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Forestry Expansion – a study of technical, economic and ecological factors The Demand for Forests for Recreation

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INTRODUCTION

The overall objective is to assess the potential value to society of opportunities for recreation in a range of new forests at various locations. Although the focus is on new investment in forestry planting and not the management of existing forests, nevertheless past trends and existing uses of forests must serve to guide the assessment of future potential. The paper begins with some definitions, facts and figures on recreation in general and on the existing forest estate in particular before considering in turn multiple-use, recreation demand, urban fringe forestry, the nature of values and prices and the local and regional economic impacts of forest recreation. Finally, the analysis is summarised and conclusions drawn.

THE NATURE AND SCALE OF RECREATION IN THE COUNTRYSIDE

Leisure is largely discretionary time, to be used as one chooses; here we are mainly concerned with general trends and their impact on one broad use of leisure time – recreational trips to the countryside. The most significant predicted trends in leisure patterns are summarised in Table 1. The main factors which affect outdoor leisure patterns are peoples' tastes and preferences, free-time, income, mobility and the weather. Most factors have shown dramatic changes this century and the emergence of the recreational use of the countryside has paralleled the growth of car ownership and disposable income and increases in holiday entitlement or decreases in average weekly hours of work. In the last two decades the changes have been variable. Population growth has been very slow and is not expected to exceed about 2% in the next decade. However, there will be important shifts in age and household structure. By the year 2000 there will have been a 15% growth in the age group 30-44, the group which now represents the most frequent countryside users, and an increase in the 60 plus age group with time and money for day trips; this will compensate for a decline of 20% in the 16-29 age group, also fairly frequent users.

Table 1 Changing leisure patterns

Growing

- New forms of home-based electronic entertainment e.g. video, computers, cable TV
- Creative and productive leisure e.g. DIY and gardening
- Healthy and active leisure e.g. sport and exercise
- Purposeful travel e.g. sightseeing, activity holidays, visits to attractions (new heritage based)
- Visiting the countryside
- Social and community leisure e.g. entertaining and eating out, local events
- Learning about leisure

Declining

- Traditional mass leisure, broadcast TV, cinema going, newspaper reading, book reading
- Spectator sport
- Activities socially discouraged e.g. heavy drinking, gambling and smoking
- Children's and youth leisure e.g. toys, childrens holidays, scouts/ guides etc.
- Pet ownership

<u>Reason</u>

Technological developments offering greater entertainment choice coupled with lower production costs of equipment.

Growth in active 'home makers' 30-44 years), increase in home ownership and gardens, greater interest in improving home environment.

Growing consciousness of need for healthy lifestyles.

Increased mobility and incomes coupled with widening choice of destinations.

Increased mobility and incomes, increased concern and appreciation of natural environments, growing awareness of opportunities and confidence.

Growing interest in pleasurable food, maturing communities becoming more sociable coupled with increasing incomes.

Diversity of leisure opportunities requires more skills.

Poor choice compared with new technology competitors coupled with less ease of access and more dated information.

Problems of violence, fall in number of young adults (most active spectators), high cost of travel and entry compared with TV.

Growing consciousness of need for healthy lifestyles – issues increasingly promoted by Government.

Decrease in child population plus shifts to more personal centred leisure. Increased concern for health to children.

Responsibilities of ownership promoted more.

Source: Countryside Commission 1987a)

The number of one parent and one person households will nearly double. Because of the social importance of the use of the countryside – it is rare to visit the countryside alone – this shift could bring about a fall in countryside use. This will be more than offset by continuing depopulation of inner city areas, bringing the countryside within easier reach of a further 3-5 million people.

Mobility will continue to rise through a continued, but slower, rise in car ownership. For those in work, incomes will continue to rise, and leisure time for the whole population will increase by an estimated 5% by the turn of the century.

Of key significance will be the attraction of the countryside in comparison with other leisure destinations. Research by the Countryside Commission (1987a) suggests that despite a boom in home-based entertainment and leisure facilities, the wide variety of natural atmospheric and sensory experiences that the countryside offers is available only in the countryside, so that visits there will continue to grow.

In addition, attitudinal research from many sources shows an increasing awareness about. and concern for, the conservation of the natural environment. This, too, is a sign that people's enjoyment of an attractive countryside will grow in importance, and a reminder that conservation policies and recreation strategies are inextricably linked.

A comprehensive National Survey of Countryside Recreation was carried out in England and Wales in 1984 (Countryside Commission, 1985), and this has been followed by a continuing programme of more limited but comparable surveys each year since then. Table 2 shows the number of trips made per person in each 4-week period surveyed. Visits in 1985, 1986, 1987 and 1988 showed a marked decline in comparison with 1984. This is most likely a reflection of the influence of the weather rather than major changes in socio-economic factors; 1985, for example, had a dull and wet summer compared with a warm and sunny one in 1984. Comparable surveys in Scotland (e.g. Countryside Commission for Scotland, 1990) show generally similar patterns and scales of recreation. The surveys confirm that countryside recreation is an all year round activity but with strong seasonal (Table 2) and weather influenced variations. It is possible that global warming could have impacts on recreation patterns as well as on tree growth (Cannell and Cape, 1991).

Nun	Number of trips per person in each 4-week period surveyed					
	1984	<i>1985</i>	1986	1987	1988	
Month	-					
February	2.5	2.0	2.0	2.2	2.13	
May	4.3	3.7	3.4	3.5	no data	
June	4.4	4.0	4.2	3.4	3.95	
July	6.0	4.1	4.6	3.8	4.38	
August	5.9	4.9	5.0	4.1	5.00	
October	3.6	2.4	2.7	2.4	2.94	
Monthly average	4.5	3.5	3.7	3.2	3.68	

 Table 2
 Volume of trips to the countryside (England and Wales)

Source: Countryside Commission, 1987a

Calculating the total number of trips is not straightforward, but the figure is of the order of 1-2 billion each year. The trend during the previous two decades has been upwards but growth has not been constant. Rises in petrol prices may have strong short term effects, but there has been little or no long term effect because petrol prices have not increased in real terms over the last twenty years. The overall level of use is sensitive to the general well-being of the economy and is not directly related to any one indicator.

It is important to remember that recreation in the countryside is diverse and also much more than a physical trip or activity. It is also important to consider the attitudes, motivations and preferences of individuals. The whole recreational experience involves anticipation and planning the trip, travel to the site(s), the activities and experiences at the site(s), travel back and finally recollection and reflection. Recent research by the Countryside Commission shows the complex and subtle interplay between what people enjoy about the countryside, what personal benefit it brings to them, the attachments they have with the countryside and the motivations for visits. In other words, while the pattern and quantity of recreation is highly relevant to policy and planning, so also is the quality, importance and satisfaction of the experience to individuals. The research has shown the high regard in which the countryside is held by people from all walks of life, the fact that countryside experiences are cherished, and that the benefits include relaxation, contentment, the pleasurable experience of a range of sounds, smells and sights, escape from the artificial quality of urban life, and the importance of a visit as an extension of people's social life, to be shared with family and friends (Campbell and Fairley, 1991).

These insights probably apply equally to visits to forests. However, what people seek from woods and forests that they do not get elsewhere is less dear. Some current research being undertaken by the Forestry Commission and the two Countryside Commissions is trying to find the answers to this question, and to the different roles of forests as elements in the landscape (to view, pass by or think about) (Campbell and Fairley, 1991) and as places to be in.

The relative merits of broadleaved or coniferous species are not straightforward from the recreational point of view, despite vociferous lobbying by some interest groups. Mutch (1968) found people relatively indifferent when visiting Forestry Commission land, but other work (e.g. Kassioumis, 1981) has suggested preference for broadleaves. There is some evidence that people accept conifers in the hills but prefer broadleaves in the lowlands; attitudes and tastes may be changing. What is clear is that in terms of preferences and recreational potential, diversity in age, species, structure and management methods is preferred and also maximises the opportunities in use.

DEMAND FOR RECREATION

Although some of the influences on the demand for countryside recreation are well known if not well understood, long run predictions are especially difficult for two main reasons. First, there is uncertainty concerning the future trends in factors such as population, car ownership, disposable income and leisure time; some best guesses are summarised in the previous section. Second, the tastes, preferences and attitudes of people are even more uncertain; given that detailed knowledge about current interests is sparse, speculation about the future is limited to the best guesses shown in Table 1.

Recreation, like other markets, demonstrates several kinds of demand. <u>Effective</u> demand is expressed now and results in the patterns and levels of use which can be recorded. Many people, however, also have <u>deferred</u> demands which may or may not be expressed in future; some individuals and certain social groups visit the countryside relatively less often than others and surveys by the Countryside Commission (1987a) show that this is only partly explained by a lack of interest. Participation, or the lack of it, is influenced by people's confidence about and awareness of the opportunities for visits, by the availability of transport or finance, and by other demands on leisure time. There is a strong latent or deferred demand to visit the countryside more often (Countryside Commission, 1985). Finally, there is a <u>potential</u> demand which could emerge in response to a wide range of factors. Changing attitudes, socio-economic changes and technological change may all contribute. Certain active pursuits, for example mountain biking and sail-boarding, are in part stimulated by new design and technology.

Substitution between sites for the same or complementary experiences, and between activities (whether passive or active, urban or rural), takes place in the face of changing socio-economic conditions, and as individuals or families grow older or change their attitudes and perceptions. It is clear that recreation in forests is not separate from the much larger market in which people invest their leisure time in a variety of ways.

FOREST RECREATION

Recreation has taken place on the Forestry Commission's estate for many years but formal powers to develop the recreation potential of forests were not established until the Countryside Acts of 1967 and 1968. The first national forest park was designated in Argyll in 1935, soon followed by others (Table 3). Designation has often been followed by the provision of day visitor and camping facilities. In other national forests recreational development was much more casual and depended on local pressures or the existence of a well-known beauty spot or viewpoint; in recent years provision has been more deliberate and systematic with particular emphasis on forests near the large centres of population. The list of facilities provided reflects part of the total recreational use by visitors (Table 4), but a policy of open access on foot throughout the forest wherever legal and operational (mainly safety) issues allow, means that there are numerous other places used for access, picnicking and car parking. Emphasis has generally been laid on the quiet enjoyment of fresh air and exercise, and various country pursuits.

Park	Location	Established	
Argyll	Strathclyde	1935	
Snowdonia	Gyynedd	1930s	
Dean	Gloucestershire	1930s	
Glenmore	Highland	1940s	
New Forest	Hampshire	1940s	
Galloway	Dumfries and Galloway	1940s	
Queen Elizabeth	Central	1953	
Border	Northumberland	1955	
Grizedale	Cumbria	1987	
North Riding	North Yorkshire	1987	
Delamere	Cheshire	1987	

Table 3 Forest parks in Britain

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I able 4	Forestry	Commission	recreation	facilities

	England	Wales	Scotland	GB
Camping and caravan sites	22	1	9	. 32
Picnic places	342	90	189	621
Forest walks and trails	281	101	259	641
Visitor centres	10	4	8	22
Arboreta	15	5	2	22
Forest drives ·	5	3	2	10
Forest cabins/holiday homes	107	0	67	174

Notes:

- 1. Figures as at 31 March 1990
- 2. In addition to the camp sites listed above, the Commission provides:
 - a. 5 sites leased to the Caravan Club;
 - b. 55 sites set aside for youth camping;
 - c. facilities for caravan rallies.

Measurements of informal day-visitor use are plagued by the same difficulties which face any monitoring of countryside recreation. In 1968. a pilot study by the Commission estimated that 10-22 million visits were made during June to September; a further survey in 1977 suggested around 15 million (24 million annually) (car-borne visitors). There has not been a recent site survey, but the views of local managers and comparisons with national data for the countryside as a whole suggest that the current figure is still at least 27 million car-borne visitors and probably more. Recent household surveys in England, Wales and Scotland estimate that visits identified as being to Commission woods and forests are in the range 38-47 millions each year out of a total of approximately 120 million visits to what respondents perceive as being woodland or forest. It is necessary to be cautious because the definitions of what constitutes a 'wood' or a 'forest' are imprecise, and many visitors do not know who owns the site visited. Also, many visits may be local, of short duration and on foot, which make site monitoring very difficult. If the latter figure is of the correct order, then visits to all woods and forests may represent about 10% of all countryside trips; this is an interesting figure because about 10% of Britain is covered by trees. It also broadly agrees with the National Survey of Countryside Recreation, which found that about 6% of main stopping places on trips were woods (but excluding stops at specific managed sites such as country parks).

A wide range of other more active pursuits take place on the Estate. These include horse-riding, orienteering, cycling, rallying, archery, stalking, fishing, cross-country skiing and sled-racing using huskies. Every forest, and every District, is different in some way; the opportunities for pursuits such as these depend partly on supply (the suitability of the land, for example in terms of topography or climate) and partly on local and sometimes national demand, from local clubs and societies or organisations such as the Royal Automobile Club. In addition, there is widespread educational use of the forests.

Future trends in these more specialised sports and special interests are difficult to predict. Continued growth seems to be taken for granted by most forecasters. There will undoubtedly be a wide range of variability between activities and over time. Forecasting studies in the USA project a rate of increase of per capita recreational participation in land-based activities of around 1.0% a year on average but overall constraints and differences between pursuits may lead to considerable changes in structure over a 50-year period. Similar projections are not available for the UK, but it would be expected that with currently lower rates of participation, and lower per capita incomes, rates of growth in the future in the UK might at least be comparable to those of the USA. Projections for the UK are in any case more complicated because of demand being satisfied in other parts of Europe (for example for winter sports).

Some facilities are operated on a commercial basis. Charges are made where practicable for stalking and fishing (McGilvray and Perman, 1991), and income is derived from the sales of refreshments, publications and at forest drives and some visitor centres or arboreta. Forest holidays using cabins and cottages have been promoted at thirteen locations mainly in Scotland and Northern England. These latter projects demonstrate high rates of return on the investment and both the Commission and the National Audit Office (NAO, 1986) have emphasised the tangible benefits produced. Such recreation competes directly in a larger market for long and short-break holidays in Britain and abroad, a market which is expanding rapidly but with the percentage of holidays taken by the British in Britain declining within an increasing total (British Tourist Authority, 1988: Table 50).

Despite the fact that more than half of the forests and woods in Britain are owned and managed by the private sector or by other organisations such as the National Trust and local government, there is not enough information on recreational use to allow the compilation of a realistic national picture. In general, access to forests in the private sector is not encouraged, except where public footpaths or other rights exist, or where physical factors prevent restrictions; the reasons for this are various. The private owner has no general incentive to encourage or permit public access, and is unlikely to see any direct return (although grants may be available to provide facilities for access); charges are either physically impossible or socially unacceptable. General public access may conflict with more specialised uses which do take place, including stalking, archery, war games and so on; in these cases charges may be feasible. There are, of course, significant exceptions to this general picture; Irving (1985) provides guidelines for private owners wishing to increase the recreational use of woods and forests. Well known examples in the private sector include Landmark (Carrbridge), the Rothiemurchus Estate (Aviemore) and the Woodland Park and Countryside Museum at Brokerswood (Wiltshire).

Recreational use of land (which includes woods and forests) owned by some charities and local government (and to a lesser extent other organisations) is also significant. The National Trust received around 8 million visits in 1987, while Sherwood Forest Country Park and Cannock Chase Country Park each receive at least 500 000 visitors every year. Other organisations which provide access at some sites include the Nature Conservancy Council, the Woodland Trust and the Royal Society for the Protection of Birds. Unfortunately the limited data available cannot be broken down accurately between different habitat types to allow any national comparison with the visits made to state forests. The data emerging from recent household surveys does suggest that around twothirds of all visits to woods and forests are to the very diverse private and public sectors outside the state sector.

Some provision involves joint ventures between organisations, such as the Queen Elizabeth Country Park (Forestry Commission and Hampshire County Council) in the south of England and Bennachie (Forestry Commission, Gordon District Council and the Baillies of Bennachie) in the north of Scotland. At a larger scale, the overall recreational and landscape planning and design at Kielder involves the Forestry Commission and Northumbria Water together with a large number of other interests.

MULTIPLE USE AND RECREATION IMPACTS

Multiple-use has been and remains a central concept in rural planning and management. Forests produce multiple-benefits irrespective of policy, but these can be enhanced by sound design and management. A series of policy adjustments and Ministerial statements over many decades, most recently in the Wildlife & Countryside Act 1981 (and amendments), requires the Forestry Commission to endeavour to achieve a reasonable balance between the development of afforestation, the management of forests and the production and supply of timber; and the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest. Some owners of woodlands may have a different objective (wildlife conservation in nature reserves, recreation in country parks). The influences on the degree and balance of multiple-use in non-state forests are as diverse as the resource itself: the conditions attached to grants or other subsidies, taxation, markets, the opinions of members and users, as well as social pressures and the pressures of lobbies.

In principle there will be conflicts where there are multiple-objectives. Almost all 'environmental' interests demand, above all, diversity and a reduction in the timber productivity which might be achieved if that were the sole objective, although questions of time scale, discount rates and concepts of sustainability (Pearce, 1991) mean that the issue is more complex than that. The potential or capability of land for different uses will depend first upon physical and biological factors. For recreation in forests, Goodall and Whittow (1975) have examined a long list of activities and their requirements. Climate, shade, size and shape, slope and microtopography, surface texture and vegetation, all have an influence, together with access and accessibility. Some pursuits have specific requirements – water, rocks, individual species of plants or animals – which may exist or can be introduced. Many if not all pursuits are not unique to forests; in fact it is often the open spaces in the forest which are critical, but the pursuit of the activity within a forest, influenced by the species, age, height, and penetrability of the tree screen, may be an important contribution to the overall experience (Campbell and Fairley, 1991).

For these reasons it is useful to classify both recreational uses and resources to distinguish two broad categories; user-oriented sites or pursuits where the activity is critical, and resource-based areas where the site attributes are relatively more important. Competitors seeking games or sports, orienteering, archery, cross-country skiing and the like will regard the forest as secondary to the main activity, and may tolerate a degree of intensive development or management, or may show insensitivity to the particular attributes of the forest in terms of wildlife assets or tree species. Visitors for whom the resource is the main reason for the visit, and who will normally be engaged in informal recreation such as walking, bird-watching, sightseeing and enjoyment of the sensory experiences of the forest (but including some non-competitive sports), will be much more sensitive and critical of the specific attributes of the forest itself (Campbell and Fairley, 1991). Of course these are extremes of a continuum which also varies spatially and temporally. A regular walk with a dog demands proximity to home whereas people will travel much further for a spectacular walk or to enjoy a unique viewpoint. Even for informal recreational use, the forest visit is likely to be complementary to, and a partial substitute for, a visit to the coast or to open moorland or another habitat.

At a small scale, recreational use may conflict with the other products of forests; people are incompatible with harvesting operations and can disturb wildlife. But the presence of people can decrease fire risks by early reporting. The vulnerability of a newly planted area, or the impenetrability of a thicket, are factors at this scale. However, as the size of the forest increases, assuming also that the diversity of the land form, age structure and tree species increases in parallel, so many conflicts reduce or disappear and the concept of multiple-use for multiple-benefits makes sense. This is seen most clearly in Forest Parks where the scale and physical diversity present is reflected in the multiple-uses which take place. Special cases like the New Forest (Forestry Commission, 1987) illustrate a different balance of objectives, where timber production is secondary and is 'worth' much less than the other benefits in any case.

There is also conflict or incompatibility between recreational activities. Goodall and Whittow (1975) describe a generalised picture of the potential conflicts, but this will also depend on the intensity of use, and proximity when adjacent sites are in use. As might be expected, there is broad compatibility between informal recreational activities.

To aid planning and management it has been suggested that site capacity can be assessed and used to achieve multiple-use. The problem has proved to be that the very concept of capacity, and the diverse products of the forest, are multidimensional. For example, a car park may have a fixed <u>physical</u> capacity, as may a visitor centre or archery range, but the effect of seasonal and diurnal changes raises the question as to whether the average demand or the peak demand is the important factor in site design. For many types of informal recreational use, there is likely to be a <u>perceptual</u> capacity concerning factors such as crowding and solitude which will vary greatly between individuals and temporally and spatially within the forest. The <u>ecological</u> capacity of a site can at least be conceived, but probably not easily defined, as when the ecological characteristics of the site (plant and animal species, nutrient cycles) are at some dynamic and sustainable equilibrium unaffected by disturbance, trampling effects or management practices. A site or a forest may also demonstrate an <u>economic</u> capacity where the values of all the outputs, measured in the same units, are maximised or optimised.

While these are interesting ideas which help focus attention on the issues surrounding multiple-use, it is less obvious that they can be translated into operational rules or guidelines which will ensure optimal solutions, even assuming that the latter can be defined.

If there are conclusions to be drawn, they are probably that (1) multiple-use is a sound concept; (2) it depends upon the scale of planning; in general a large forest is better able to support multiple-use with minimal conflicts; (3) conflicts or damage can be avoided by careful planning, design and management; (4) the relative balances between forest outputs will vary both spatially and temporally.

DEMAND FOR FOREST RECREATION

Effective demand for forest recreation is revealed by actual visits to forest sites, and this type of demand is easiest to measure in economic terms, by say, a Clawson-Knetsch type model. Such models show that the basic determinant of demand is travel cost, or the price of the recreational experience, with other variables affecting demand (such as car-ownership providing a means of access to forests, socio-economic group status as a proxy for income, and availability of substitute sites) of less importance for purposeful day visits of 3 hours duration or more (Willis and Benson, 1989b).

Demand can be thought of both in spatial terms and in a time series sense. Increasing car ownership over time may generate more day visits to forests. But more important would be a decrease in the travel cost (price) of a visit either through (1) the expansion of forestry closer to centres of population, or (2) a general reduction in real transport costs, for example in terms of petrol, motor vehicles, etc, as has occurred throughout the 1980s.

A suitable time series data set on forest recreation and associated variables does not exist. The other source is through *ad hoc* cross-section studies on demand for forest recreation and various national cross-section studies that are repeated at regular time intervals (for example the Family Expenditure Survey), or regularly published information on holiday entitlement, car ownership, leisure time, etc., variables which might be expected to determine demand for forest recreation. Extrapolations based on these are possible, but the longer the time period (for example 50 years), the greater the likely margin of error.

Such a forecast was made to the year 2030 by the United States Forestry Service from a 1977 national outdoor recreation survey (American Recreation Coalition, 1983), but it was recognised that error margins were probably too great for such long run forecasts to be worthwhile. Uncertainty is simply too great, given the considerable lack of predictability of both the socio-economic factors in the future, and their uncertain and perhaps changing relationship to recreation demand. Both of these factors contribute to large errors inherent in demand forecasts. However, if growth took place at about 1% each year, the overall growth in 50 years would be around 60%; at 2% each year, growth would be around 150%, or a doubling in about 35 years.

It is difficult to know whether effective demand will rise in the future. Prices, incomes, price of substitutes, and changes in tastes and preferences may well work in common or contradictory directions with unknown magnitude. New types of recreation activities can arise such as paint ball (war) games which create demands for particular kinds of woodlands and forests. Renewed interest in medieval woodland habitats and lifestyles, based on wood industries and crafts associated with game hunting and animal herding, can create visitor interest at specific areas, for example the pollarded beeches at Burnham Beeches. Actual empirical evidence on visitor numbers between two points in time (1977 and 1988) suggests some growth in visitor numbers, but a very low growth of only 13% or 3 million from 24 to 27 million to Forestry Commission land (Benson and Willis, 1990). A comparison based on household survey results in 1988/89 suggests that the increase during the same period could be in the range 58-96%. These figures are, however, conservative and uncertain because they are not based on comparable survey methods.

Nevertheless it has been shown empirically from the General Household Survey 1977 that participation in sports rises as income rises, but that this is most striking for indoor sports. For outdoor activities Gratton and Taylor (1985) show, from General Household Survey data, that income elasticities are higher for activities such as horse riding (3.64) sailing (3.13), cricket (2.51), golf (1.86) and comparatively lower for some activities, such as long distance walking (0.53) which might be associated with the forest environment. An income elasticity of less than 1 indicates that participation grows less than proportionately with income.

Overall, any major expansion in visitors on the basis of available evidence and existing supply of forests and facilities, would seem improbable in the short to medium term. Visitors are more likely to be attracted to specialist activities compatible with the forest environment, for example horse riding, car rallies, stalking etc which could require capital investment in facilities. But forests within reasonable access of large population centres could tap new sources of demand which partly explains the current interest in urban forestry.

URBAN AND URBAN FRINGE FORESTRY

Despite the existing contribution of forests and woods to countryside recreation, there are marked regional differences in both existing use and potential. Much of the Forestry Commission's estate is relatively remote from people for reasons described in other

Papers. Some recent research to value the recreational use of the estate (Figure 1b) shows broadly that the number of visitors (per unit area) and the total value of those visits is highest in the English lowlands and lowest in the Welsh and Scottish uplands. This is perhaps obvious, but the differences are dramatic; for example, the values are around $\pounds 1$ (per hectare per year) in the remotest areas, $\pounds 10-50$ in intermediate areas, but around $\pounds 200$ (and more in exceptional cases) in lowland areas.

Both the use of existing forests (private and public), and the potential of those not presently developed for recreation, are likely to show benefits of the same order. So, for example, existing country parks such as Cannock Chase and Sherwood Forest, and forests like Epping, are heavily used for a wide range of recreational pursuits, not dissimilar in general from those found on the Forestry Commission's lowland estate, and are probably generating recreational benefits expressed in monetary terms of hundreds of pounds per hectare each year. These sites serve large catchment areas and may be the only local alternative to the farmed landscape for countryside recreation. In other regions, the proximity of the coast or the hills (especially in the National Parks of north, north-west and north-east England) mean that countryside recreation and many active pursuits may show (or have the potential for) greater degrees of substitution between sites or habitat types.

Even close to the major conurbations, many of these forests (and substitutes) involve a round trip journey of 20-50 miles. The National Survey of Countryside Recreation showed, however, that over one-third of trips have a round trip distance of less than 10 miles, and one-half a distance of less than 20 miles. This highlights the importance of the <u>local</u> countryside around towns. The people most likely to travel short distances are the under 20-year olds, the unemployed and families with young children and no car. Unfortunately there is no detailed evidence on the importance of woods and forests for these local visits, although community woodland projects by the Woodland Trust, and those such as Whitwell Wood, Derbyshire by the Forestry Commission, suggest that there is considerable local demand and potential.

The Countryside Commission's proposals for a new Midlands Forest and for urban fringe forests (Countryside Commission, 1987b), and the Central Scotland Woodlands initiative announced by the Secretary of State for Scotland in January 1989 (Campbell and Fairley, 1991), all include the provision of recreation opportunities as one of several objectives. The concept of a Midlands Forest of up to 40000 ha in total (as big as Kielder) is modelled on the New Forest (the New Forest Heritage Area covers some 50000 ha) and in particular on the unique blend of historic, scenic and environmental characteristics which are found there.

Assuming that demand for recreation will grow, or that tastes will change, or that substitution should be encouraged to solve other problems of congestion or conflicts, new forests are obviously able to contribute in the longer term to the development of a co-ordinated recreation strategy at local, regional and national scales. Whether they will add to the overall recreational benefits of the countryside, and by how much, is a more difficult question because substitution and displacement may take place. Areas of intensive use (Figure 1) at least suggest that there is a buoyant demand which may grow.



Figure 1 Spatial implications of informal recreational use for forestry expansion (Forestry Commission estate only)

(a) Woodland area as percentage of land and inland water area (countries and regions) (from Locke, 1987).

(b) Variation in visitor numbers (car-borne) and consumer surplus (CS) ha⁻¹ year⁻¹ on Forestry Commission land (forest districts) (from Benson and Willis, 1990).

(c) Indicative areas for: (1) New planting: below average woodland cover, highest usevalues in existing FC forests and high accessibility to large populations;
(2) Existing forests: where further development of recreational use could produce high use-values, but woodland cover is above average; (3) Other areas: above or below average woodland cover but low to medium use-values in existing FC forests.

Note that the maps are generalised from large administrative units and therefore mask local variations and opportunities for new planting.



markets. But in the case of forest recreation, consumers must transport themselves to the production site, which is immobile. Thus consumers face differing marginal costs of consuming the same good. Changing the future pattern of planting could therefore increase accessibility to forest recreation and increase participation and numbers of visitors. Second, the public good nature of many forest recreational activities is important: it may cost no more to admit 500 people to a forest walk in a day than it does to admit 50. In short, marginal cost is often zero. Pricing is not optimal, and the transaction costs of charging in any case dictate open access arrangements. Third, forest recreation is only one of a number of outputs, jointly produced with timber. When foresters plant to enhance the beauty of the countryside and provide recreational outlets, the social benefits from forestry are greater than the private benefits from timber output alone.

The benefits generated by open-access forest recreation, as a public good, were first investigated by Grayson and others in the late 1960s and early 1970s, and a number of subsequent studies have appeared based on Clawson-Knetsch methodology, the principal ones of which are documented in Table 5. These studies estimate the visitors' willingness-to-pay, or consumer surplus for the visit. Consumer surplus per visitor appears to have grown in real terms since the Forestry Commission study of 1971 (Grayson, Sidaway and Thompson, 1975), but so have real incomes, and the demand for outdoor recreation, which may also have become more price inelastic. The estimate for Gwydyr Forest (Christensen, 1983) is closer to the Grayson estimate than the consumer surplus reported by Willis and Benson (1989a, 1989b), but was produced as part of a methodological study using a small sample. The models developed for Gwydyr were diverse and complex and the estimate quoted here is the most cautious of several calculated on a per head basis.

For the only forest common to two studies, namely Dalby (Everett, 1979; Willis and Benson, 1989a), the estimates of consumer surplus or all recreation are remarkably similar when indexed to 1987 prices, as are the estimates of the wildlife component of the general consumer surplus.

One possible explanation for some of the differences between the studies is the treatment of travel costs. Consumer surplus per person based on variable (petrol and servicing) costs alone, has a mean (weighted) value of £0.59 in the most recent studies, which is very similar to the indexed estimates of Grayson and Christensen. Unfortunately, some authors are not at all explicit about how travel costs are calculated. But given that entry fees at many National Trust, Department of the Environment and other properties which include gardens, woodlands and forests are closer to the full travel (distance and time) cost estimate of Willis and Benson (£2.00) (see Bovaird, Tricker and Stoakes, 1984), this figure may be more realistic and plausible for open-access car-borne forest visits.

This work indicates that the value of open-access recreation on Forestry Commission land is much higher, at around £53 million per annum (Benson and Willis, 1990), than the value suggested by the NAO (1986) of £10 million. This puts a recreational value of £47 per hectare per year on the Forestry Commission's estate, but there is a very wide geographical variation (Figure 1). markets. But in the case of forest recreation, consumers must transport themselves to the production site, which is immobile. Thus consumers face differing marginal costs of consuming the same good. Changing the future pattern of planting could therefore increase accessibility to forest recreation and increase participation and numbers of visitors. Second, the public good nature of many forest recreational activities is important: it may cost no more to admit 500 people to a forest walk in a day than it does to admit 50. In short, marginal cost is often zero. Pricing is not optimal, and the transaction costs of charging in any case dictate open access arrangements. Third, forest recreation is only one of a number of outputs, jointly produced with timber. When foresters plant to enhance the beauty of the countryside and provide recreational outlets, the social benefits from forestry are greater than the private benefits from timber output alone.

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Study:	Consumer surplus for recreation			
year/author	per visitor	per hectare		
1969-71 All FC forests aged 25+ years				
Grayson <i>et al.</i> , (1975)	0.33	30.50(1)		
1975-76 Dalby				
Everett (1979)	1.82	64.60(2)		
1981 Gwydr				
Christensen (1983)	0.53	-		
1987 Six sites				
Willis and Benson (1989a)				
(a) 6 sites	1.90	31.78(3)		
(b) 6 sites	1.90	100.51(4)		
(c) Dalby only	1.82	52.44(2)		
1988 Eight sites (5)				
Willis and Benson (1989b)				
(a) highest: Loch Awe	3.31	<1		
(b) lowest: New Forest	1.43	425		
(c) average: eight sites	1.97	18.55		
1987-88 Fifteen sites extrapolated to				
whole Forestry Commission				
estate (5)				
Benson and Willis (1990)	2.00	47		

Table 5Consumer surplus estimates from various forest recreation studies (all figures in
£ at 1987 or 1988 prices)

Notes:

1. Calculation from consumer surplus per visitor is: consumer surplus/visitor x all forest visitors divided by total area of FC land aged 25+y (Grayson *et al.*, 1975).

2. Different estimates of annual visitor numbers produce different estimates of consumer surplus per hectare.

3. Calculation from consumer surplus per visitor is: £1.9 x total visitors to six sites divided by total area of six sites.

 Calculation from consumer surplus per visitor is £1.9 x all UK forest visitors divided by total area of FC land aged 27+y: i.e. same as/similar to 1.

5. 1988 prices.

The possible implications of this for forestry expansion can be illustrated by taking some typical rotations of different types of forest and adding to wood production costs and returns the expected consumer surplus from forest recreation. The following calculations assume a marginal increase in forestry, which would not reduce the consumer surplus on forest recreation. Clearly, any major expansion of forestry, without a commensurate growth in demand, would lead to declining marginal recreational benefits from forests. Four different new planting rotation models, similar to those described more fully by (Dewar, 1991), were used to assess the impact of recreational benefits on the overall economics of forestry:

- 1. (Table 1 in Dewar, 1991): spruce forest in the uplands. Such a forest would be typical of much new planting in upland Wales, northern England, and Scotland at elevations not exceeding 1000 feet. Consumer surplus is assumed to be either £3 (remote areas) or £30 (higher levels of recreational use) per hectare per year.
- 2. (Table 3 in Dewar, 1991): lowland spruce/Douglas fir forest, comprising an equal mixture of spruce and fir with 10% broadleaves and 10% unstocked. This is a high yielding conifer mixture, typical of and suitable to south-western England. The consumer surplus assumed is £50 per hectare per year.
- 3. (Table 4 in Dewar, 1991): lowland pine forest, including 10% broadleaves and 10% unstocked. Such a forest might typically be planted in eastern England and Thetford in East Anglia provides an existing example. The consumer surplus is high at £220 per hectare per year.
- 4. (Table 5 in Dewar, 1991): lowland forest with a very high consumer surplus, managed for timber and/or for non-marketed benefits. For the present calculation, an oak YC 6 model with clear felling in year 120 is used, but variations are possible (see Dewar, 1991). The consumer surplus of £424 per hectare per year is based on the New Forest, but this comprises around 60% conifers; factors such as location, history and management practices are therefore at least as important as the characteristic species.

The models include various cost combinations of ground preparation, fencing and road construction in year -1, planting and fertilising in year 0, weeding and fertilising in the early years of the rotation (1 to 16), protection, maintenance, management and insurance (from year 0 to clear felling) and periodic sections of road construction during the rotation. Some revenue is derived from thinning, but most occurs from clear felling at the end of the rotation. Note that these models exclude land costs.

The typical consumer surplus values per hectare per year are based on Benson and Willis (1990). Adding in these expected consumer surplus benefits from recreation, for the marginal forest, increases net present value (NPV) and internal rates of return (IRRs) depending upon when recreational value is assumed to start. Three different dates from which recreation values might commence were assumed: from the beginning of the rotation i.e. year 0; from year 16; and from year 26. Table 6 shows that the NPV and IRR are quite sensitive to the commencement of recreation benefits, especially for lowland forests which are also assumed to have the largest recreational benefits per hectare.

Whether, for new forests, recreational benefits can be assumed to occur throughout the rotation is open to debate. On 'green field' sites, it is likely that no recreation is possible on newly planted land, and that recreational benefits will only accrue after the forest has been thinned and has matured somewhat. This will clearly reduce the NPV of recreational benefits and the IRR. Indeed new planting may displace existing recreational

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uses. But in some situations it may be possible to design a new forest around existing woodland and open-space recreational areas to maintain and increase benefits while the forest matures to provide yet further recreational benefits (Campbell and Fairley, 1991); this has already been demonstrated by the planting of the Verderer's inclosures in the New Forest. The Table also shows the effect of assuming that recreational benefits will grow at a compound rate of 1% each year, a realistic but conservative assumption given the limited evidence available. This has a variable but general effect of increasing the overall IRR, in exceptional cases by nearly 4%, but more typically in the range 0.1-1.7%.

	(4	 (i)	(:	3)	(5)	(1	a)	(1	1b)	
Madal	Low	Lowland High CS		Lowland Low CS		Lowland		Upland		Upland	
Ivioael	Hig					High CS	Low CS	Low CS			
	(£2	20)	(£	50)	(£4	á24)	£)	3)	(£	30)	
Discount r	ate = 6%										
Rec26											
NPV	458	647*	155	220*	1640	2535*	8	12*	81	116*	
IRR	6.6	6.9	7.0	7.1	6.0	7.2	3.9	3.9	4.1	4.3	
Rec16									•		
NPV	950	1247	318	419	2943	4124	17	23	168	223	
IRR	7.5	8.0	7.3	7.5	8.4	9.6	3.9	3.9	4.4	4.5	
Rec0											
NPV	2663	3074	1886	1023	7485	8964	50	58	501	5 79	
IRR	18.9	20.6	9.2	9.6	107.7	111.4	4.0	4.0	5.2	5.5	
Discount r	ate = 3%										
Rec26											
NPV	1257	1796	429	616	6354	11119	23	33	228	330	
IRR	6 .6	6.9	7.0	7.1	6.0	7.2	3.9	3.9	4.1	4.3	
Rec16											
NPV	2133	2869	719	971	8676	13960	38	52	388	527	
IRR	7.5	8.0	7.3	7.5	8.4	9.6	3.9	3.9	4.4	4.5	
Rec0											
NPV	4203	5088	1405	1706	13712	19840	79	96	795	965	
IRR	18.9	20.6	9.2	9.6	107.7	111.4	4.0	4.0	5.2	5.5	

Table 6Discounted recreational consumer surplus values in different forest rotationmodels (see text for further explanation)

The net present value (NPV) is that attributable to recreation, but the internal rate of return(IRR) is for the complete rotation model including timber revenues; Rec 0,16, 26 means that recreation benefits are assumed to begin in those years after planting and continue throughout the rotation;* in these columns recreation benefits increase at 1% per annum compound.

The general result of the calculations is to suggest that, except for upland forests with low recreational benefits, the addition of recreational benefits produces a significant and positive net present value (which may be low or negative for wood production alone),

and an overall internal rate of return which exceeds a test discount rate of 6% for the lowland forests; the precise return depends upon when the recreational benefits are assumed to start.

It may therefore be difficult in some cases to argue the case for forestry expansion on 'green field' sites using recreation as an additional criterion since benefits may not appear for a number of years. Managing new forests in an environmentally sensitive way (by planting broadleaved trees in addition to conifers, designing coupe shapes to emphasize landforms and diversity, retaining open space for recreation areas) will all add to costs, without producing immediate benefits, and will reduce timber value per hectare at the end of the rotation.

(Pearce, 1991) discusses these recreational benefits further and the additional effects of including land prices, changes in timber prices and the opportunity costs of labour, none of which are dealt with in the present models.

The foregoing calculations have not explicitly taken account of possible recreational losses on farm or other land which would be used for new forests; it could be argued, however, that the inclusion of land prices does also implicitly incorporate the expected priced recreational benefits on the land forgone, although not the non-priced open access recreation from the alternative (agricultural) land use. The 'without forest' state will be easy to specify for forest expansion when areas have been designated and defined. Until this occurs any assessment of recreational losses on farmland to be used for new forests will be hypothetical. Much urban fringe land has little access at present, so no existing recreation would be forgone. In other cases existing recreation use may be substantial. However, where it is possible to design new forests so that existing footpaths and open space recreation areas can continue to provide value, recreational losses on existing land may be minimised i.e. the opportunity recreational cost would be zero or close to zero. This is clearly central to the Countryside Commissions' ideas for major new lowland or urban forests.

Other benefits, in addition to consumer surplus, which are often associated with outdoor or wilderness recreation are option, existence and bequest values (Walsh, Loomis and Gillman, 1984). Option value is the value an individual places on the option to visit a recreation site at some time in the future, even though there is no immediate or expected intention to make such a visit. Existence value is simply the value from knowing that the facility exists, while bequest value is the motive to pass on the environmental asset to future generations. The empirical determination of such values using continent valuation methods has produced estimates as large as consumer surplus (Walsh, 1986), although theory suggests option value, under plausible assumptions, ought to be extremely small in relation to consumer surplus Freeman, 1984). There would also be option, existence and bequest benefits to some individuals from the agricultural land forgone, so the net benefit could be either positive or negative. Moreover, quasi-option value and irreversibility arguments suggest that for land transferred from agriculture, the B/C ratio (benefits from forestry [priced plus non-priced benefits] divided by opportunity costs forgone) ought to be substantially greater than 1.0 (Hodge, 1984). Local and regional impacts of recreation can be measured in terms of the multiplier effects in the rest of the local economy through increased turnover in local firms supplying goods to tourist and recreational establishments, and through the spending of individuals whose incomes have increased as a result of extra employment opportunities.

Local impacts in terms of direct employment from recreation are substantially higher in hotels, guesthouses and bed and breakfast accommodation, where direct employment has been estimated at around 1 person per 1000 tourist days (TRRU, 1975). For touring and static caravans, rented accommodation, and camping, direct employment may be around 1 person per 3000 tourist days, while for transit and day visitors a figure of 1 person per 10000 tourist days has been estimated.

Jobs generated elsewhere in the local and regional economy as a result of these direct additional jobs from recreational spending are quite small. Archer (1974) estimated an indirect average recreational multiplier for Anglesey of 1.11; that is, for every 100 direct jobs created by tourism, an additional 11 jobs would be created elsewhere in the local economy. Such small multiplier effects were confirmed in Tayside by TRRU (1975) where an average tourist direct and indirect multiplier of 1.08 and a direct, indirect and induced multiplier of 1.12 were estimated.

Of course the size of the multiplier is a function of the spatial scale chosen for analysis: the larger the spatial area, the greater the multiplier. Restricting the analysis to the forest, with no residents nor any firms outside tourism, will restrict the multiplier to 1.0. So the impact of forest recreation will be felt in neighbouring areas. But rural areas are known to have lower multipliers than urban areas. Much of the impact of rural recreation eventually flows through to towns and cities. Moreover, since the overwhelming majority of recreation uses directly associated with forests are either day visits, transit visits or camping and caravanning, the employment impacts of recreation are likely to be small. Only where development is in the form of a hotel, with leisure centre and forest orientated recreation activity, for example the Centre Parcs development in Sherwood Forest, are direct and indirect employment and income impacts likely to be significant.

However, the trend of British holiday patterns may be changing in directions detrimental to the impact of forest recreation on the local economy. If holidays of 4 or more nights can be regarded as representative, then the proportion of the British population taking this kind of holiday in Britain has declined from 50% in 1970 to 36% in 1987; while the percentage taking such holidays abroad has risen from 10% in 1970 to 29% in 1987 (British Tourist Authority, 1988; Table 50). Moreover, the spatial distribution of such holidays is heavily concentrated in England; only 11% of holidays of 4 or more nights duration are taken in Scotland (British Tourist Authority, 1988; Table 54), where large forests exist and forestry expansion is taking place.

Trees, and probably woods and forests also, are known to have a positive effect on the value of land, especially for residential purposes. Anderson and Cordell (1988) calculated a 3.5-4.5% increase in the sales prices of houses in Athens, Georgia, associated with trees on the plots, whilst Payne and Strom (1975) estimated that trees could add

approximately 30% to the value of undeveloped land, although their experiments were based on hypothetical values; increases in the range 5-15% are more typical from other studies. Such increases in land or property values will have impacts on a number of aspects of local economies.

Expansion of forestry in the urban fringe may only be mainly associated with informal recreation: such recreation, of the open access non-paying type, results in least local impact in terms of employment and income of both direct and indirect kinds. The economic impact of urban forestry would then not be in terms of employment, but in terms of external effects on house prices and environmental amenity benefits. The latter may, however, contribute to the encouragement of inward investment in the longer term.

SUMMARY AND CONCLUSIONS: IMPLICATIONS FOR FOREST EXPANSION

Recreation in the countryside generates a wide rang of benefits to society; these may be personal, social, psychological or economic (Kelly, 1983). Recreation has grown dramatically in the past, but more recent growth and future projections suggest a slower but still positive rate of change. Recreation is also extremely diverse and any assessment of the role of forests and woods must be seen as part of a wider, changing market for the use of leisure time. Evidence suggests that a major expansion of countryside or forest recreation is unlikely in the foreseeable future, although a steady and positive increase could lead to significant growth over the medium to long term.

Although the overall level of informal use is not expected to change dramatically, there could be marked changes in more specialised pursuits. Forests provide a broad range of opportunities for such uses, particularly because of their ability to absorb large numbers of people and to screen activities both physically and perceptually.

Recreation in forests and woods may comprise around 10% of all informal countryside recreation in Britain; about one-third of this is on the Forestry Commission's estate, and most of the rest on land owned by bodies such as the National Trust, Woodland Trust and local government. The private sector estate is relatively underused and undeveloped, although there are significant exceptions. There is enormous potential for further provision in the existing forest estate, perhaps by co-operative ventures between the state, private, public and voluntary sectors. Multiple use will remain a concept central to such development and co-operation. Imaginative planning and sensitive design and management can reduce conflicts to a minimum (Campbell and Fairley, 1991).

Many state forests are remote from people and therefore generate very low use values per hectare. Existing forests in lowland areas in contrast generate values calculated at around £200 per hectare each year (or more in exceptional cases like the New Forest), some one hundred times greater than the values of the remotest and youngest plantations. The implications for forest expansion are shown in Figure 1. By combining data on the existing distribution of woods and forests (public and private) with recent research on the distribution of visitor numbers and use-values on the Forestry Commission's estate, a map can be produced (Figure 1 (c)) which indicates a possible priority area for new planting (below average woodland cover and high use values in existing Commission forests). It should be noted, however, that it is impossible to capture all the benefits which recreation or even forests provide by an economic valuation of the levels of existing use. Existing and new forests possess option and other values for which people are likely to be willing to pay (Walsh, 1986). Such preservation values are additional to use values; they may be substantial, but have not been estimated in Britain. A large body of work in North America (see for example Walsh, Loomis and Gillman, 1984) points to preservation values for many natural resources as being between 50 and 100% of current use-values. Such additional values may apply throughout a rotation but assume, of course, that the location, design and management of the forest meets the publics' requirements in terms of environmental and other attributes (Campbell and Fairley, 1991; Good *et al.*, 1991). Further work is needed to develop these areas of research and to refine their potential contribution to planning and policy development.

Because the use benefits of new planting are often not realised for a long period, they add small amounts to an economic appraisal of new investment. In remote areas the addition may be effectively zero, but in lowland areas the benefits could be more significant; multiplier effects will not be significant in any area unless as a result of investments in commercial recreational developments. It would be legitimate to include peoples' preservation values in the calculation, but there is no detailed data to suggest what the size of such values might be. Also, there are arguments for adopting, different methods of appraisal (Pearce, Markandya and Barbier, 1989; Pearce, 1991).

Demand for the use of forests is modified by the costs and convenience of access; new forests will therefore generate the largest benefits if located close to or within short distances (10-20 miles?) of where people live. Although the evidence on people's tastes and preferences is limited, diversity in species, scale, age structure and management methods is likely to produce the highest levels of satisfaction, as well as maximising the opportunities for different kinds of recreation and favouring the wildlife diversity of forests (Good *et al.*, 1991), an important and significant factor in people's expectations of the forest environment (Willis and Benson, 1989a). Given the uncertainty involved in making projections over the rotation period of new forests, diversity will also maximise the ability of the forest estate to respond to novel or changing recreational demands.

New programmes of afforestation, especially in lowland or urban fringe areas, may not necessarily add to the overall recreational use benefits of the countryside, unless overall demand increases; but it is possible that the value of the experience may be enhanced. More needs to be discovered about peoples' tastes and preferences. Any transfer of use to forests could lead to the relief of congestion or a reduction in conflicts with other interests, including for example agriculture and wildlife conservation, at other sites in the countryside. It is therefore important to include recreation in the preparation of forestry and conservation strategies.

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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:

<u>Occasional</u> <u>Paper No</u>	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, Consultar.t
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
46	New Planting Methods, Costs and Returns	Jim Dewar, Forestry Commission
47	Assessing the Returns to the Economy and to Society from Investments in Forestry	David Pearce, University College London

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