FORESTRY COMMISSION
OCCASIONAL PAPER 41

Forestry Expansion –
a study of technical, economic and ecological factors

Forestry and the Conservation and Enhancement of Landscape

D. Campbell and R. Fairley
Countryside Commission for Scotland

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INTRODUCTION

In this paper, we discuss the need for landscape conservation and the impact this has upon forestry in Britain. In addition we look at the role of forestry in landscape enhancement. We seek answers to a number of questions: what is the demand for the conservation of existing landscapes; where are the most highly valued landscapes; to what extent does that demand limit the availability of land for future forestry? These questions are interrelated to others: what value do trees and woodlands have on the landscape; when woodlands and forests are planted, how can that value be optimised; and are there sites in Britain today, where planting would confer major benefits to landscape and how can these areas be identified?

In analysing these questions we concentrate on three key topics: aesthetics, planning and design. We examine the cultural appreciation of landscape and woodlands, the process of landscape appraisal and evaluation and the identification of landscapes which require special conservation. We then go on to answer the main questions – what role forestry has in landscape conservation, what constitutes a well designed forest, and where well designed forests would enhance landscape. Throughout, as is necessary when considering an environmental resource, we stress the importance of forest ecology, and, as is necessary when society is involved, we refer to the importance of understanding public preferences and perceptions.

The central message of this paper is twofold: that all landscapes have elements requiring conservation and that therefore great care has to be taken in assessing the landscape resource and in executing detailed landscape design work in all forests and woodlands to ensure that opportunities are grasped to add to, rather than detract from, landscape quality. Benefits could be derived from planting more well designed forests and woodlands in Britain. The trick is getting the location and the design right.

Both the landscape and its perception are dynamic processes. The way we see the landscape depends upon who we are, the age we live in and the way in which we use our eyes. Over the centuries, the way in which people have thought about landscape has undergone profound changes. Up to the early eighteenth century, wild and mountainous landscapes were generally feared. Cultural appreciation demanded order and control. Then the growth of the romantic movement, parallelled by Man's declining dependency on the countryside and his growing urbanisation led to appreciation of the 'sublime' – wild and awe-inspiring countryside; of the 'beautiful' – smooth and gentle pastoral landscapes; and the 'picturesque' – grand vistas, often with partly ruinous buildings frequently framed by trees.

In this century, landscape appreciation has become increasingly linked with recreational use of the countryside and, indeed, recreational utilisation and value has been one of the motivating forces acting in favour of landscape conservation, though paradoxically, recreational pressure has become a potent cause of landscape damage. It has often been argued that the popular areas are in danger of being 'loved to death'. That is not to gainsay the valuable interaction there is between recreational utilisation, increased understanding and landscape conservation.

Appreciation of landscape depends not only upon the eye but upon all other senses as well: the cry of moorland birds, the feel of the wind, subtle temperature changes with the passage of clouds, the song of streams and rivers, the pounding of the sea, the scent of pinewoods, the taste of salt spray – all contribute to the experience and its impact. Thus, the blind may continue to derive great pleasure from landscape (Scroggie, 1989).

Cultural associations may also play an important part. Few visitors can fail to respond to the emotional association of places like Eynhallow, Iona or Lindisfarne on the one hand or, on the other, to places like Strathnaver or Glencoe. Today, the media is having a considerable impact on landscape perception, both through the way in which it portrays the countryside and wildlife, and through its use of landscape for drama or comedy. Hence, 'James Heriot's Yorkshire' is promoted or 'Poldark's Cornwall'. Although some of these associations are transient and may appear trivial, they have a long and honourable pedigree: viz. Thomas Hardy's Wessex, 'Bronte Country', 'Scott Country', etc. The difference, today, is that these associations are used unashamedly in tourism marketing. Because of this they are one of the causes for society developing a preservationist attitude to the appearance of certain landscapes and views.

Perception of beauty is also impacted upon by familiarity. Whereas a degree of familiarity may increase appreciation (visiting a place annually), overexposure will lead to decreased appreciation (seeing a particular landscape every day) (Williams, 1985). It is also affected by the role of the perceiver: a twisting lane may have a charm when traversed on a Sunday afternoon, but not when it has to be travelled under pressure of business.

That said, although a diversity of response and opinion is expected when looking at landscape, consensus within society on 'what is beautiful' can be reached. It has been suggested by some that this is for cultural reasons, by others that the human response is

linked to evolutionary habitat selection (Orians, 1986) and by yet others that psychological reasons dominate (Appleyard, 1971; Craik, 1972, 1986). It seems likely that all these influences may interact, with cultural and psychological responses increasingly dominating, as society becomes more divorced from the day-to-day Darwinian struggle for survival.

It is not surprising, then, that different people approach the subject of landscape conservation from different but equally valid viewpoints. Some have been developed to a high degree:

1. the conservation of historic gardens and designed landscapes (Countryside Commission for Scotland, 1989);

2. the conservation of archaeological landscapes: settlement and cultivation patterns; fortifications; areas associated with ancient ritual and burial (Proudfoot, 1989);

3. the conservation of historic sites and battlefields (Marren, 1990);

4. the conservation of literary or artistic landscapes (Drabble, 1979);

5. the conservation of natural beauty (Countryside Commission for Scotland, 1978);

6. the conservation of relatively wild countryside;

7. the conservation of areas of nature conservation value.

The approach to conservation of these different interests also tends to differ. For instance, some groups concentrate on the conservation of certain elements within a landscape. The history of archeological conservation reflects this (Magnusson, 1982), though increasingly, there are demands for a wider approach to be taken (Noble, 1989). Others, of necessity, take a very wide view looking at whole tracts of countryside. The 'wild land lobby' is an example (Smith, 1988).

Some areas have considerable overlay of interest: the Lake District, for instance, with its natural beauty, elements of relatively untamed countryside, strong literary associations and historic settlement and agricultural patterns. At other sites, a single interest may dominate, such as the stretch of countryside traversed by Hadrian's Wall. Yet even here, conservation of the experience of seeing and appreciating the Roman Wall is not just a matter of preserving the archaeological remains. The open grassland to the north of the Whinsill escarpment and the pastoral countryside to the south need to be safeguarded also. The Roman Wall, meandering through a forest, could be cared for, but it would lose its feeling of being a frontier, a strategic defensive position and a line of communication.

However, the real history of any landscape is a history of change. Landscape conservation has to be a management of change to secure the development or safeguarding of its aesthetic, ecological, cultural and economic values. This, of course, may include the 'preservation' of certain elements within a landscape so far as that is possible. But management prescriptions must have regard for ecological processes and the dynamic of civilisation.

> Conservation essentially implies respect: respect for the natural resources of our countryside – whether visual, ecological or economic. It is therefore an ethic as well as a code of practice. It demands policies geared towards long-term equilibrium – an awareness of Man's potential harmony with his surroundings, not an acquiescence in their destruction – nor, on the other hand, a determination to freeze the current scene. For above all, the word should signify a dynamic process, one which incorporates, indeed depends on, change. The term has been abused, and devalued. It should not be equated with preserving, unchanged, landscapes, species, buildings and monuments. (Countryside Review Committee, 1976).

Thus, landscape conservation must be a process of planning and design requiring as much professional skill and balanced decision-making as the planning and design of new developments in the countryside (Hackett, 1980).

LANDSCAPE CONSERVATION

Given recent arguments concerning the effects of forestry on the British countryside (e.g. Tompkins, 1989), it may seem paradoxical that the earliest measures introduced by Parliament to conserve landscape relate to the conservation of forests. The forest law which applied to the New Forest, for instance, for almost 900 years was one of the most potent forces in securing the conservation of that area and sustaining its unique ways of life (Tubbs, 1968). Throughout medieval times various attempts were made to protect wooded areas by legislation variously restricting the cutting of oak, controlling grazing or prohibiting fires (see Anderson, 1967, for examples). The continued depletion of the forests of Britain serves to show how unsuccessful much of this legislation was.

In more modern times landscape conservation was first given statutory backing with provisions to protect archaeological monuments being enacted in 1882 and powers being granted to County Councils to protect the nesting sites of seabirds in 1884.

Recognition that wider elements of the British scene had heritage value encouraged the setting up of the National Trust in 1894 which, under an Act of Parliament in 1907, was enabled to hold land 'inalienably' for the nation.

Between the wars, pressure grew for legislation which could give greater protection to natural features and whole areas of landscape. Voluntary groups like the Council for the Protection of Rural England and the Association for the Protection of Rural Scotland and the Council for the Protection of Rural Wales (founded in the mid-1920s), together with recreation groups like the Ramblers' Association pressed for strengthening of the planning laws and adoption of National Park status for the most popular and sensitive areas of landscape. Simultaneously, the Royal Society for the Protection of Birds and the Society for the Promotion of Nature Reserves were encouraging the development of a network of nature reserves to protect species and habitats for scientific and educational purposes (Sheail, 1976).

The result of all this pressure was the definition of green belts around major cities and conurbations and the creation of the National Parks in England and Wales during the

1950s and the identification and designation of Nature Reserves and other Sites of Special Scientific Interest – the products of the Town and Country Planning Acts and the National Parks and Access to the Countryside Act of post-war re-construction which created both the National Parks Commission (also with the powers to designate Areas of Outstanding Natural Beauty) and the Nature Conservancy.

Growing recreational use of the countryside and increasing awareness of its natural beauty encouraged the broadening of the National Parks Commission into the Countryside Commission and the creation of a Countryside Commission for Scotland which were established under the Countryside Acts of 1967/68. Both these Acts recognise the public interest in 'natural beauty' and its enjoyment. Both reflect the philosophy that continuing or increased enjoyment of the country and its resources can only be secured through its conservation; a tenet central to 'The Countryside in 1970' conferences of the 1960s, and at the foundation of the World Conservation Strategy (IUCN, 1980) and modern ideas of sustainable development.

The arguments put forward for national parks in Scotland in the immediate postwar years (Cmd 6631) failed to secure legislation and although National Park Direction Areas identified then had some protection under the Planning Acts, it was not until 1980 that a more comprehensive assessment of Scotland's scenic heritage (Countryside Commission for Scotland, 1978) allowed the designation of National Scenic Areas, with some additional planning constraints to those applying in the wider countryside. In the late 1980s, four regional parks were designated in Scotland to assist in the conservation of land popularly resorted to for recreation. Even so, in Scotland only 13% of the land is designated on grounds of its natural beauty in comparison with over 20% in both England and Wales and in Northern Ireland.

The forest industry responded to these pressures for landscape conservation as early as the 1930s with the designation of National Forest Parks in sensitive areas like Snowdonia and Glen More or in areas where Forestry Commission holdings were very large such as in the Borders. The aim was to provide for landscape enjoyment and recreation as well as to grow timber.

However, all these procedures were partial and piecemeal. Special protection was given to areas for particular reasons, and despite the panoply of conservation designations, the majority of the countryside remained free of most constraints for agricultural or forestry developments. Not until the Countryside Acts of 1967/68 were the Agricultural Departments and Forestry Commission given statutory duties to have regard for the natural beauty and amenity of the countryside. Even so, many observers would continue to argue that only scant regard was paid to these duties (Shoard, 1980). Although the Forestry Commission had appointed a landscape architect to advise them as early as 1963, the resources allocated to conservation and landscape work continued to be of such a low order that the majority of new plantations continued to receive no professional landscape appraisal. The 1970s were lean years with simplistic economic arguments in the ascendant.

In 1981 the Wildlife and Countryside Act introduced enhanced powers for the conservation of moor and heathland in the national parks, as well as strengthened legislation providing for wildlife conservation. An amendment to the Act in 1985 placed

a duty on the Forestry Commission endeavour to achieve a reasonable balance between the needs of the environment and those of timber production. The state forest enterprise set about this task by producing environmental guidelines (Forestry Commission, 1989), re-defining job descriptions, staff training, by amending management practices and by creating nature reserves within certain forests. Expenditure directed wholly at conservation and amenity management rose from 5% of the enterprise budget in 1985 to around 10% in 1987/88.

The forest authority announced a new broadleaves policy (Forestry Commission, 1985) and has successively broadened the objectives of its grant schemes to encompass multiple-purpose aims. However, a problem has remained: that on the whole timber production is encouraged by financial incentive whereas (apart from an enhanced rate of grant for planting broadleaves) conservation objectives are sought by means of constraint. This has sown disaffection and has contributed to conflict between prospective planters and the conservationists. Positive recommendations, even from within the industry itself (FICGB, 1989), have to date not removed this obstacle.

There are elements of forestry legislation which assist in landscape conservation. For instance, the administration of felling licences can be used to protect valued countryside, and the possible enforcement of replanting conditions under the more recent Forestry Act (1986) could be used to order the reinstatement of tree or woodland features in the countryside where felled unlawfully.

To what extent do statutory landscape protection mechanisms limit forestry? The true answer to that is that for aesthetic reasons, forestry is limited by statute only in areas of moor and heath assessed to be of particular natural beauty in the National Parks of England and Wales. Elsewhere in Sites of Special Scientific Interest, National Nature Reserves and Ancient Monuments there are mechanisms whereby forestry can be statutorily influenced, but it is only through consultative procedures and grant-aid policy as determined under the Forestry Commission's interpretation of its duties defined under the Wildlife and Countryside Act, 1981 and Countryside Acts, 1967/68, that the possible impact of forestry is ameliorated for landscape purposes.

Thus, National Park authorities have for long had 'agreements' with the Forestry Commission in a form of 'indicative strategies' with varying detail. Special 'consultation' takes place with the Countryside Commissions and local authorities in regard to forestry proposals in Environmentally Sensitive Areas, Areas of Outstanding Natural Beauty and in National Scenic Areas. Regional Advisory Committees of the Forestry Commission seek to conciliate on contentious cases. The 'natural beauty and amenity' duty in the Countryside Acts and the more recent duty for the Forestry Commission to balance the needs of conservation and timber production in the Wildlife and Countryside Act of 1981 add statutory weight to these procedures, but in the end, the decision lies with the Forestry Commission where and when not to award grant. Or indeed, with the private individual who, if he wishes (and can afford to), may plant trees on his own land without permission or guidance from anyone.

Increasingly, this lack of mechanism for inhibiting the afforestation of certain sensitive lands is being perceived as inadequate and calls have been made for the introduction of a system of planting licences (Countryside Commission for Scotland, 1986; House of

Lords Select Committee on the European Communities, 1986). The requirement for Environmental Assessments to be carried out before certain afforestation schemes (SI 1988/1207) under a European Directive (No 85/337) is a more recent mechanism which may influence afforestation proposals likely to have a significant effect upon the landscape, but apart from refusal to pay grant, there is no statutory procedure to enforce the conclusions of such an assessment.

On the basis that the Forestry Commission is being called upon to carry out conflicting tasks – as developer through the state forestry enterprise and the provision of grant for new planting and as development controller – voices are being raised as to whether the Forestry Commission as currently constituted can, with integrity, achieve the balance it is statutorily bound to pursue (Tompkins, 1989; House of Commons Agriculture Committee, 1989).

Nevertheless, the current process has had its successes, particularly in the National Parks (Brotherton, 1987) where the public's demand for conservation, and hence the authorities' need to respond to such a demand, is most compelling. Elsewhere it is often pointed out that where detailed consultation proceeded, major disagreement among the main parties was generally resolved (Hetherington, 1988). However, the majority of plantations were planted without detailed consultation, resulting in a considerable reservoir of planted land where some opportunities were missed in achieving adequate standards. Formal consultation with local authorities was only initiated in 1974 and through revision of the working rules for such consultation since that time, the general trend has been for an increased proportion of applications to be so referred (Mather, 1989).

That said, despite the refinement over the years of consultation procedures, a number of environmental bodies consider that these procedures should be extended to give all Woodland Grant Scheme proposals the level of peer review they consider to be required. On the whole, market forces have dictated the process of conversion of open land to forestry, and the way and places in which this has taken have been largely determined by the comparative advantage or otherwise of forestry with its main competitor, hill sheep farming.

This is the main cause of the problems which have arisen over the location of forests with the result that both those involved in the conservation of the countryside and the forestry industry have requested the development of indicative forestry strategies (Countryside Commission for Scotland, 1986; COSLA, 1986; Nature Conservancy Council, 1986; Forestry Industry Committee of Great Britain, 1987). Government adopted this idea in 1989 and recommended that local authorities should develop strategies where necessary. Later we shall outline the procedures for developing indicative strategies but here simply state that they are an essential part of landscape conservation.

Landscape designation was described as a 'gesture of fear, an act of desperation, made because we do not have the confidence and the courage to mould positively a new landscape' (Darke, 1970). Indicative strategies provide the framework for decision making which can provide the confidence for society to create new landscapes, while safeguarding and enhancing its heritage.

This paper concentrates on how new plantations should be located and designed to improve landscape, but that emphasis should not foreclose the fact that expansion and management of both the native woodlands and the 'non-woodland trees' of our countryside should be progressed in balance with the expansion of forestry.

There are three heritages of trees in Britain today:

1. a heritage of native woodland (some managed, some more or less altered remnants of the 'wildwood');

2. a heritage of amenity plantings (by roadsides, in hedgerows, in parkland and as a component of gardens and designed landscapes; and

3. a heritage of plantations, many of species introduced from other countries.

Each may contribute to the enhancement of the countryside, but sadly, the native woodland is too often neglected or under-valued and continues to decline in extent (Mackenzie 1987, 1989). The amenity plantings of past ages, and of recent years are particularly important in the lowlands where avenues, copses and isolated trees are vital to the characteristics of various regions. Opportunities to ensure that plantations enhance landscape have frequently been missed in the past due to lack of understanding, planning and the pressures of market forces.

Miller, (1991) catalogued the clearance and drastic alteration by man of Britain's natural forest which had developed after the last glacial period. By the beginning of this century only around 5% of Britain was woodland, and indeed, most people's experience of trees was derived from the sight of individual roadside or parkland trees, rather than through entry into a forest. The majority were broadleaved trees and the main reason for their existence was their contribution to the amenity of country estates, to the beauty of parkland or, in the case of the remnants of natural woodland, because they were in inaccessible places or on poor and difficult soils.

The conifers that were present also contributed to landscape quality and interest. In Scotland, the remnants of the native pine forests, particularly in Strathspey and on Deeside were much admired. Elsewhere, planting, in part as a result of two centuries of botanical collecting around the world, aroused aesthetic and scientific interest. A small number of pioneers were beginning to experiment in the use of these conifers, particularly those from north-west America, for upland plantations (Stalker, 1883; Marriot, 1907; Stirling-Maxwell, 1929).

However, the policy of woodland expansion initiated by Government after the shortages of the 1914-1918 war led to the development of drainage and cultivation techniques and to the widespread introduction of exotic hardy conifers, to allow the planting of poor agricultural land in upland Britain or on lowland heaths. Little regard was paid to the appearance of these plantations, or to their integration into the wider interests of the

countryside. The result was often the creation of intrusive plantations, many with artificial shapes following the geometric enclosures of earlier centuries, or straight lines of landownership boundaries, conflicting with the natural irregularity of the original land form. This upset many people, particularly those who used the uplands for recreation.

Criticism was not slow to arise, the campaign by the Friends of the Lake District, the Council for the Protection of Rural England and others in the 1930s over the afforestation of Eskdale and Dunnerdale being a significant example (Symonds, 1936). Indeed, from then till now, it may be said that the arguments over the afforestation of much loved landscapes have become increasingly polarised (Ramblers' Association, 1971, 1980; Tomkins, 1986), and in recent years have been compounded by (Nature Conservancy Council, 1986), and often confused with, ecological issues.

During this time, the high regard which the public have for broadleaved trees, copses, hedgerow trees and small woods in general has increased, as demonstrated by protests over tree-felling before development and over hedgerow removal. In recent years, it has been demonstrated by the success of the Woodland Trust in raising money for the purchase of woodland for conservation and recreational purposes.

What is needed now is for the goodwill that people have for trees and woodlands to be captured and translated into a similar goodwill for afforestation. As we shall show, this can best be done by recognising the various values which can be derived from forests, their development in multi-purpose forestry and its achievement through good design and appropriate location.

THE VALUE OF TREES IN THE LANDSCAPE

To the general public, the main benefit perceived from trees is aesthetic. Either singly or in groups, they are an important visual component of many landscapes. Apart from lending a vertical feature to the otherwise linear flow of much countryside – an important design element in defining, reinforcing or creating patterns of space – their aesthetic contribution covers a wide array of our sensory abilities. Their infinite diversity of form, their foliage and bark textures, the seasonal change of leaf growth and fall, flowering and fruiting as well as of colour, scent and the sound of rustling leaves or twigs all combine to command the conscious and sub-conscious mind to such an extent that it is difficult to picture the passage of time and the seasonality of our weather without conjuring up some vision of trees.

These aesthetic values have been considered of value for:

1. enjoyment: a thing of beauty is a joy forever (Keats, 1818);

2. psychological wellbeing: relieving the stresses of urban life with a sense of tranquillity (Kaplan, 1973, 1984);

3. child education and development: the value of woodlands and trees as resources for play and stimuli for learning (Ward, 1987; Cochrane and Cave, 1984);

4. artistic and creative stimuli (Howard, 1984; Appleton, 1986);

5. imbuing a sense of security: in a time when change seems all-pervasive, trees and wooded landscapes record and communicate a continuity and permanence (Goodey, 1986).

This aesthetic value, which may well contribute to people's health, creativity and productivity, must be seen as part of the capital stock which contributes to societal welfare. It is part of our common wealth and contributes to society's standard of living in a similar way to other elements of inherited and shared wealth. As such, it is a resource pertinent to evaluation and appraisal within any strategy towards sustainable development (Pearce, *et al.*, 1989; and Pearce, 1991).

There is, indeed, evidence that the aesthetic value is not wholly intuitive or hypothetical. For instance, a wooded setting or the presence of trees can increase the sale value of residential property (Payne and Strom, 1975) and well designed woodlands fetch a capital price in excess of their timber value in contrast to poorly designed woodlands which are correspondingly more difficult to sell (TGUK, 1989). The 'options value' and 'existence value' (see 'The Nature of Economic Value', Chapter 18 for definitions) of attractive woodland are much less easy to quantify but given the scale of existing contributions to tree and woodland-related charities, both are likely to be high.

Trees and woodlands in the landscape, of course, have other values which must be briefly summarised here, although they are more fully treated in other chapters. These values are:

- environmental improvement: screening, noise attenuation (Cook, 1978), pollution abatement, erosion control (Gray and Leiser, 1982);

- wildlife habitat;

- shelter for stock, crops and people;

- sporting: as specialised habitat for game birds and animals;

- contributing to recreation sites;

- providing wood and timber produce either for on-farm use or commercial use.

This diversity of values creates a cultural perception of woodland which is both variable and difficult to define. However, despite the aesthetic and other values of trees, it is not to be assumed, as the experience of the past 50 years has demonstrated, that any trees planted anywhere will contribute to landscape quality. As we have seen existing landscapes have existing values and any planting carried out must add to, rather than detract from, that quality. Then, design criteria have to be adopted which promote an aesthetic response rather than negate it. In effect, a process of landscape planning and landscape design has to be adopted. Both are integrating disciplines synthesising data from a wide range of sources; the former seeking to resolve the question of forest location and the second, the detailed layout, composition and appearance of the proposed forest.

The impact of landscape conservation on forestry has two aspects. First, it influences the location of new forests; and, secondly, it influences the scale, design and management of forests.

When considering the location of a new forest in the landscape, the question has to be asked whether a forest can contribute to the value and appearance of the countryside. Certain sparsely wooded areas are greatly cherished as they are and indeed, there are places where the 'genius loci' or 'sense of place' depends upon the dominance of features other than trees; a sense of place which could not be conserved within a forest. Examples are the wild openness of Rannoch Moor, the intricate stone walled enclosures and contrasting open moorland of the Yorkshire Dales. The rocky features of the Quirang and the Storr in Skye or the furzey habitat and open views of the Dorset heaths. Of course, the decision to create a new sense of place might be taken, but careful evaluation of costs and benefits of such a decision then becomes essential. Semi-natural landscape is a finite and relatively non-replaceable resource. Consumption of such a resource, particularly those parts of the highest aesthetic, cultural or ecological value, should only be considered when the benefits of so doing are very high (Pearce, *et al.*, 1989).

The value of semi-natural open countryside in England has been recognised. Ministerial decision in 1988 directed forestry away from such landscapes, and the maps to be prepared by National Park authorities under Section 43 of the wildlife Countryside Act 1981 are one tool to assist in their conservation. However, no such direction has been given in Scotland and Wales where the resource of semi-natural landscape is correspondingly larger.

The heritage of open land has become a much-loved element of the countryside with the hills resorted to for walking and other sports such as hang gliding and parascending. The moors are valued for their grouse populations and the lowland heaths are in particular noted for their wildlife. Over most of the country, the appearance of countryside most readily associated with Britain in the public's mind is that of either open hill and mountainside or of a pattern of open spaces divided by hedgerows or other field boundaries.

Most, though not all, of these valued open landscapes are within Areas of Outstanding Natural Beauty, National Parks or National Scenic Areas. The process of drawing up indicative strategies, if carried out with sufficient public involvement, should readily identify where other areas of value are.

Elsewhere, in sensitive landscapes, the main impact of the landscape conservation imperative is its effect upon the amount of forestry which can be accommodated within the scene without loss of quality. Thus, in most circumstances, landscape assessments should indicate what balance of new planting could be assimilated in the existing valued landscape. Many cherished areas already have woodland and forest components and it can be readily understood, therefore, that some reinforcement of these elements is generally possible. For instance, in an analysis of the Loch Rannoch and Glen Lyon National Scenic Area (Countryside Commission for Scotland, 1987), it was assessed that

in the region of a 10% increase in the existing areas of conifer forest (amounting to 500 ha) could be accommodated if sited away from key prized areas and also properly designed. A further 500 ha of broadleaved and Scots pine/birch forest was, in addition, considered to be desirable in certain locations.

Similarly, in the English National Parks and Areas of Outstanding Natural Beauty, the emphasis is on reinforcing existing patterns of woodland, improving the design of plantations which do not come up to modern standards, bringing into sustainable management the broadleaved and native woodland components and encouraging local utilisation of woodland produce in craft and other small local industries.

In the wider countryside, similar attitudes must prevail, with the aim of securing an appropriate balance and matrix of different land uses appropriate to the landform and contributing to the diversity of countryside. This balance has rarely been articulated outwith heritage areas. Perth and Kinross District Council, however, proposed a mechanism in 1984 whereby the area given over to afforestation in each part of the district should be monitored and when 30% of the land below 450 m was planted, then the effects on other interests such as landscape and nature conservation as well as roads, employment and agriculture should be reviewed with a view to more stringent control over allocation of land to forestry thereafter (Perth and Kinross District Council, 1984).

So far, we have concentrated on landscape conservation as a constraint upon forestry. However, there is clearly much that forestry may do to assist positively in the care of landscapes. This broadly fits into three areas:

1. the heritage of native woodland;

2. the heritage of plantations;

3. the heritage of amenity and landscape planting.

Native woodland, as we have identified, is an integral component of most areas of land which is cherished for its landscape value. Usually, it may cover only a small proportion of the land area of the landscape, but its importance and value greatly exceeds that proportionate measure.

Because different native woodland types are ecologically specific to different areas (cf. Bunce, 1985) they contribute to the unique character of different regions. The remnants of native woodland also sensitively emphasise landform, add, importantly, to diversity, and assist in creating landscape unity. Thus, safeguarding and, where appropriate, expanding these native woodlands is a key element in the conservation of heritage landscapes, and is generally identified as such and given due emphasis in national park plans and statements concerning National Scenic Areas or Areas of Outstanding Natural Beauty.

In some areas, the native woodland component is particularly important. For instance, the native pine forests of Strathspey or Upper Deeside, fringing the Cairngorms, are especially evocative of that countryside. A policy of expanding the native pinewoods with their special characteristics to secure their dominant place in these areas would do much to conserve and enhance the special landscapes.

Elsewhere, continuous management of the originally wild resource has secured a heritage of woodland in a productive partnership with man. The cultural, historic and social elements in these woodlands add to the emotional response and enjoyment provided in landscape. Examples are the coppiced woodlands of south England, the multiple use and intricately managed forest associated with particular ways of life as in the New Forest and ancient Crown forests like the Forest of Dean. Management of these woodlands must seek to conserve strong elements of the human as well as natural heritage.

Exotic trees, both conifers and broadleaves, have been planted in Britain for many centuries and have become a component of a great many landscapes. Some, like the pines of 'One Hundred Acre Wood' in Ashdown Forest, or at Tarn Howes in the Lake District or the progeny of planted pine in the New Forest, have an adapted air of naturalness about them and are now viewed in ways similar to attractive native woodland. Larger plantations have also become components of cherished landscape, as the larches on the Atholl Estate in Perthshire or spruces and firs in several of the National Forest Parks, Queen Elizabeth Forest Park, Grizedale and Snowdonia. In such places, the planted trees create a highly regarded landscape which requires much sensitivity in its future management – management based upon landscape planning and design.

Thus, very special consideration has to be given to:

- the scale, shape and disposition of felling coupes;
- avoidance of crudely patterned thinning regimes;
- maintaining a diversity of species when re-stocking;
- extended rotation lengths, where appropriate; and
- in particularly sensitive areas, the use of shelter wood or group selection regimes.

The forester also has a role in the conservation management of other tree features in the countryside. The special case of gardens and designed landscapes is an important aspect. The significant contribution designed landscapes make to the beauty of our countryside is matched by the contribution they make as a resource for tourism and recreation. In Scotland, a survey of 275 properties indicated that they receive in the order of $5^1/_2$ million visitors per year (LUC, 1987). What has to be remembered, however, is that designed landscapes are dynamic, subject not only to radical alteration and changes in social and economic conditions, but evolving with the growth and death of the trees and other plants themselves. Designed landscapes, and the gardens that form a part of them, are living works of art.

The consequences for forestry in the future are twofold. First, ongoing management and re-planting of the parkland trees, policies and woodlands of the surrounding estate grounds has to be sensitively maintained. Secondly, new planting has to be accommodated without damaging the integrity or the design values and aesthetic interest of the existing landscape. Thus, although positive management is essential, this has to be based upon a good understanding and evaluation of all the components of the existing design. Clearly, a management plan would prove invaluable, providing a framework for future decisions about the care of the land. These plans would help to ensure that important features and values were recognised and that they were managed in such a way as to retain that value.

In Scotland alone, the Garden History Society have estimated that there are some 2000 significant sites. Work is progressing on evaluating the best known sites (LUC, 1987) and guidance has been prepared on planning their management and conservation (Countryside Commission for Scotland, 1989).

LANDSCAPE ASSESSMENT

The process of landscape conservation has to be founded upon a proper understanding of the character and qualities of the landscape in question. Landscape assessment is therefore a vital procedure which provides information for conservation, planning and design purposes and is a necessary precursor to decision making on matters such as designation, conservation policies and management .

Early work on landscape assessment attempted to devise objective, quantitative systems of landscape classification and evaluation (LUC, 1971; Landscape Evaluation Research Project, 1976). No agreement was reached, and indeed, practitioners often rejected the procedures, finding them over-complex, unworkable and philosophically flawed in their attempt to treat landscape as a dispassionate scientific subject (Countryside Commission for Scotland, 1978). However, the procedure of designating landscapes of special value to the nation and also the need for advice to be given to the Inland Revenue on which land should be granted exemption from inheritance taxation on the grounds that it is being managed to secure the conservation of its natural beauty as part of the nation's heritage, have lent impetus to the search for an acceptable, structured, rational and fully accountable approach to landscape assessment.

Today, most people agree that 'the assessment of landscape quality necessarily involves a subjective assessment and, that within the consensus of informed opinion, allied with the trained eye, and commonsense, the matter is one of aesthetic taste' (Secretary of State for the Environment, 1986). In both the Countryside Commission for England and Wales and in Scotland, work has proceeded to try to find ways in which the subjective and objective aspects of assessment can best be combined in a multi-dimensional approach which accepts that there can be no single value system (Swanwick and Iles, 1988; Swanwick, 1989).

The structured approach which is emerging recognises the need to draw a clear distinction between different types of assessment, notably between landscape description, landscape classification and landscape evaluation. Landscape description can draw on both objective information about the nature of landscape, and subjective information helping to describe reactions to it or value attached to it (Table 1).

Inventory and description may be accompanied by some form of landscape classification which can help to ensure that like can be compared with like. Classifications which have been used have been based on professional judgement, for example the work by the Peak Park Planning Board (1974), or on statistical methods such as the computer generated land classes in Britain produced by the Institute of Terrestrial Ecology (Bennefielde and Bunce, 1982) which were derived from climatic, geological, topographical and human artefact information derived from maps.

Table 1

Objective	*Subjective*
Geology	Attractors: scale
Soils	colour
Geomorphology	diversity
Land Use	harmony
Enclosure pattern	sounds
Ecology: vegetation	tastes
habitats	smells
natural history	
Archaeology	Detractors: eyesores
Buildings	Feelings evoked by the place
	Historical associations
	Cultural associations: People
	Music
	Literature
	Visual Arts

Though the current ITE classification is very useful as a tool for stratification and sampling for various purposes, it is not necessarily synonymous with a classification of landscape that would be produced by the combination of map overlays, field survey and professional judgement. For the future, the evolution of geographic information systems (GIS) offers another potential route to the sophisticated generation of a landscape classification.

However, until such techniques are refined and are more commonly available, professional judgement is likely to remain the more common approach in determining an appropriate range of landscape types.

The process of landscape evaluation is the most complex as it must consider all the information gathered and also take into account societal and cultural perceptions. The value of landscape can best be determined by reference, therefore, to a wide range of criteria ranging from rarity and representativeness, through scenic and aesthetic quality, to more intangible qualities like 'genius loci' and wild land quality. Cultural and other special heritage interests such as wildlife value or geomorphological interest should also be considered. Evidence of public preference can also be examined and an attempt made to ensure that judgements reflect an informed consensus.

Although such an approach has not been followed in identifying the range of heritage landscapes currently designated in Great Britain, it seems likely that these existing designations – National Parks, Areas of Outstanding Natural Beauty, National Scenic Areas – would stand up to such rigorous appraisal, as being of national (or international) importance for their landscape character. However, it is also conceivable, indeed likely, that the present designated areas are not exhaustive in their coverage.

LANDSCAPE PLANNING

Landscape planning has been defined as 'that continuous process which helps to make the best use for mankind of the limited area of the Earth's surface, while at the same time conserving its beauty and fertility' (Crowe, 1969). The key words are 'continuous', 'best use', 'beauty' and 'fertility'. 'Continuous' because it is essential that we all recognise the process of working with the land is ongoing. We must not mistakenly think that the job is done when a portfolio of landscape designs for a forest is completed. Nature and society require that land management is a process of managing change. 'Best use' can only be determined through evaluation of total economic value which requires assessment of all the actual uses, the forest's option values and its intrinsic 'existence value'. 'Beauty' brings us a recognition of the cultural value placed on the appearance of land by society and is related to countryside recreation. Finally, the idea of 'fertility' leads us towards a requirement for ecological understanding.

In effect, landscape planning is a process of optimising the economic, social and ecological benefits to be derived from land use.

Currently, landscape planning for forestry is progressing in Britain in three complementary ways: indicative forestry strategies, the locating of new multi-purpose forests, and the locating of 'community forests'.

INDICATIVE FORESTRY STRATEGIES

Indicative forestry strategies are being developed by planning authorities in co-operation with the Forestry Commission, the forestry industry and statutory agencies (SDD Circular 13/90). In effect, the procedure to follow is similar to that outlined by McHarg (1969) in his important book *Design with Nature* where information is carried for synthesis by means of subject maps delineating landscape quality, recreation and tourism interest, nature conservation value, archaeology and heritage factors, water catchment requirements, agricultural use, existing forestry and forestry potential and socio-economic infrastructure. This information is then synthesised and collated in the production of a strategy map which is supported by a statement explaining ecological and landscape classifications, the logic behind the collation and synthesis. The strategy map, on the other hand, would present the information in terms of land zonation indicating the sensitivity required in accounting for various interests. Overall, it would present a framework for:

1. encouraging forestry development to preferred areas;

2. identifying areas where other existing or potential values would make the widespread planting of forests undesirable;

3. articulating policies where broadleaves and native woodland require expansion and reinforcement;

4. indicating areas where farm forestry options could be pursued;

5. determining the critical interest which would have to be satisfied in the detailed design of woodlands and forestry;

6. suggesting the key groups who should be consulted on proposed forest and woodland designs.

The process of landscape planning by indicative strategies is a 'top down' approach to identify areas where well designed forests would enhance the landscape and determine the most important criteria that the design would have to recognise.

This process is one where practicality (the land capability for forestry maps of the Forestry Commission (1989) which cover the whole of Scotland being particularly useful here); where sensitivity of the landscape to change is determined according to examination of habitat, existing landscape quality, archaeological remains and so on; and where the desirability for the landscape to change is examined through assessment of existing cultural perceptions and evaluation of existing qualities.

The final stage is perhaps the most difficult – the determination of limits of acceptable change in each of the many tracts of landscape which constitute the region under assessment. Clearly, in some areas, the public view and/or special interest view may be that change should be minimal. Elsewhere, considerable change may be desirable.

In the strategy derived by a working party for Highland Regional Council which covers Caithness and Sutherland (Highland Regional Council, 1989), a reservoir of around 215 000 ha of land was identified as being possible or preferable for afforestation. However, it was assessed that out of this only 40 000 ha would be needed to achieve enough planting to sustain the forestry enterprise in the region. Within this construct, the emphasis can now move away from arguments over the location of forests to concentrating on achieving the right design for individual forests which accommodate all interests at a detailed rather than strategic scale.

For indicative strategies to be made best use of, they will have to fit into an overall national policy. All indicative strategies will identify reservoirs of potentially plantable land where forests could be accommodated so long as they are designed to a high standard. It is likely that some of these reservoirs will be large (cf Strathclyde Regional Council, 1988; Highland Regional Council, 1989). However, it would be undesirable to plant too great a proportion of this reservoir in any one area. What must be sought is an appropriate balance between forest and open land.

Determination of the appropriate balance depends upon many factors – aesthetic, economic, ecological and social – but in part it must reflect the size of forest perceived to be required in Britain. This has never been appropriately defined, but must be soon if indicative planning is to fulfil its potential.

On the basis that the whole forest must provide a continuity of supply and be continuously restocked, a valid estimate of an appropriate forest size may be derived. For instance, in Scotland, if forest planting (both new planting and restocking) continues at

recent rates, this can only sustain a forest of around 1.4 million hectares (18% of Scotland's land area), assuming an average 60 year rotation (Countryside Commission for Scotland, 1986b).

It is particularly important that indicative strategies should outline policies for multi-purpose forests and not concentrate on limiting the spread of monoculture 'blankets'. Imagination is needed in considering the desirability of new farm woodlands, or new community woodlands in the urban fringe.

Consideration should also be given to areas suited to the development of silvo-pastoralism. Long carried out in the New Forest with a variety of grazing animals, and in the Lake District with Herdwick sheep, the pasturing of animals in forests has a long pedigree in Britain. Too often management of the woodland has not proceeded hand in hand with management of the grazing animal and so, although the benefits of woodland grazing and shelter are well recognised by farmers in the Highlands of Scotland, the woodland resource, often birch or birch with oak, is deteriorating through lack of regeneration. A managed approach to silvo-pastoralism could prove a valuable way of enhancing landscape while maintaining traditional land management integrated with the management of new woodlands. Grazing improves access, reduces fire hazard, reduces the need for chemical herbicides and may provide a financial return via the grazing animal (Swain, 1987).

Farm forestry in general but not 'agro-forestry' or tree farming, if well designed, is easier to accommodate in countryside than extensive plantations. If it is managed as part of a farm enterprise, compartments of trees are likely to be small-scale. Large clear-fells are avoided and the intimate mixture of crops and woodland interlinked by enclosure patterns, the whole providing good settings for buildings, creates a countryside sympathetic to human scale and enjoyment.

LOCATION NEW MULTI-PURPOSE FORESTS

The other two approaches to landscape planning currently being followed are 'bottom up' projects where land which is known to be degraded, in need of enhancement, and poorly valued by society is considered as an appropriate location for forests which would achieve multiple objectives.

It is this thought process which has led to the identification of the area between Glasgow and Edinburgh, south of Falkirk, in Scotland (Central Scotland Steering Group, 1988) and similarly to an area in the East Midlands (Countryside Commission, 1987) as appropriate for the development of large multi-purpose forests, both incorporating agricultural holdings and providing enhanced amenity for the communities in the areas. Both are seen as creating a many faceted resource for the future and as acting as a focus for efforts directed at environmental regeneration. If appropriately designed, they could play a strategic role in the economic renewal of these areas by creating an environment in which people want to live and which is, therefore, attractive to future inward investment.

The planning of these forests is, again, an integrated process with a need still required for careful evaluation of the existing land resources and appropriate protection and enhanced management provided for habitat remnants, agricultural holdings, archaeological, historic and industrial heritage, and valued landscape features.

Work to plan the creation of a Central Scotland Forest is progressing. As early as the 1970s proposals had been made to create such a forest (Selman and Blackburn, 1986) and the Countryside Commission for Scotland has actively supported the planting of trees for landscape improvement in the area through a woodlands project from 1979 to 1985 (Countryside Commission for Scotland, 1986b) and thereafter through the creation of the Central Scotland Countryside Trust. Progress made by a steering group of officials from the Forestry Commission, the Scottish Development Department, the Scottish Development Agency, the Department of Agriculture & Fisheries for Scotland, the Countryside Commission for Scotland and the Central Scotland Countryside Trust in working up proposals for an expansion of forestry planting in the central belt of Scotland led to Government support for the project early in 1989 (Scottish Development Department, 1989). A company was set up to develop a business plan. The Government has promised funding of up to £50m over 20 years if a feasible programme of work can be developed.

The multiple purposes of the new forest were agreed at an early stage. Opportunities for access to existing and new woodlands would be important and, given that the area is central to the major conurbations and has good motorway access, there could be major opportunities for commercial outdoor leisure or sport developments that would benefit from the woodland setting. Opportunities would also be taken to ensure that as much of the investment in forest operations was retained in the area as a benefit to the community. Also important in securing the goodwill of communities would be a commitment to sensitive forest design.

To achieve the broad objectives, three main categories of woods were identified.

1. Community Woods – community woodlands would be located very close to urban areas and would be planned from the outset with environmental enhancement and local access as the main objectives. Timber production would continue to be an objective, but of low priority. Planting would be with a high proportion of broadleaves. Community involvement would be encouraged, possibly through community ownership.

2. Amenity Woods – amenity woodlands would generally be located on better ground and in particular around areas with recreational potential. Some planting would be close to communities. Improved environmental quality would be the main objective although opportunities for timber production would not be neglected. Broadleaved planting would play an important role. Existing amenity woodlands in the area, as remnants of old policy plantings and shelterbelts would be reinforced as part of the programme of development of these woodlands.

3. Productive Woods – productive woodlands would generally be located on poorer land, mostly moorland and unimproved grassland, in the more remote parts of the area. Although they would be mainly coniferous with wood production as the main

objective, there would also be provision for public access and recreation. Design would be to a high standard. These woodlands would be attractive to traditional forestry investors and to existing agricultural owners as a replacement for marginal agricultural use. Older areas of productive woodland already existing in the area would undergo landscape improvement and additional provision for recreation would be made.

The new woodland company faces great challenges and will have to use imaginative financial and legal techniques to encourage or respond to opportunities. Various routes are being explored: the use of 'planning gain', the potential for 'lowland crofting', the development of co-operatives (Stirrat, 1989). Even with the additional money from central government, the achievement of a productive forest, enhancing landscape and wildlife habitat and providing for a diversity of recreational pursuits, will take commitment and long-term vision.

An important early conclusion from this experience is that the planning and creation of large multi-purpose forests requires collaboration between organisations. Imaginative partnerships are needed. This has implications for mechanisms to achieve the objectives. There is little doubt that both the Central Scotland Forest and Midlands Forest are important test beds for new ways to create new forests.

LOCATING 'COMMUNITY FORESTS'

The 'bottom up' approach has also encouraged the idea of 'community forests' which would lie adjacent to many of the old industrial cities of England and Wales (Countryside Commission, 1989). Here the aim is to create an attractive mix of farmland, meadows and lakes in a conifer/broadleaf setting, the woodlands being managed both commercially for timber and as multi-purpose 'green lungs' for wildlife and public recreation. Changing what is currently unattractive urban fringe and green belt areas in this way is a major challenge requiring the co-operation and enthusiasm of all the relevant agencies and communities.

The idea of 'a forest for every town' is a growing one. The Forestry Commission and Countryside Commission are making a substantial financial commitment but it is hoped that much of the funding to establish individual forests will come from the public and private sectors in each area. The intention is for community forests to not only support a rich variety of wildlife but also to be working forests providing employment in forestry, agriculture, conservation and leisure. But above all, it is emphasised that they should be truly community forests, shaped by local people for themselves and their children into the future.

In both the 'community forest' and the proposed 'multi-purpose forests' one element is particularly important. These forests are not being considered as single blocks of new planting. They are proposals which take an integrated and balanced approach to planning a new landscape. These new forests would not only provide new woodland, but also provide a woodland setting for other aspects of human endeavour. This would include forested settings for communities – towns and villages – and for industrial and

infrastructural development. Most importantly, however, they would provide wooded settings for continuing agricultural use of some land. For instance, in the area proposed for the Central Scotland Forest, only around 30% is likely to be forest covered. In the 'community forests' of England and Wales, between one-third and one-half of the area is the suggested scale of planting. What is envisaged is a new attractive and valuable matrix of land use which is both ecologically diverse and socially welcome.

Even though formulative planning for these new multi-purpose and community forests is at an early stage and the concept untried in Britain, the scale of planting currently being actively promoted is in the region of 100 000 ha. As the ideas gain momentum and mechanisms are developed to bring them to fruition, planting to enhance landscape and provide multiple benefits to society could become a very significant portion of new afforestation in Britain. Five potential areas for multi-purpose forests in England are being examined (only one to be developed initially) and ideas for similar diverse planting have been canvassed for Buchan in north-east Scotland and Ayrshire in Scotland's south-west. Additionally, the scope for urban fringe community forest development is considerable.

LANDSCAPE DESIGN

Having outlined the processes whereby sites can be identified and where well designed forests could enhance landscape, we now go on to outline the basic principles involved in ensuring that these new forests are well designed: what constitutes a well designed forest? How can we ensure that the aesthetic, and other values, outlined at the start of this chapter are optimised in a forest design?

There are three main elements to achieving a successful landscape design:

1. that of creating a forest which is aesthetically pleasing;

2. the integration of our knowledge of the ecology of woodlands: practical landscape ecology; and

3. giving consideration to how the forest will appear from within (crucial for recreational values. The potential recreational use of a forest impacts upon the design which is to be adopted and must also be considered from the outset).

On top of all this, attention has to be given to the changing appearance, ecology and use of the forest with time. And, lastly, the solution has to be practical and give value for money.

In effect, new forested landscapes must be designed to provide an enhanced environment for ourselves and future generations. Landscape design should be seen as the integration of ecological understanding with society's view of what a forest should provide and how it should appear. As such, it is not an algorithmic process in which the designer 'knows' his solution to be correct, but a process in which there is no definitive solution – only management of continuous evolution and a succession of changes.

Computer simulations for forest design provides one route whereby a great deal of information can be integrated and varying solutions tested (Turnbull Jeffrey Partnership, 1988). These enable designs based on three-dimensional photo sketches to be rapidly and accurately transferred to maps, as well as being validated from different viewpoints.

Landscape ecology is improving our understanding of how different components of the landscape interact and how management of a landscape can influence the most beneficial integration of these components. Translating the ideas of landscape ecology into forest design makes us appreciate the importance of edges, of patterns, of interconnecting corridors and networks, of flows of water, chemical elements and energy between ecosystems. The efficient capture of atmospheric pollutants ('acid rain', for example) by conifers, followed by the flow of these and other chemicals by biological and physical pathways into the hydrological system is one important example of this.

To date, the emphasis in forest design has been directed at perceptions of utility and beauty. Although the ideal has always been to design with nature, as is evidenced from some early guidelines (Anderson, 1950), technology transfer has proved inadequate to communicate modern understanding of the complex interactions of all the various factors which have to be taken into account.

Recent attempts to collate the information into general principles by both the Forestry Commission (1989a) and Timber Growers United Kingdom (1986) are valuable, but practice on the ground is taking a long time to catch up. Detailed guidance has been prepared for the management of water courses (Mills, 1980; Forestry Commission, 1988; cf. Harvey, 1991) and silvicultural advice is abundant. Guidelines are in preparation for the protection of the archaeological heritage and scientific understanding of the habitat requirements of forest flora and fauna is assisting in defining design criteria for nature conservation. Outline guidance on the aesthetic aspects of landscape design is now available (Forestry Commission, 1989b) and the increasing number of landscape architects employed on forest design work is significant and welcome.

Thankfully, the integration of all the various interests does not, in general, lead to conflict. Indeed, in properly accounting for all of them in a forest design, the discovery is made that they are mutually supportive. An ecologically sound, habitat-rich forest may be aesthetically pleasing and in turn can be a pleasant place for recreation. Careful landscape design can be beneficial to the silviculture of a forest, adopting appropriate species or mixtures of species to appropriate sites and assisting in the development of a wind-firm crop (Hibberd, 1985). Appropriate water course management, conservation of heritage sites and attention to ride and forest road management can together assist in achieving nature conservation objectives (Morton Boyd, 1987), and again help provide an attractive forest for recreation.

However, great care is required to ensure that successful integration is achieved. For instance, landscape or visual diversity is not always synonymous with ecological diversity. To achieve both requires an understanding of the requirements of both.

AESTHETIC DESIGN

Creating the right shapes, responding appropriately to visual forces, adopting the correct scale, achieving adequate diversity, ensuring overall sensory unity and reinforcing the 'spirit of the place' or 'genius loci' are the main aesthetic principles in forest landscape design. The interaction among these factors is both complex and varied and achievement of a satisfactory result is a skilled task (Campbell, 1987).

The designer seeks as natural an appearance as possible for the new forest by making forest shapes follow the form of the land, identifying lines of force, rising up valleys and hollows and running down ridges. The sizes of the shapes also need to be in keeping with the scale of the landscape, smaller forms being appropriate to intimate and intricate countryside, or that already dominated by field patterns, lanes, buildings and small woodlands; while larger shapes are more appropriate to open hillsides.

Diversity is introduced through the maintenance of open areas, the utilisation of a variety of species (particularly those with different leaf colours or textures) and the use of species mixtures in addition to emphasising certain landscape features such as streams and other water bodies, outcrops of rock or areas of marsh and wetland. However, care has to be taken to ensure that excessive diversity is not introduced, which could lead to a loss of unity and a distraction from the overall sense of place. The creation of diversity is a key element in modern design as too often in the past afforestation has tended to reduce landscape diversity through concealing detail beneath the developing canopy.

Unity is achieved through careful balancing of shapes which conform to the landform and landscape character of the place. However, overall unity has to be assured and this means that overtly urban influences in car park design, buildings and signs all have to be avoided if the natural appearance is not to be compromised. This is not achieved simply through use of rustic materials. Again, it requires careful integration of form, function, scale, materials and techniques. The right design relates to its setting.

Genius loci has been well analysed by Norberg-Schulz (1980). It is an important factor in landscape design because it is the genius loci which is capable of evoking an emotional or artistic response. Within any landscape, various parts may evoke quite different feelings, and therefore care has to be given to enhancing genius loci at the detailed as well as the general landscape level. The best approach to conserving genius loci is to let the spirit of the place be the chief stimulus for the design. Indeed, that is the fundamental message: that forest design has to be guided by the landscape. The consequence of that is that each design will be unique, responding with subtlety to the landform, character and nature of the site.

LANDSCAPE ECOLOGY

The forested landscape is made up of many habitats. In addition, it will represent a number of different 'ecosystems': the woodland, neighbouring moorland, lakes, rivers and streams, and neighbouring agricultural land, for instance. The physical, biological

and chemical interactions among these various components are considerable and the linkages complex. However, it is through taking account of these interactions that best use of a forest can be developed.

The most obvious design criteria developed from an understanding of landscape ecology are those pertaining to water courses and water bodies (cf. Chapter 11). These indicate the importance of the edges between different ecosystems, and the need for careful consideration of the connections that exist. Increasingly, it is recognised that the design of the forest has to take this into account and that benefits are derived from this approach.

Thus, the importance of a network of corridors through a landscape making connections between ecosystems and offering routes for plant and animal colonisation, migration and the maintenance of populations can be emphasised (Golley, 1987). In agricultural landscapes, hedgerows are good examples. In the forest, streamsides take on a similar role and the network can be extended by managing forest tracks and rides appropriately. But to do this we have to know optimum widths of corridors. This is likely to vary according to the terrain, its aspect, vegetation cover and the species composition of neighbouring forest areas. Research is beginning to determine the environmental needs of woodland insects and birds (French *et al.*, 1986; Young, 1986), and this emphasises the importance of corridors and connections between areas.

The disposition, size and shape of open areas, including felling coupes, are also important as they can form part of the network for wildlife. Developing connections between remnant habitats can be particularly useful. Thus, linking and reinforcing areas of native woodland and utilising the planting design to bring them into contact with hedgerows or linear strips of trees by water courses on the margins of the forest could be particularly valuable. This can also provide one way of securing conformity of landscape character and developing landscape unity. It may also contribute to the conservation of genius loci.

WITHIN THE FOREST

The appearance of the forest from within is an undervalued attribute in current design work, and yet recreation within woodlands and forests is very popular (cf. Paper 7). Unless due consideration is given to the internal appearance, and to views out of the forest, they cannot be expected to achieve the optimal benefit for environmental enhancement.

In considering the enjoyment of the forest, one has to consider moving through it. The elements considered to be of importance in landscape ecology then reappear as important to the design of the inner forest – the edges of woodland blocks, the disposition of open spaces, connection routes and the management of tracks and rides.

Design of walking routes within forests, or the conservation and enhancement of the experience of travelling along routes traversing the area to be afforested, require assessment to be made of the maintenance of views, of the changes in scale and texture, of light and shade, and of space and enclosure.

A good example of the importance of these considerations is the pleasure that can be derived from traversing through a tunnel of trees, to emerge from heavy shade into sunlit glades fringed by shafts of light. The emotional response to this is calming and uplifting; the psychology possibly more basic.

The width of rides and paths, their design to permit a questing spirit of adventure without inhibiting exploration through fear of the unknown, requires the designer to plan the forest for its enjoyment from the outset, and to respond to a knowledge of human behaviour and public preference. Wide, straight paths, of value for extraction purposes, may be perceived as dull. Narrow, twisting paths without a clear view either to destination or 'home base' may be perceived as intimidating and engender fear. The element of surprise, a view suddenly opening out, for instance, has to be balanced with ensuring a sense of security.

Opportunities should be grasped to develop networks of permanent paths appropriate to modern recreational needs. The visual quality of the forest should be promoted through a choice of paths to water, archaeological sites, viewpoints and to open ground above the forest. But in creating good access provision, not only walking should be considered. Horseriding, mountain bikes, motor cycling, fourwheel drive motoring and, in Scotland, cross-country skiing, can all be catered for in modern forests. Again, if the forest is to be valuable for these purposes, then their requirements must be integrated into the design right from the start.

DESIGN PROCESS

Clearly, the process of designing a forest is complex and multi-disciplinary. This process has three main phases:

1. data accumulation by means of resource survey, landscape and ecological assessment and perception studies;

2. data analysis and the determination of opportunities and particular aims;

3. information synthesis: the design of the forest.

The first two stages are relatively straightforward, but of great importance. Existing resources can only be safeguarded, existing qualities enhanced, opportunities grasped and an optimal design created if all relevant information is first gathered and analysed.

It has been found that the design of the shapes which comprise the forest is the single most important issue, fundamental to influencing the quality of the overall design. Much of the more detailed process of designing for multi-purpose benefits can be introduced in refining the plan after the basic shapes have been validated.

It is important, however, for the designer to seek the best solution from the outset and not work within the constraints of cost, species proportions, or imposed boundaries. When an 'ideal' has been defined, a good design may still be possible by imposing the

constraints upon it, or indeed by allowing the 'ideal' to temper the constraints! It is less likely that a satisfactory solution will be achieved by attempting from the start to 'make the best of a bad job'. If landscape is to be enhanced, and a multiple resource created for future generations which will be highly valued, then the pursuit of excellence is paramount.

CONCLUSION

Forests, trees and woodlands can be attractive and therefore highly valued. However, achieving woodlands which enhance rather than detract from landscape quality requires careful locational planning and detailed landscape design.

The process of landscape planning can identify sites which require enhancement, such as urban fringe areas or landscapes degraded by industrial abuse and dereliction. It can also identify land reservoirs, currently used for agriculture, where well designed forests can be accommodated so long as various interests are accounted for and an overall balance between forestry and other land use interests is maintained.

The process of landscape design integrates aesthetic, ecological, social and practical requirements to achieve forests which uniquely suit the landform, character and nature of the countryside in which they are placed.

Forests which will enhance the landscape, will be integrated with other land uses, creating a matrix of interrelating and interlocking agricultural land, afforested land, recreational land and communities. Afforested land itself will have an internal level of design enhancing its wildlife, recreational and environmental values. It has been written that the well designed forest is coming to take on the appearance of a leaf (McPhillimy, 1989), rides and roads and forest shapes following landforms, burns and streams being given significance, archaeological sites being recognised and featured in the design: all the linear features forming veins which ramify across the woodland acting as channels of communication for people and wildlife. The veins also link up with the outside of the forest and the forest edge and connect semi-natural areas within the forest: glades, deer lawns, wet flushes, ponds and rocky outcrops.

A current problem is that improved forest design techniques and practice are taking too long to improve existing bad design on the ground. The public have begun to associate afforestation with despoliation of landscape rather than enhancement and will require a lot of persuasion otherwise so long as they can point to the mistakes of yesterday.

It is therefore essential that:

1. A democratic process for land use planning is adopted with full public involvement. Indicative forest strategies as part of regional structure planning will contribute to this but ways of involving local communities in local strategies will have to be developed, and where forests are planned to enhance peri-urban environments for the benefit of people, their real involvement in planning and implementation has to be realised.

2. The design process must be genuinely holistic, striking balances in multi-purpose objectives which the profession and society perceive as reasonable.

3. The principles of good design are applied in all new planting so that their adoption can be perceived to be taking place at an acceptable rate. Action needs to be taken sooner rather than later on improving the design of existing forests.

4. The public are reassured that an appropriate balance is targeted *vis-a-vis* the heritage of native woodland and its enhancement and the continued development of woodlands comprised of introduced species.

This is an ambitious programme of work to run in tandem with the development of new multiple purpose forests which will enhance landscape and add value to the countryside of Britain, but essential if the programme is to win public approval and the confidence of the forest industry.

We began this paper by posing a series of questions. We asked what the demand for the conservation of existing landscape was. Clearly, that demand is high and increasing. People do not like change in well-loved scenery, nor do they find the pace of change of modern life comfortable or easy to relate to. The calls for the conservation of green belts, the outcry over hedgerow removal, the strong lobby opposed to major engineering projects like motorway construction, as well as opposition to conifer planting even in undesignated areas (viz Glen Lednock (McLaren, 1988)) are all evidence of the growing claims for care for the appearance of existing countryside. Today, a requirement for the sensitive management of attractive landscape cannot be restricted to a few designated areas. It extends to all but the most degraded areas of our land which are in need of enhancement and even there, people demand quality when improvements or new developments are proposed. Thus, the demand for landscape conservation cannot be compartmentalised into defined areas. Today it is a general requirement and part of the conservation ethic which should pervade all land management.

That said, particular areas are viewed by society as having particular value deserving of special regard in land management and planning. This view has led to the identification and designation of National Parks, Areas of Outstanding Natural Beauty and, in Scotland, National Scenic Areas. Other areas may also have special values for specific reasons: archaeological landscapes, designed landscapes, cultural landscapes.

In examining to what extent future forestry policy may be influenced by landscape conservation, we come to the conclusion that five factors are important:

- location;
- scale;
- balance;
- detailed design;
- public perception/acceptance.

Thus, the natural beauty, 'wilderness' characteristics or cultural or heritage value of certain areas make them inappropriate to further forestry. Rigorous identification of these areas can only be carried out by preparing indicative strategies which articulate and map

all the valid interests which pertain to land. In other areas some forestry may be both possible and desirable if sensitively designed and if due regard is given to the disposition of new planting relative to other features in the landscape. In other areas, an appropriate balance has to be determined between open or agricultural land and forested or wooded country.

This balance necessarily differs around the countryside and can best be determined by the development of these indicative strategies. These coupled with improved incentives to achieve multi-purpose forestry, are key elements in increasing public acceptance and affection for forestry in Britain.

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'FORESTRY EXPANSION: A STUDY OF TECHNICAL, ECONOMIC AND ECOLOGICAL FACTORS'

This is one of a series of papers which form part of a study to consider the scale, location and nature of forestry expansion in Britain.

The Forestry Commission invited fourteen specialist authors, including economists, foresters, ecologists and biological scientists to write about current knowledge and to assess the main factors bearing on decisions about the future direction of forestry expansion. It is intended that the papers will form the basis for future discussions of the location and type of forestry that will best meet the demands of society for wood products, jobs, recreation, amenity, wildlife conservation, carbon storage and the other uses and public benefits supplied by the country's forests.

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The full list of papers is as follows:

Occasional Paper No	Title	Author
33	Introduction	Professor Ian Cunningham, Macaulay Land Use Research Institute
34	British Forestry in 1990	Hugh Miller, University of Aberdeen
35	International Environmental Impacts: Acid Rain and the Greenhouse Effect	Melvyn Cannell and John Cape, Institute of Terrestrial Ecology
36	The Long Term Global Demand for and Supply of Wood	Mike Arnold, Oxford Forestry Institute
37	UK Demand for and Supply of Wood and Wood Products	Adrian Whiteman, Forestry Commission
38	Development of the British Wood Processing Industries	Iain McNicoll and Peter McGregor, University of Strathclyde and Bill Mutch, Consultant
39	The Demand for Forests for Recreation	John Benson and Ken Willis, University of Newcastle
40	Forests as Wildlife Habitat	John Good, Ian Newton, John Miles, Rob Marrs and John Nicholas Greatorex-Davies, Institute of Terrestrial Ecology
41	Forestry and the Conservation and Enhancement of Landscape	Duncan Campbell and Roddie Fairley, Countryside Commission for Scotland
42	The Impacts on Water Quality and Quantity	Mike Hornung and John Adamson, Institute of Terrestrial Ecology
43	Sporting Recreational Use of Land	James McGilvray and Roger Perman, University of Strathclyde
44	The Agricultural Demand for Land: Its Availability and Cost for Forestry	David Harvey, University of Newcastle
45	Forestry in the Rural Economy	John Strak and Chris Mackel, Consultants
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