward involving modification of holes and the relocation of a tee. The dune system is designated as a SSSI and the club were obliged to consult with the SNH on the proposals. The relocation of the tee involved potentially increased incursions into the SSSI. A number of options were discussed and the final recommendation designed to reduce the impact of access on the system was the construction of a shell path through the dunes. The path served to channel access and control erosion.

The club provided the expertise necessary to explore the options from within their membership. They also carried out reinstatement of dune habitat after the work had been completed. The location was particularly sensitive ecologically and the degree of co-operation between club and SNH is to be commended.

Brighouse Golf Course

This coastal golf course was extended from 9 to 18 holes. The issue in this case was the grassland around the course. The grassland was of relatively high ecological value and would only remain so with careful management. The operator of the course recognised the potential for habitat development and consulted the SGEG with regard to management advice.

Of particular importance were the Skylark populations and recommendations were followed which retained and enhanced habitat resources for this species. The particular considerations were the application of fertiliser and the cutting regime of out of play grass. Care was emphasised in the application of fertiliser, the increased levels of nutrients in coastal grass systems would rapidly result in a depletion of species. Skylark numbers are currently being monitored.

5. SUMMARY OF RECOMMENDATIONS

The main body of the report has attempted to provide an introduction to the elements of nature conservation practice relevant to golf course development. It has also provided an overview of the processes of evaluating issues, and subsequently integrating proposals, into the final development "product"

This final section draws together the key points to emerge from the study in the form of the following recommendations:

- ***A checklist of good practice covering the overall development process;***

- ***Two indicative course layout diagrams illustrating "do s" and "don't s" in the treatment of nature conservation issues.***

- ***A list of the key benefits to clubs of following the recommended process.***

Table 4 Checklist of Good Practice

STAGE	ACTIONS	OUTPUTS
Feasibility / inception	▪ Initial consultation with Local Authority Planning Department and SNH to identify key nature conservation issues	▪ Brief for Ecological Consultant
Site Appraisal	▪ Agree brief, appoint professional ecologist as part of project team ▪ Detailed consultation with Local Authority Planning Department, SNH, SGEG, and others as referred to by above bodies if required ▪ Identify legislative and planning context – ie protected status, designations, etc ▪ Carry out Phase 1 Survey and/or NVC classification	▪ Ecological Report identifying and evaluating potential conflicts and opportunities
Site Planning and Design	▪ Input by ecologist to design proposals – liaison with golf course architect ▪ Avoidance of negative impacts where possible including impacts during construction ▪ Mitigation measures to minimise negative impacts ▪ Habitat creation and enhancement proposals ▪ Prepare habitat management objectives	▪ Design Proposals ▪ Outline Environmental Management Plan ▪ Planning Application including Environmental Statement if required
Construction	Site visits by Ecologist to: ▪ troubleshoot negative impacts arising from construction works ▪ "fine-tune" habitat creation and enhancement works	▪ Instructions to Contractor(s)
Post Construction	▪ Finalise Environmental Management Plan in consultation with Course Manager and SGEG Advisor ▪ Monitor and review management objectives	▪ Ongoing management prescriptions / actions implemented by Course Manager

SUMMARY OF BENEFITS

The benefits to clubs of adopting the recommended process fall into two main areas:

- Cost-effective design and management;
- Enhancement of the golfing experience;

COST EFFECTIVE DESIGN AND MANAGEMENT

Areas of potential financial benefits include the following.

- *Compliance with Legislation*
  Adoption of an environmentally responsible approach to development and management can save abortive costs in eg obtaining Planning Consent, complying with Planning Conditions and Environmental Assessment Regulations, and regulations regarding control of pollution.

- *Earthworks*
  Reduced cost for earthworks and course construction by retention of natural landforms and soils.

- *Drainage*
  Drainage is commonly one of the major heads in the construction budget and there is a temptation to cut corners leading to future management problems. By designing with the site, using the naturally poorly-drained areas as out-of-play rough, carries, wetlands or open water features, overly-expensive drainage systems and costly future problems can be avoided or minimised.

- *Seeding, turfing and planting costs*
  Retention of existing vegetation features (trees, woodland, scrub, grassland, heathland) can reduce the cost of planting and seeding.
  Use of locally-adapted species of turfgrass, trees and shrubs reduces risk of establishment failure.

- *Grant Aid*
  Grants may be available to offset costs for proposals such as tree planting and habitat management which are shown to be environmentally beneficial.

- *Mowing*
  Thoughtful design and management of fairways, semi-roughs and roughs saves cost through reduction in mowed areas and mowing frequency.

- *Integrated Turf Management*

  Adoption of an IPM approach to turf culture breaks the cycle of dependence on chemical control and reduces costs of chemical purchase and application.

- *Water*
  Reduced water requirements in terms of irrigation frequency and total amount, and cost of water supply and storage.

- *Protection of Property Value*
  Environmental features such as woodland, ponds, etc have an asset value which is protected by responsible management.

- *Marketing*
  Improved environmental quality and public image of the course is a marketable asset in terms of promotion for green-fee income.

GOLFING EXPERIENCE

The playing experience for golfers can be enhanced by the following:

- Improvement in amenity value of the course generally, through more trees, woodland, wildflower colour and scent, birdsong, sightings of other animals, etc;

- Creating more memorable and locally-distinctive features of holes, through retention of existing natural habitats;

- More variation in visual character of holes;

- Better visual definition of holes;

- Trees and woodland give improved shelter and reduction in extraneous noise levels;

- Natural habitats (eg wetland, grassland and woodland) provide the potential for increased playing challenge from medal and championship tees;

- Environmental quality can be a source of pride among club members, which can be reinforced by recognition through programmes such as “Committed to Green” or the SGEG Environmental Awards.

6. APPENDICES: APPENDIX 1:

NATURAL HERITAGE DESIGNATIONS

Sites of Special Scientific Interest (SSSIs) - notified under the Wildlife and Countryside Act 1981 as being of interest for their flora, fauna, geologic or physiographic features. There are 1359 covering 828,900 ha or approximately 10% of Scotland. Owners and occupiers of SSSIs must take care when undertaking potentially damaging operations, the planning system pays particular attention to these sites.

National Nature Reserves (NNRs) - identified under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981. Nature reserves of national importance which may be protected under bylaws. NNRs cover 114,769 ha, approximately 1.5 % of Scotland. Some may be owned by Scottish Natural Heritage or may be managed through a Nature Reserves Agreement with owners and occupiers.

(Biosphere Reserves (UNESCO) and **Biogenetic Reserves** (Council of Europe) are two non-statutory designations, selected from existing NNRs).

Ramsar Sites - designated under UNESCO 'Convention of Wetlands of International Importance, Especially as Waterfowl Habitat' (the Ramsar Convention) 1971. The convention was intended to stop the reduction, and loss, of wetland sites by promotion of wise use of all wetlands and special protection of 'Wetlands of International Importance'.

Special Protection Areas (SPAs) - designated by the Secretary of State for Scotland under Article 4 of the European Communities Directive 79/409/EEC on the Conservation of Wild Birds (the 'Birds Directive') for the protection of habitat of rare, threatened or migratory species. Protection, management and control applies to birds, their eggs, nests and habitats. There are approximately 27 SPAs in Scotland, with a further 107 candidate sites.

Special Areas of Conservation (SACs) - will be designated under Article 3 of the EC Directive 92/43/EEC on the Conservation of Natural and Semi-Natural Habitats and of Wild Fauna and Flora (the Habitats and Species Directive). This is aimed at ensuring biodiversity through conservation of natural habitats and wildlife by the establishment of protected areas throughout the European Union. SACs with SPAs are termed the **Natura 2000** series.

National Scenic Areas (NSAs) - are important for their landscape quality. There are 40 NSAs in Scotland covering 10,018 sq km, 13%, of Scotland. Their designation is provided for by the Town and Country Planning (Scotland) Act 1986 and more specifically by Secretary of State Order (Scottish Office Circular 9/1987). The land is deemed to be of outstanding scenic value in the national context. Most of the land is privately owned and protected through the planning system.

Environmentally Sensitive Areas (ESAs) - May be designated by the Secretary of State under the Agriculture Act 1986. There are 10 in Scotland covering 1.5 million hectares or 19% of the agricultural land in Scotland. Their aim is to help conserve areas where agriculture and land use have created distinctive landscapes whilst at the same time maintaining wildlife and historic features. European Council Regulation (EEC) no 2078/92 embodies this approach and makes provision for Community aid for environmentally friendly agriculture within these areas.

Areas of Special Protection (ASPs) - designated for the protection of individual species of birds, there are 8 sites in Scotland. Protection is afforded individual species as listed in the Schedules of the Wildlife and Countryside Act 1981 but the ASPs draw attention to specific instances.

Local Nature Reserves (LNRs) – designated by Local Authorities under the National Parks and Access to the Countryside Act 1949, they reflect areas of locally important nature conservation or amenity value and to give access to the public.

Listed Wildlife Sites (LWSs) and **Sites of Importance for Nature Conservation (SINCs) -** areas of local wildlife interest notified by Local Authorities in Development Plans ie Local Plans and Structure Plans.

Areas of Great Landscape Value (AGLVs) –areas of local or regional landscape value highlighted in a Development Plan**.**

Green Belts – areas which form the landscape setting to a city or town, protected in a Development Plan.

Tree Preservation Orders (TPOs) – used by Local Authorities in a Development Plan to protect trees or areas of woodland of local scenic or amenity importance.

Non governmental organisations may declare their own reserves on sites which they own or manage. Examples are reserves owned by the Royal Society for the Protection of Birds (**RSPB Reserves**) and the Scottish Wildlife Trust **(SWT Reserves)**.

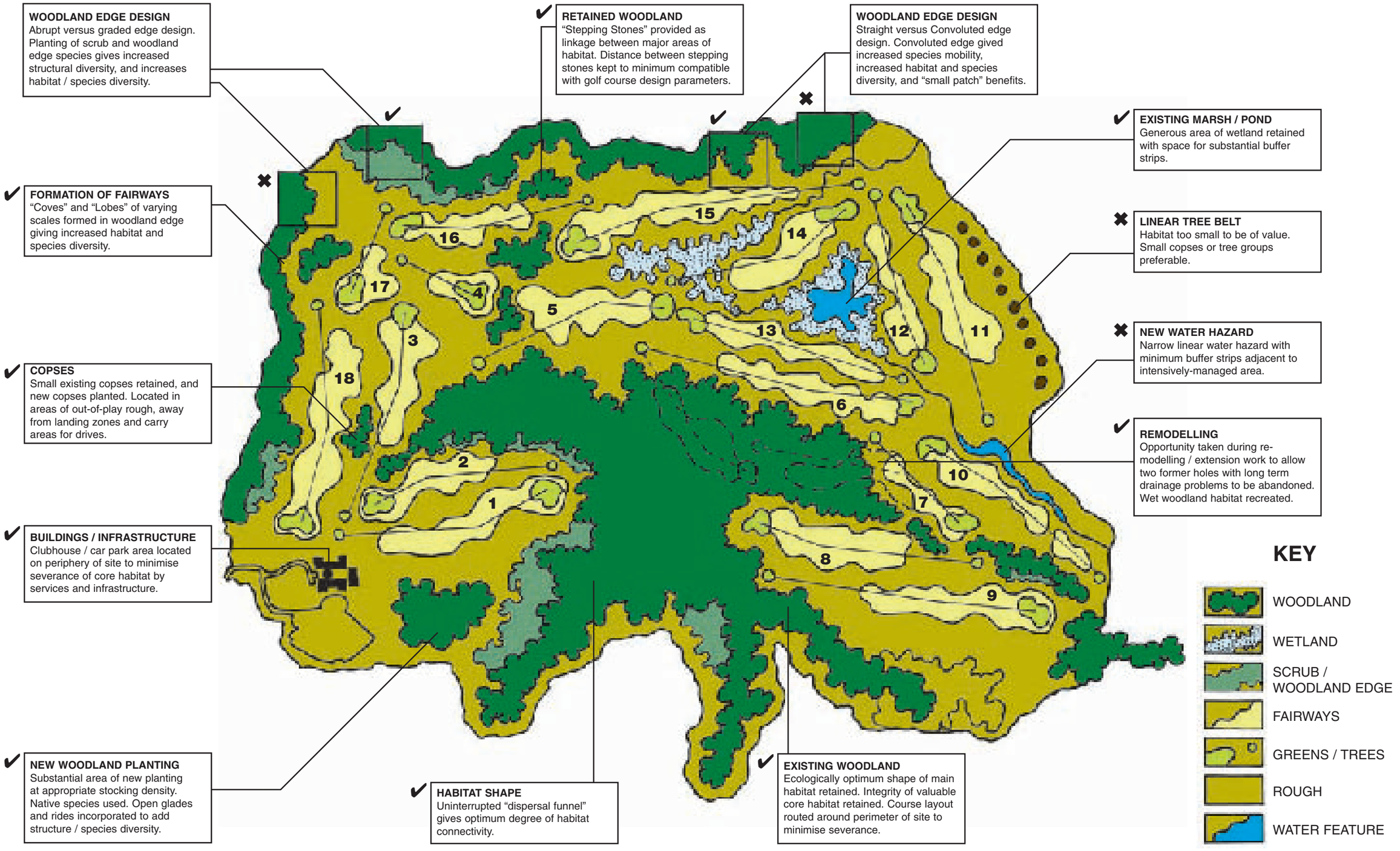


Figure 19
INDICATIVE COURSE LAYOUT DIAGRAM
Woodland and Wetland Habitats

✔ **DUNE RIDGES/HOLLOWS**
Subsidiary dunes and "dune slacks" create definition for golf holes and setting for greens and tees.

✖ **DUNE RIDGE**
Part of dune ridge excavated to form site of green. Hole could have been shortened and ridge kept intact.

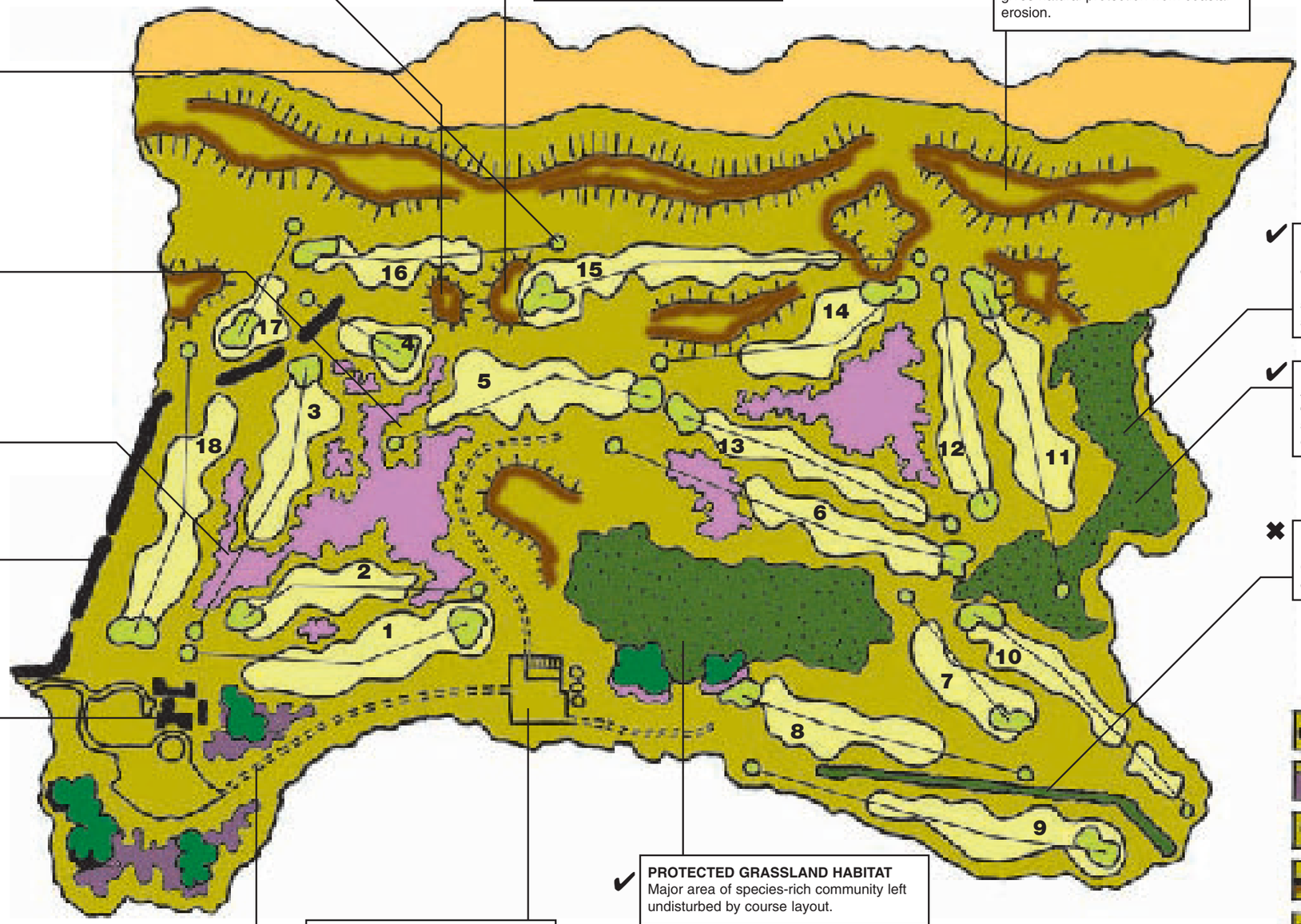
✔ **MAIN DUNE RIDGE**
Major coastal dune ridge system left undisturbed by course layout. Forms ecological buffer with shoreline and gives natural protection from coastal erosion.

✔ **RETENTION OF WET DUNE SLACK**
Ecologically important area conserved by change in location of 16th tee.

✖ **HEATHLAND**
Existing heathland removed to form fairway. Could have been retained to form carry from tee.

✔ **HEATHLAND**
Large patch of heathland could have been severed by fairway. Designed to form carry from tee - retaining patch size and avoiding fragmentation.

✔ **EXISTING DYKE**
Retained as design feature in the course layout, and for its ecological and cultural value.



✔ **BUILDINGS / INFRASTRUCTURE**
Buildings and car park sited on area of least valuable habitat. Tree planting of appropriate species around clubhouse area predominantly on inland side. Integrates buildings in flat landscape, screens views from main roads, retains open views from clubhouse.

✔ **MAINTENANCE FACILITY**
Sensitively located outside areas of most valuable habitat. Incorporates environmental protection features including chemical store, fuel and waste oil storage tanks, chemical interceptor traps on drainage gulleys.

✔ **MAINATENANCE VEHICLE ROUTES**
Access routes for maintenance vehicles intergrated with course design to minimise long term disturbance of habitat.

✔ **PROTECTED GRASSLAND HABITAT**
Major area of species-rich community left undisturbed by course layout.

✖ **TREES IN SPECIES-RICH GRASSLAND**
Tree planting reduces value of habitat for grasses and herbs. Natural colonisation by pioneer species such as poplar and sycamore should be prevented by removal of seedlings.

✔ **HABITAT CREATION**
During earthworks cut and fill, area of bedrock close to surface left uncovered to create niche habitat for specific wildflower and invertebrate species.

✔ **MEADOW**
Area used as borrow-pit during construction used to create new species-rich meadow, linkage with existing patch of grassland habitat.

✖ **HEDGEROW**
Existing hedgerow grubbed-up. Could have been retained as feature of hole, and for its ecological value.

KEY

- HEATHLAND
- SCRUB
- SPECIES RICH MEADOW
- DUNE RIDGES
- FAIRWAYS
- GREENS / TEES
- TREE PLANTING

Figure 20
INDICATIVE COURSE LAYOUT DIAGRAM
Linksland and Heathland Habitats

SCOTTISH
Golf Environment
GROUP

Scottish Golf Union

R&A

SCOTTISH
NATURAL
HERITAGE

SCOTTISH
BIODIVERSITY
FORUM