Forests' Role in Tourism: Phase 2

SUMMARY REPORT - FINAL

for the Forestry Group (Economics & Statistics) of the Forestry Commission

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FORESTS' ROLE IN TOURISM

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EXECUTIVE SUMMARY

MAIN FINDINGS

1. The main findings of the research are as follows:

- Forests generate visitor spending through visits by tourists to forests. This is decribed as "forest-related expenditure" in this report and includes items of expenditure made during a day visit in which visiting a forest is one of the reasons for making the trip.

- Forests also generate visitor spending through visits by tourists to the countryside, even where tourists do not actually visit a forest. This effect arises from the influence of forests on the choice of countryside area that tourists choose to visit. The importance of this role, compared to other reasons for visiting the area, can then be used to apportion part of total trip expenditure to an area's forests. This expenditure is described as "forest-associated expenditure".

- **Forest-related tourism expenditure associated with tourism day visits is estimated to be around £2.3 billion, over 3% of total tourism expenditure in the UK.**

  Table 1 shows how this is split between England, Scotland and Wales

  Table 1. Forest-related tourism day visit expenditure

Forest related expenditure	England	Scotland	Wales	GB
£ millions	2,054	163	51	2,268
% of tourism expenditure	3.4	2.5	1.8	3.3

  * These data are based on surveys of visitors to forests across Great Britain

- **On average, around 13% of total tourism expenditure incurred by visitors to six countryside areas surveyed could be considered to be "forest-associated expenditure".**

  Table 2 shows the variation across the six case study areas.

  Table 2. Proportion of tourism expenditure in the countryside that is "forest-associated" (%)

New Forest	Lake District	Tross-achs	Borders	Wye Valley	Snow-donia	Total
15	12	13	11	17	12	13

  * These data are based on surveys of visitors to rural areas including town centres and sites that are popular with tourists. The surveys were not carried out at forest sites.

The results presented in Table 1 are explained in more detail in paragraph 15. The results presented in Table 2 are explained in paragraph 18.

INTRODUCTION

2. Forests, woodlands and trees provide what may be termed amenity services. These attract people to visit forests specifically, and to countryside areas more generally, where the presence of trees and woodland contributes to the amenity value of the landscape. These visits necessarily involve expenditure which provides income to local businesses, supports employment and economic output. A proportion of these visits can be classified as 'tourism' visits. Understanding the influence that forests and forestry practices have on tourism visits and associated expenditures is important for those bodies charged with their management. Building on an earlier scoping study (Roberts *et al*., 2000), this study was commissioned by the Forestry Commission in November 2001 to provide greater understanding of "Forests' Role in Tourism".

3. The aims of this study were to:

- Quantify the economic significance of forest-related day visit tourism expenditures in England, Scotland, Wales and at the Great Britain (GB) level.
- Quantify the economic significance of forests in relation to tourism in the wider countryside.
- Measure the attitudes of tourists towards the environment and forests, and to investigate links between these attitudes[1] and tourist visitor behaviours.

The first aim was based on the premise that a proportion of all tourism expenditure in GB is incurred by tourists undertaking forest-related recreational activities. The second was based on the premise that the presence of trees and woodlands can attract tourists to the countryside more generally. Undertaking a visit to a forest or the countryside, and spending money to do so, are specific examples of individual behaviour. The third aim was to improve understanding of the factors that motivate these behaviours.

4. To inform the study, two visitor surveys were undertaken. The first was a survey of day visitors to forests. A total of 1,906 face to face interviews with adult visitors to forests were undertaken at a stratified sample of 44 sites located throughout England, Scotland and Wales during the summer of 2002. Data was collected on the characteristics of the visitors and the visits, the importance of the forest in their decision to go on a day visit, their day visit expenditure and their attitudes to forests and the environment. A second survey, of visitors to the wider countryside, was also undertaken. Here, the study focussed on the importance of forests in attracting visitors to six countryside case study areas. This second set of surveys was carried out in towns in the six rural areas that were selected.

5. This report presents a summary of the methodological approaches adopted for the study and the results of the analysis and is set out in six chapters. Following the introduction in Chapter 1, Chapters 2 and 3 are concerned with quantifying the economic significance of expenditures directly related to tourism day visits to forests in GB. Chapter 2 presents the methods adopted,

[1] Attitudes are generally considered to be a major motivational factor influencing behaviour.

whilst Chapter 3 presents the results. Chapter 4 considers the economic impacts of forests associated with tourism visits to the wider countryside, whilst Chapter 5 outlines the methods and key results of the investigation into the linkages between attitudes towards the environment and forests and tourism behaviour. Chapter 6 presents the study conclusions and recommendations.

ECONOMIC SIGNIFICANCE OF FOREST-RELATED TOURISM DAY VISITS

6. There were a number of key stages to the method for quantifying the economic significance of forest-related tourism day visits in GB.
   - Develop a model to estimate the volume of visits made to individual forest sites
   - Identify levels of day visitor expenditure
   - Partition this expenditure between forest and non-forest related expenditure
   - Apply the visitor and expenditure models to unsurveyed forest sites
   - Estimate economic significance of forest-related tourism day visits at country and GB level

7. The first stage was to develop a transferable econometric model (a Trip Generation Function – TGF) that could be used to estimate the volume of tourism day visits made annually to individual publicly accessible forest sites in GB. For the purpose of this study **"tourism day visits"** included (i) day visits from home that lasted 3 hours or more[2], and (ii) all day visits made by holidaymakers regardless of trip duration. The second stage was to record expenditure incurred by tourists on day trips to forests using data from the survey of forest visitors. Not all this expenditure is necessarily related to forest tourism. Thus, it was necessary to develop an approach to estimate the proportion of this expenditure that could be attributed to forest tourism. The next stage was to estimate visits and expenditures at all publicly accessible woodland sites in England, Scotland and Wales. The final stage was to estimate the economic significance of forest-related tourism expenditure in England, Scotland, Wales and at the GB level using the data from the survey of visitors to the wider countryside.

Modelling visits to forest sites

8. Two main approaches to the development of a TGF were considered in this study. The general approach adopted here for the purpose of estimating visit numbers to unsurveyed sites, was referred to as the "forest" model. The "forest" model predicts the annual number of tourism visits made to a specific forest site. The second approach, referred to as the "individual" model, predicts the annual number of visits made by a given individual to a specific forest site. The basic analytical method for the "forest" model involved fitting various linear regression models with forest visit counts as the dependent variable. The resulting TGF predicts the mean values of the dependent variable for a linear combination of the independent (predictor) variables. Drawing on findings from previous studies, a wide range of independent

[2] This is the same trip duration used to distinguish tourism from leisure day trips in the UKDVS 1998.

variables were considered including forest attributes, travel cost, the availability of substitute recreational sites, and the socio-economic characteristics and attitudes of visitors. A summary of the modelling approach is presented in this report and full details of all models developed are presented in the Main report for this study.

9. Data for the dependent variable (visit numbers) for the forest model were obtained for 101 sites across GB owned or managed by either the Forestry Commission (FC), the Royal Society for the Protection of Birds (RSPB) or the Woodland Trust Scotland (WTS). The quality of this data is a key determinant of the ability of regression models to explain the variability in the data and therefore the ability of the TGF to predict future visits. The representativeness of the data is a key determinant of the transferability of the TGF model. Due to a lack of information it was difficult to assess the data used here with respect to these criteria. However, there are a number of factors which may have affected data quality, discussion of which is in the report. The independent variables were derived from a combination of primary and secondary data sources. Data regarding the characteristics and attributes of specific forest sites were obtained through a survey of forest managers. Data on forest visits including trip type, purpose of visit, frequency of forest visits and expenditure were collected through the visitor survey. Previous studies have identified that the size and characteristics of the local population and the availability of substitute recreational sites can influence the number of visitors to a given forest site. An extensive modelling exercise using Geographical Information Systems and sophisticated data handling techniques was required to compile data on substitute woodland sites, as well as to summarise the demographic characteristics of the local population in six specific travel time zones around each of the 101 forest sites.

10. Two alternative TGF 'forest' models were developed. Model I explained the greatest variability in the visit data and was also considered the most practical model for the purpose of predicting visits to unsurveyed sites. However, because it included certain predictor variables, the interpretation of which could be considered ambiguous, Model II was also considered for the purpose of predicting visits to unsurveyed sites.

11. Both models were used to predict annual tourism visits to 2,862 sites for which independent variable data (site data) were available. Site data was difficult to obtain and the 2,862 sites were estimated to represent only about a third of all GB woodland. A proportion of this data was provided by ADAS, collected for a parallel, but unrelated, project. The remainder came from direct surveys of public and NGO landowners and managers.

12. Model I predicted a mean of 9,475 visits per site. Mean visits per site for England, Scotland and Wales were around 10,500, 9,600 and 1,200 respectively. Model II predicted a mean of 6,922 visits. Mean visits per site for England, Scotland and Wales were around 7,850, 5,800 and 3,000 respectively. The uncertainties inherent in the models and concerns about site sample biases, suggest that these results should be treated with caution.

Estimating forest-related tourism day visit expenditures

13. Expenditure levels and patterns vary considerably between different visitor types, as does the proportion of expenditure that can be considered forest-related. Visits were classified into three categories in relation to the importance of forests in motivating day visits:
    - Forest only visitors: Visitors who make a conscious decision to visit a specific forest on their day trip and for whom the forest is of central importance to their decision to make the trip.
    - Forest combined visitors: Visitors who combine a visit to a forest with other activities on their day trip, and for whom the forest is of less importance to their decision to make the trip.
    - Casual forest visitors: visitors who did not specifically set out to visit a particular forest site on their day trip but, during the course of their outing, decide to spend some time in a forest. The forest plays no role in motivating their day trip, which would be made regardless of whether or not a specific forest existed.

14. The proportion of visit expenditure that was forest-related was estimated using the "expenditure partition" method. For the purpose of this study 100% of the day visit expenditure of "forest only" visits and 0% of casual forest day visit expenditure was assumed to be forest-related[3]. Based on the results of the visitor survey, 44.7% of "forest combined" visits expenditure was assumed to be forest-related. The mean forest-related tourism expenditure per site was estimated drawing on the results of the visitor survey and taking into account seasonality effects. The results from Model I showed that, on average, forest-related tourism expenditure associated with visits to forest sites in England is highest at around £72,000 per annum per site, followed by £70,000 in Scotland and only £6,500 in Wales. The results from Model II show mean forest-related tourism expenditure per site to be around £54,000, £42,000 and £17,000 in England, Scotland and Wales respectively. The mean value per forest-related tourism day visit in England, Scotland and Wales was £7.43, £8.58 and £6.54 respectively. For various reasons outlined in this report, the estimates presented here should be treated with due care. Nevertheless, the results represent a 'best guess' of mean forest-related tourism expenditure for individual sites in GB.

Economic significance of forest-related tourism day visits

15. The lack of reliable data regarding publicly accessible forest sites for the majority of the wooded area of GB currently presents an insurmountable barrier to the use of the TGF approach to estimate the total number of tourism day visits to publicly accessible woodland in GB. Thus, an alternative approach was used to estimate the economic significance of forest-related tourism day visits in GB. Based on data from the UKDVS (Countryside Agency, 1999), in 1998 there were an estimated 114 million tourism day visits from home[4] to woodlands, 104 million made by people living in England, 6.5

[3] The decision to visit a forest could have resulted in an increase or a decrease in the overall expenditure incurred on the trip, depending on the type of activity foregone by visiting a forest. However, it is assumed here that this impact is neutral.
4 A day visit from home that lasted 3 hours or more.

million made by people living in Scotland and 3.5 million made by those living in Wales. Virtually all of these trips took place within the country of origin. The UKDVS 1998 includes only those visits made from home[5]. After taking into account day visits by holidaymakers, the total annual number of tourism day visits to forests in GB was estimated to be in the region of 303 million, of which 107 million are day trips from home and 197 million are trips made by holidaymakers. Just under 277 million of all visits took place in England, with only 19 million in Scotland and 8 million in Wales. Forest-related tourism expenditure for day visits in GB was estimated drawing on the results of the forest visitor survey undertaken for this study and are, therefore, sensitive to any potential bias within the survey. This suggests that the economic significance of forest-related day visit tourism is somewhere between £1.3 and £5.6 billion, about 1.9% and 8.2% of total GB tourism expenditure respectively, with a conservative 'best guess' of £2.3 billion (3.3%). Based on the 'best guess' estimate, over £2 billion of the forest-related tourism expenditure was in England, £163 million in Scotland and around £51 million in Wales, representing 3.4%, 2.5% and 1.8% of total tourism expenditure respectively. These estimates of forest-related tourism day visits and expenditure may be subject to review following the publication of the 2002 UK DVS.

16. Overall, the figures presented here are a measure of the economic significance of forest-related tourism. Whilst improvements in data input quality could reduce the statistical uncertainty of the results, these estimates clearly demonstrate the important role played by forests within the tourism economy of GB.

THE ECONOMIC SIGNIFICANCE OF FORESTS TO TOURISM IN THE COUNTRYSIDE

17. A second aim of the study was to quantify the extent to which forests influenced tourism visits to specific countryside areas and the economic significance of these expenditures. A case study approach was adopted to compare areas of the countryside in Great Britain that differed in terms of the importance of forests and woodlands in relation to tourism and recreation. In consultation with the Forestry Commission, six case study areas were selected that were assumed to differ in respect of the importance of forests to tourism. Those areas where it was assumed forests were more important were the New Forest in England, the Trossachs in Scotland the Wye Valley in Wales. Those areas where forests were assumed to be less important to tourism were the Lake District, the Borders and Snowdonia in England, Scotland and Wales respectively. A total of 739 face to face interviews with adults were completed across the six case study areas throughout the summer of 2002.

18. Based on the method developed for the study[6], the survey showed that 13% of the total tourism expenditure incurred by visitors to the case study areas could be considered to be "forest-associated expenditure". This showed that forests play a positive and significant role in influencing tourists to visit areas of the

[5] The visitor survey (Table 3.2) showed that day visits from home represented around 22% of all tourist day visits to forests on average across GB, with 78% of trips being made by holiday makers.
[6] An expenditure partition method was developed and is described in section 4.2.3.

countryside in GB. In line with expectations, the survey showed that forests were more important in attracting visitors to stay in or visit the New Forest, the Trossachs and the Wye Valley than the other case study areas. These were the more heavily forested areas. However, the general extent of forest cover is just one of many characteristics of the forests likely to influence tourism decisions to visit an area. Other characteristics will include the specific attributes of the forests themselves, whilst the general marketing of an area is also likely to have an influence. Further research would be required to identify the specific forest-related factors that attract people to visit each area and their relative economic significance.

MEASURING VISITOR ATTITUDES TOWARDS THE ENVIRONMENT AND FORESTS

19. Undertaking a visit to a forest or the countryside, and spending money to do so, are specific examples of individual behaviour. Understanding the factors that motivate these behaviours can provide useful information for those organisations engaged in managing forest-related tourism. Attitudes[7] are generally considered to be a major motivational factor influencing behaviour. The most common way to measure attitudes is to use psychometric scaling techniques: measures which allow the individual to evaluate belief statements on an ordinal scale ranging from a strongly positive response to a strongly negative response. The "*Forest Importance Scale*" (FIS) was developed for this study to measure attitudes towards forests for recreation. The General Awareness and Consequences (GAC) environmental attitude scale was used to measure general attitudes towards the environment. The study found that there was a strong correlation between attitudes towards forests and general environmental attitudes. Overall, the results showed that respondents' behaviour was consistent with their attitudes to forests. High scores on the forest attitude scale indicate that respondents are likely to be more frequent visitors to forests and are likely to plan to remain at the forests for longer periods of time. Further, high scores also indicated respondents were more likely to visit another forest if they could not gain access to their chosen one. The FIS scale developed may be useful in further studies as a means of assessing how a community is likely to respond to the creation of a new forest area or the opening up of a new forest for recreation. In particular, where telephone or postal surveys are to be used, it may provide a simple measure of attitudes towards forest importance and therefore forest usage. It was also shown to be a statistically significant independent variable when modelling tourism visits to forest sites.

CONCLUSIONS AND RECOMMENDATIONS

20. The study has examined the 'economic significance' of forest-related tourism day visit expenditures, the economic significance of forests in attracting tourists to the countryside as well as the link between attitudes towards forests and forest visiting behaviour.

21. It was estimated that the expenditures on tourism day visits to forests, that are attributable to the forests themselves, contribute around £2.3 billion to the GB

[7] The conceptual definition of an attitude used here is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993).

economy per annum. These figures do not take into account the expenditure undertaken through formally organised events in woodlands (e.g. sporting competitions) or that proportion of general holiday expenditures that could be attributable to forests for holidays involving forest-related activities. Nevertheless, it was estimated that in terms of economic significance this represented in the region of 3% of all tourism expenditure in GB. At present, the types of TGF models developed and used in this study to predict visits to forests are limited in their application. However, with some improvements in statistical robustness they have considerable potential to contribute to the development of local and regional economic development strategies and policies of forestry and non-forestry organisations. The key measures for improving their potential application should be:

- A comprehensive and co-ordinated programme for monitoring visits to a representative sample of publicly and privately owned woodland sites, including a common set of monitoring protocols and common definition of a "site".
- Improved data to more accurately assess the ratio of tourism to non-tourism day visits to forests and woodlands across GB.
- Further research into the development of model input variables, particularly in the use social psychology theory to explore factors motivating trip location decisions and the use of GIS to derive spatially explicit socio-economic and recreation variables.
- Household surveys regarding current and future forest tourism day visit behaviour.
- The development of a national database of publicly accessible forest "sites", both privately and publicly owned, including details on site characteristics and attributes.

22. The study also showed that forests play an important role in attracting people to the countryside, even where they don't visit forests specifically. On average across the areas considered, it was estimated that in the region of 13% of all tourism expenditures incurred in by tourists visiting and staying in these areas were "forest-associated tourism expenditures". For those areas more renowned for their forests, this estimate was even higher showing that the forests of these areas are an extremely important economic asset.

23. The study also developed a novel instrument for investigating individual's attitudes towards forests for recreation and how attitudes relate to behaviour. The study has shown that there is a clear link between individuals attitudes and their forest visiting behaviour. Again, as with the TGF models, the attitude scale has the potential to be used in the development of local forestry policies.

24. Together the results from the different parts of the study highlight the important and integral role of woodland and forests in the tourism economy. In terms of recommendations, these findings suggest the need for:
    - close integration of woodland and forestry policies with those on tourism, recreation and land use;
    - close liason between the Forestry Commission and those organisations charged with the responsibility for collecting statistical data on tourism in GB;

- further development and promotion of multi-purpose forestry by public and private organisations.

CHAPTER 1 INTRODUCTION

1.0 THE STUDY

Forests, woodlands and trees provide what may be termed amenity services. These attract people to visit forests specifically, and to countryside areas more generally, where the presence of trees and woodland contributes to the amenity value of the landscape. These visits necessarily involve expenditure which provides income to local businesses, supports employment and economic output. A proportion of these visits can be classified as 'tourism' visits. Understanding the influence that forests and forestry practices have on tourism visits and expenditures is important for those bodies charged with their management. Building on an earlier scoping study (Roberts *et al*., 2000), this study was commissioned by the Forestry Commission in November 2001 to provide greater understanding of "Forests' Role in Tourism".

1.1 AIMS OF THE STUDY

The primary aim of this study was to quantify the economic significance of forest-related tourism expenditures in England, Scotland, Wales and at the Great Britain (GB) level. This was based on the premise that a proportion of all tourism expenditure in GB is incurred by tourists undertaking forest-related recreational activities. Here the specific focus was on day visits to forests. However, the presence of trees and woodlands can also attract tourists to the countryside more generally. The second specific aim of the study was to quantify the economic significance of forests in relation to tourism in the countryside. A third aim was to measure the attitudes of tourists towards the environment and forests, and to investigate links between these attitudes[8] and tourist visitor behaviours. Undertaking a visit to a forest or the countryside, and spending money to do so, are specific examples of individual behaviour. Understanding the factors that motivate these behaviours can provide useful information for those organisations engaged in managing forest-related tourism.

1.2 CONCEPTS AND DEFINITIONS

The main aim of the study is concerned with an analysis of "**economic significance"**. This is an estimation of the economic importance of an activity to a country's economy based on expenditure taking place within the economy. The relevant focus here is the amount of direct expenditure associated with forest-related tourism and the importance or significance of this in terms of supporting existing businesses and employment. In the absence of forest-related tourism, this expenditure might have occurred in another form elsewhere in the economy. Thus, economic significance analysis can be distinguished from "**economic impact"** analysis, which is concerned with the impact of policy intervention or "new money" being injected into an economy.

The first part of the study focussed on day visit tourism only. There is no single agreed definition of a "tourism day visit", and all definitions used are necessarily arbitrary. It is common for definitions to be based on the duration of the trip (in terms

[8] Attitudes are generally considered to be a major motivational factor influencing behaviour.

of hours spent on the trip), distance travelled on the trip and/or the type of activity undertaken. For the purpose of this study **"tourism day visits"** included (i) day visits from home that lasted 3 hours or more[9], and (ii) all day visits made by holidaymakers regardless of trip duration. The focus of the economic significance analysis was the expenditures incurred on undertaking tourism day visits to forest sites. A visit to a forest site may be only one activity on any day visit. The term "**forest-related**" expenditure refers to that proportion of the expenditure that is directly "related" to the forest site visit. Once again, there is no single agreed definition of a "**forest site**". Further consideration is given to this matter in Chapter 2. However, at a general level, the term "forest site" is used here to refer to a distinct location that is characteristically wooded or partially wooded. As well as the actual woodland, the forest site itself includes man-made site attributes such as paths, visitor centres etc. and natural physical site characteristics such as water features (rivers, lakes etc.) located within the site. In the second part of the study, the focus was on forests at the landscape, rather than site, level. In this context, "**forests"** were defined broadly to include all trees and woodland in the landscape.

The third part of the study is focussed on attitudes towards forests for recreation, and the environment more generally. Attitudes are generally considered to be a major motivational factor influencing behaviour. The conceptual definition of an "**attitude"** used here is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993). Again, in this part of the study, forests were defined in general terms to include all trees and woodland in the landscape.

A detailed explanation of specific terms can be found in the Glossary, presented as an Annex to this report.

1.3 THE STRUCTURE OF THE REPORT

This report presents a summary of the methodological approaches adopted for the study and the results of the analysis. Full details of the literature review, the study methods and results are presented in an accompanying Main report. This Summary report is set out in six chapters. Following the introduction in Chapter 1, Chapters 2 and 3, are concerned with quantifying the economic significance of expenditures associated with tourism day visits to forests in Great Britain (GB). Chapter 2 presents the methods adopted, whilst Chapter 3 presents the results. Chapter 4 considers the economic significance of forests to tourism in the wider countryside, whilst Chapter 5 outlines the methods and key results of the investigation into the linkages between attitudes towards the environment and forests and tourism behaviour. Chapter 6 presents a summary of the study along with conclusions and recommendations.

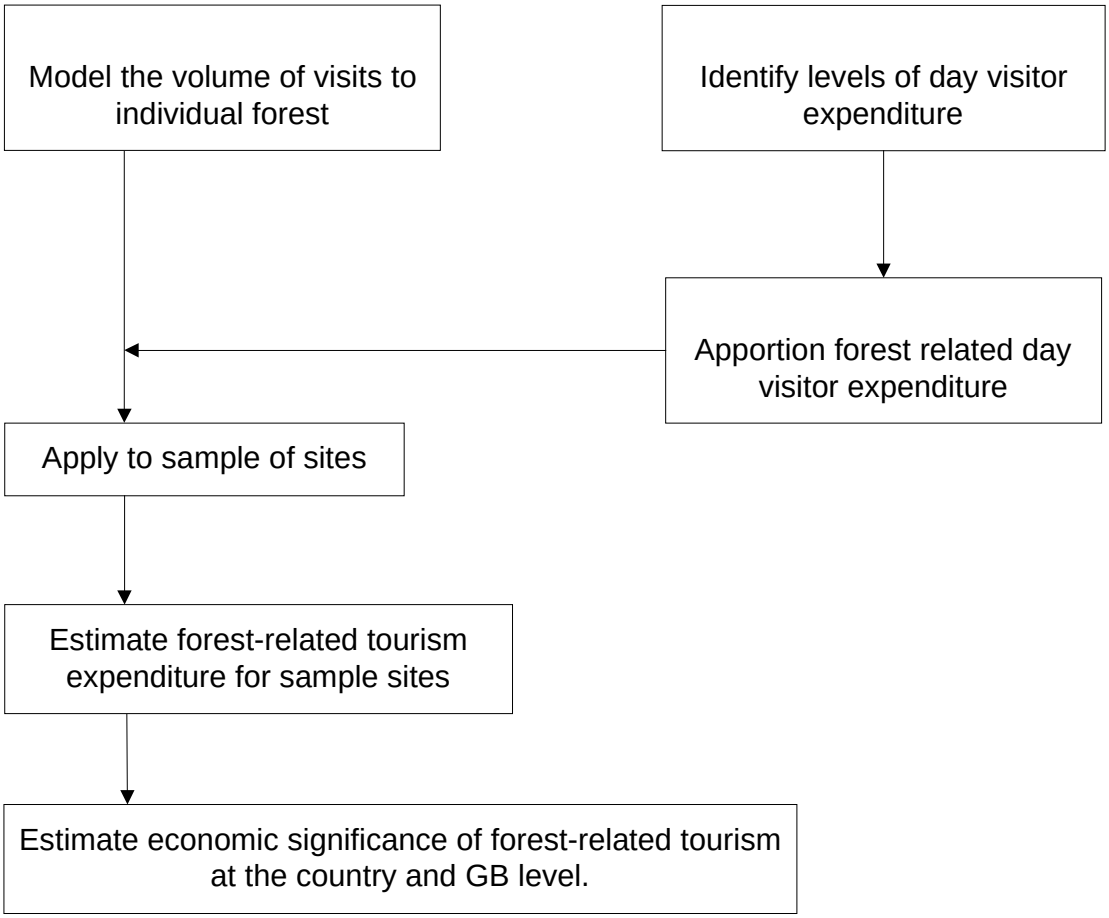
[9] This is the same trip duration used to distinguish tourism from leisure day trips in the UKDVS 1998.

CHAPTER 2 QUANTIFYING THE ECONOMIC SIGNIFICANCE OF FOREST TOURISM – AN OVERVIEW OF THE METHOD

2.0 INTRODUCTION

This chapter presents the methodological approach adopted to quantify the economic significance of forest-related day visit tourism expenditure in GB. Figure 2.1 presents the key building blocks required for estimating the economic significance of forest-related day visit tourism expenditures.

Figure 2.1 Stages to estimate the economic significance of forest tourism day visits



The first stage was to develop a transferable model that could be used to estimate the volume of tourism day visits made annually to individual publicly accessible woodlands in GB. The second stage was to develop an approach to estimate the level of expenditure incurred by tourists on day trips to forests and to establish the forest-related proportion of this expenditure. The next stage was to apply these methods to all publicly accessible woodland sites in GB. The final stage was to estimate the economic significance of forest-related tourism expenditure in England, Scotland, Wales and at the GB level. This chapter outlines the general approach adopted for each stage of this part of the study.

2.1 MODELLING DAY VISITS TO FORESTS

A key objective of the study was to develop a method to predict the numbers of "tourism" day visits to individual publicly accessible forest sites in GB. For the purpose of this study, a transferable Trip Generating Function (TGF) was used. The basic analytical method involved fitting various linear regression models with the natural logarithm of forest visitor counts as the dependent variable[10]. The resulting TGF predicts the mean values of the dependent variable for a linear combination of the independent (predictor) variables, and shows *ceteris paribus* impacts of each predictor on the dependent variable. This approach follows that of Brainard *et al.*, (2001), who demonstrated how forest recreation demand can be modelled quite locally using just site specific characteristics, simple measures of population and availability of competing woodlands as input. Here, we extend and improve upon this method by:

- extending the geographical coverage to include all three countries of mainland GB;
- encompassing data from privately and publicly owned woodlands in the development of the models;
- incorporating many more observation sites in the models; and
- transferring developed models to predict visitor numbers at un-surveyed sites.

Two main approaches to the development of a TGF were considered in this study. The first approach, referred to here as the 'forest' model, predicts the number of tourism visits made to a specific forest for a given time period, and has the basic functional form:

$$Visits_i = f\ (Att_i, Pop_i, Sub_i, Char_i) \qquad (1)$$

Where $Visits_i$ is the number of tourist visits made to forest *i*, Att_i are variable(s) to reflect the attributes of site *i*, Pop_i is a variable for the population that lives within a given travel time(s) of forest *i*,; Sub_i is a variable to represent the accessibility of substitute forest sites from outset zones and $Char_i$ are variables to indicate the socio-economic characteristics of the population within a given travel time(s).

[10] The negative binomial and Poisson distributions have often been applied to represent the distributions of visits and trips, which contain non-zero positive integer data. These were attempted here but the data gave a very poor model fit. It was therefore decided to follow Brainard *et al.*'s (2001) approach and take the natural logarithm of the visit count as the dependent variable. Indeed, many studies incorporating UK travel cost models for forest recreation have concluded that the semi-log form provides the most satisfactory model specification.

The second approach, referred to as the 'individual' model, aims to predict the number of visits made by an individual to a specific forest for a given time period, and has the basic functional form:

$$Visits_{ij} = f(Att_i, Dist_{ij}, Sub_i, Char_j) \quad (2)$$

Where $Visits_{ij}$ is the number of tourist visits made to forest *i* by individual *j*, $Dist_{ij}$ is the distance to forest *i* from individual *j*'s place of residence (or holiday base), $Char_j$ are socio-economic characteristics of individual *j*. Att_i and Sub_i are as before.

The advantages and disadvantages of each approach are detailed in the accompanying Main report, whilst the specific primary and secondary data requirements for the dependent and independent variables used in the modelling exercise, and data collection methods are outlined in section 2.4 below.

2.2 ESTIMATING FOREST-RELATED TOURISM DAY VISIT EXPENDITURES FOR FOREST VISITORS

The TGF model can provide an estimate of the number of visits made to any given forest. In order to assess the economic significance of these visits it is necessary to quantify expenditures incurred on these visits and the proportion that is forest-related. Expenditure levels and patterns vary considerably between different visitor types, as does the proportion of expenditure that can be considered forest-related. This section sets out the visitor classification used in the project and the general method for identifying tourism expenditures as forest-related.

2.2.1 A visitor classification

There are a number of ways of classifying tourism day visitors. One distinction is between day visitors from home and day visitors from holiday bases. A further distinction can be made in relation to the importance of forests in motivating day visits. In Phase 1 of this study, Roberts *et al*., (2000) identified three relevant types of tourist:

- Forest only visitors: Visitors who make a conscious decision to visit a specific forest on their day trip and for whom the forest is of central importance to their decision to make the trip.

- Forest combined visitors: Visitors who combine a visit to a forest with other activities on their day trip, and for whom the forest is of less importance to their decision to make the trip.

- Casual forest visitors: visitors who did not specifically set out to visit a particular forest site on their day trip but, during the course of their outing, decide to spend some time in a forest. The forest plays no role in motivating their day trip, which would be made regardless of whether or not a specific forest existed.

Figure 2.2 presents the classification of visitors for the purpose of this study showing differences in trip motivation and expenditure levels. *A priori*, one would expect the largest forest-related tourism expenditure levels from visitors falling within category V_{11} and V_{12}, since visits to forests are their primary activity.

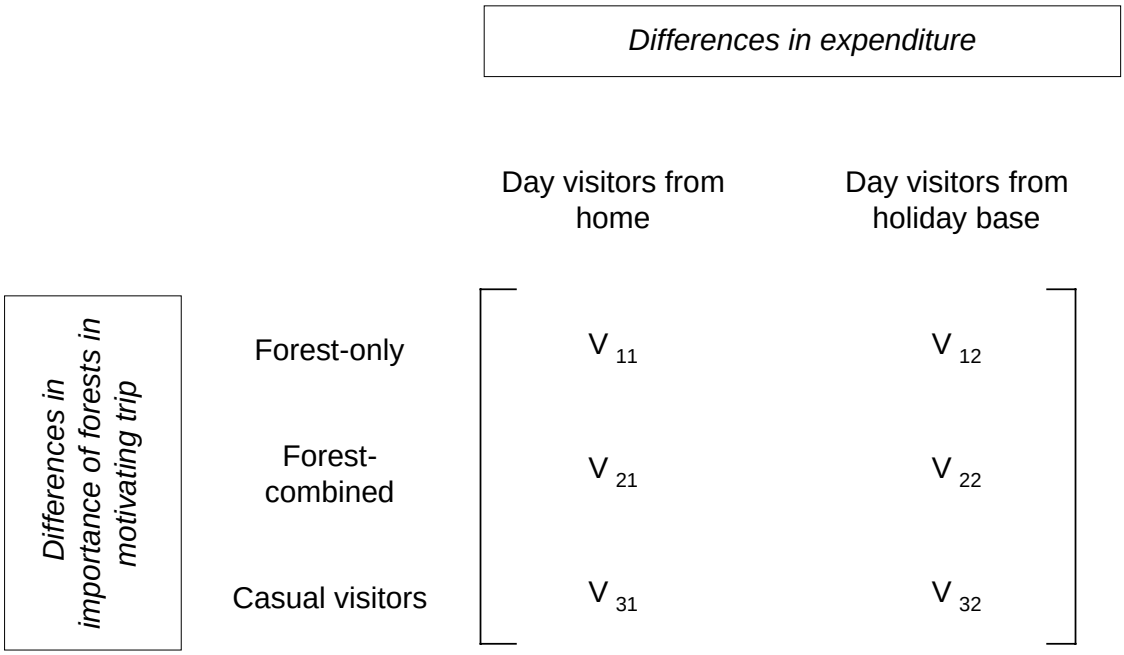


Figure 2.2 Different visitor types to be distinguished in the forest study

Information on total expenditure per day visit was collected in a survey of visitors to forests, the detail of which is presented in section 2.4. In order to estimate the proportion that was forest-related, the "expenditure partition" method, identified in Phase 1 of this study (Roberts *et al*., 2000), was adopted. The general approach is based on a scoring or ranking system, where visitors are asked to rank the importance of various factors relating to a particular behaviour, in this case visiting a forest. Visitor expenditure is then apportioned appropriately to each factor. For this study, following earlier examples of the partition method (e.g. Harley and Hanley, 1989 and Crabtree *et al*., 1994), 100% of the day visit expenditure of "forest only" visits was assumed to relate to forest-tourism. Conversely, for casual forest visits where it is assumed that the trip would have been made regardless of the existence of forests, 0% of day visit expenditure was assumed to be forest-related[11]. For "forest combined" visits, expenditure was apportioned based on the importance of the forest in motivating the trip, relative to other trip motivating influences. In addition to the forest visit, forest-combined visitors were asked to specify up to four other reasons why they had made their day trip and to score each reason (including the forest visit) from 1-10, where 1 was not important and 10 was very important. The forest score was then divided by the sum of the scores for all reasons for making the trip, with the resulting proportion being used as the basis of apportioning the total trip expenditure for that respondent. The method adopted means that the importance of the forest visit in motivating the day trip could range between 2-91%, i.e. where forests are scored 10

[11] The decision to visit a forest could have resulted in an increase or a decrease in the overall expenditure incurred on the trip, depending on the type of activity foregone by visiting a forest. However, it is assumed here that this impact is neutral.

and only one other reason is specified and scored 1, then the importance of forests is 10/11 (91%), where four other reasons are specified and scored 10 and forests are scored only 1, the importance of forests is 1/41 (2%).

Partition methods are arbitrary but provide a transparent and logical method for apportioning expenditures. A summary of the general approach proposed for apportioning total tourism expenditures to forest-related tourism for the three main categories of visitor is set out in Table 2.1.

Table 2.1 General approach for apportioning total tourism expenditures to forest-related tourism

Visitor category	Forest-related tourism
Forest specific– forest only	100%
Forest specific– forest combined	Apportioned between 2-91%
Casual forest visitors	0%

The expenditure figures considered here are only those incurred on the day visit. For day visitors from a holiday base this will represent only a proportion of the overall cost of a holiday, which may include accommodation, travel and insurance costs etc. Where a holiday involves forest-only or forest-combined day visits, as opposed to forest-casual trips[12], it could be argued that some of the expenditure associated with the overall holiday is also forest-related and could, therefore, be included in any analysis of economic significance of forest-related tourism at the country level. However, this study did not attempt to quantify these expenditures.

2.3 ESTIMATING FOREST RELATED TOURISM EXPENDITURES AT SITE, COUNTRY AND GB LEVEL

The overall aim of this part of the study was to estimate the economic significance associated with forest-related tourism expenditure at the site, country and GB level. The methods outlined in sections 2.1 and 2.2 are used to estimate the volume and value of visits to individual sites. In order to scale up to a country and GB level it would be necessary to apply these methods to all publicly accessible forests in GB, both privately and publicly owned. However, at present no database exists that identifies the total number of woodland sites in GB or how much of it is open to public access. Thus, visits and expenditure were estimated for those sites for which data was available. In the absence of adequate site data, total forest-related tourism visits and expenditure at the country and GB level were estimated drawing on visitor data in the 1998 UK Day Visits Survey (UKDVS) (Countryside Agency, 1999).

2.4 PRIMARY AND SECONDARY DATA COLLECTION METHODS

The methods outlined in sections 2.1 and 2.2 were dependent on a combination of primary and secondary data, specifically:

1. TGF dependent variables:

(i) Visit numbers at specified forest sites ('Forest' model)

(ii) Individual visits to specified forest sites ('Individual' model)

[12] For holidaymakers that make no visits to a forest whilst on holiday, or only make forest-casual visits, none of their day visit or holiday expenditure is considered forest-related. However, forest may be of some local economic where individuals are attracted to an area by the them. The significance of forests in relation to countryside visits is considered in more detail in Chapter 4.

2. TGF independent variables:
(i) Forest attributes
(ii) Data within specified travel time zones around each forest for:
   (a) population ('Forest' model only)
   (b) substitute accessibility index for woodlands
   (c) socio-economic characteristics of population
   (d) individual specific characteristics including attitudes and socio-economic characteristics and trip specific characteristics including distance travelled ('Individual' model only)

3. Day visit tourism expenditures

This section considers these data requirements in more detail and outlines the methods used for data collection.

2.4.1 Site visits data for the 'forest' model

The dependent variable in the 'forest' model (equation 1) is the annual number of tourism visits made to specific forests. Thus, the modelling exercise is dependent on the availability of "reliable" secondary data on visit numbers to forest sites. The quality of the visit data is a key determinant of the ability of regression models to explain the variability in the data and therefore the ability of the TGF to predict future visits, whilst the extent to which the data is representative of all woodlands and forests in GB, both privately and publicly owned, is a key determinant of the transferability of the TGF model.

After extensive enquiries, only three organisations were able to provide visit number estimates for a recent 12-month period to specific forest sites. Visit numbers were available for a total of 101 sites, of which 68 were Forest Enterprise (FE) owned sites across GB, the Royal Society for the Protection of Birds (RSPB) provided data for 18 sites located throughout GB, and the Woodland Trust in Scotland (WTS) provided data for 15 sites in Scotland[13]. A summary of the sites by ownership and country is given in Table 2.3, and the sites are mapped in Figure 2.3.

Table 2.2 Available woodland/forest sites with reliable visitor number data

	Forest Enterprise	RSPB	Woodland Trust Scotland	Total
England	35	9	0	44
Scotland	21	5	15	41
Wales	12	4	0	16
Total	68	18	15	101

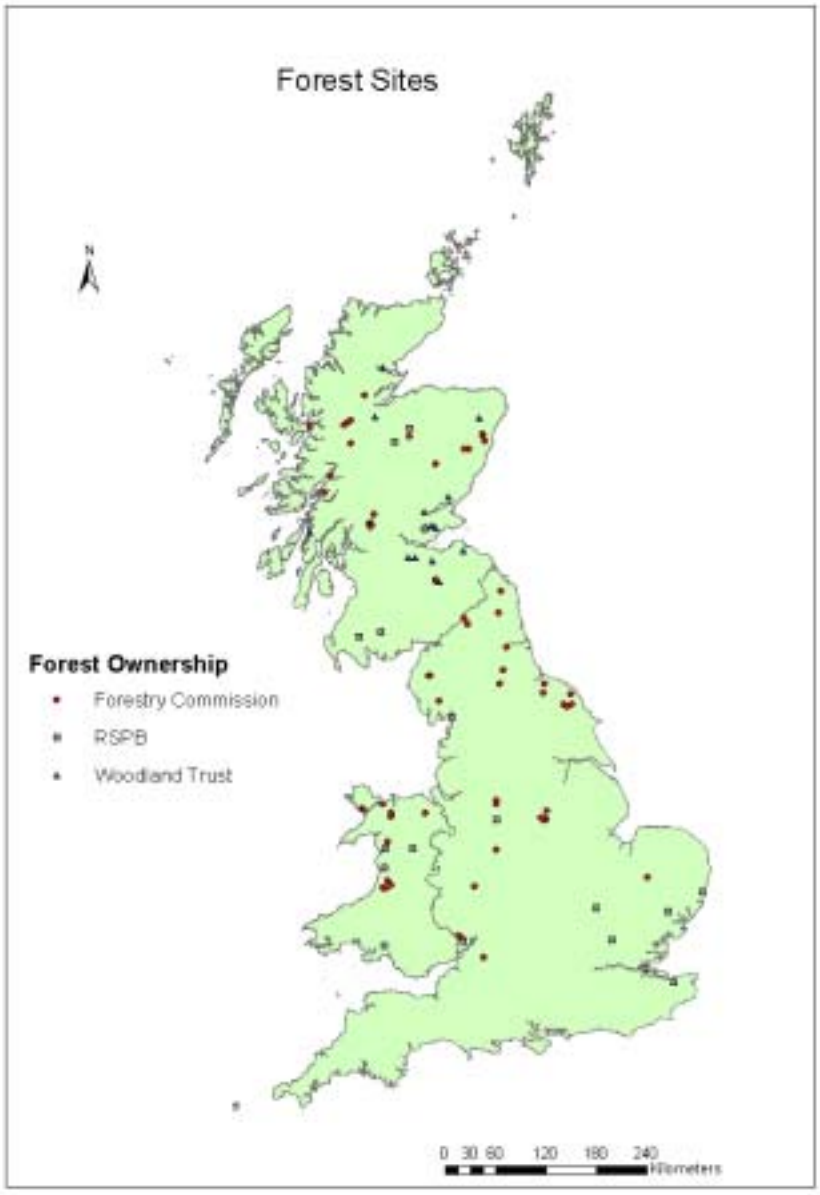
No clear or rigorous definitions of a "site" were provided by the FE, RSPB or WTS organisations. However, the following definitions were derived from a consideration of the information provided by, and in discussion with, the respective organisations.

[13] The visitor data used in this study was for 'all' visits made to each forest and did not distinguish between 'tourism' visits and 'non-tourism' visits. Data to split visitors between tourists and non-tourists was obtained through the survey of visitors to a sample of sites, further details of which are given below.

The RSPB sites are entire individual nature reserves characterised by a significant presence of woodland. The visit numbers to the "site" represent the visits to the nature reserve not just the woodland part of the nature reserve. The Woodland Trust for Scotland sites are individual areas of the Woodland Trust Estate. Visits were counted at all access points to each WTS site. Thus, the visit numbers represent the visits to the whole area included in the WTS Estate, not just to the wooded part of the Estate. In contrast, the FE sites were single access points to a forest area (not specifically a block or compartment). Thus, relative to the RSPB and WTS sites, where visits may be counted at more than one access point, the visit numbers for FE woodland/forest may be understated. The inconsistency in the definitions of a site used by the different organisations introduces some ambiguity in terms of what is being modelled. However, in the absence of alternative sources of data, site data based on all three definitions were included in the modelling exercise.

A list of the individual sites and the methods used to collect the data are presented in detail in the Main report. However, a few points regarding the representativeness and reliability of the data are worth noting here. 'Reliable' data on visitor numbers to forest sites, however defined, is relatively scarce. For the data that is available, there is considerable scope for introducing error into the visit counts during its collection. The data may be collected by one of a variety of different counting mechanisms, some of which are more reliable than others. These include electronic vehicle counters, pay and display counters, pedestrian counters, pneumatic counters, "magic eyes", forest drive tickets, cycle counters and manual "hand" counts. Depending on the mechanism, it may be necessary to translate the actual counts produced into individual visits using a range of assumptions, for example, the average number of individuals per car parked at a pay and display car park. Further problems arise where the data is collected for only part of the year. Here again assumptions have to be made about the pattern of visits to individual sites during the period not monitored. These assumptions are more transparent for some data than others. The data set used for this study was collected using a combination of count mechanisms. The individual organisations that collected the data made their own assumptions in order to estimate the final visit counts. Whilst it would have been possible to take some of these potential sources of uncertainty and error into account in the modelling exercise if they were quantified, no such data was available for the survey based estimates of visit numbers available for use in this study.

Figure 2.3 Location of sites with 12 month visitor data



Outline based on Bartholomew's Digital Database

2.4.2 Forest attribute data for the 'forest' and 'individual' models

Both the 'forest' and 'individual' modelling approaches require data regarding forest attributes as a key input. There are a number of site attributes relating to the size, type and nature of the forests as well as a wide diversity of natural and man-made features present at woodland locations that may influence the type and number of visitors. Data on a range of woodland facilities and quality attributes were collected (or confirmed where already available on organisation web sites) for the 101 sites through a survey of forest managers. Around 50 FE, RSPB and WTS forest managers were

contacted and requested to complete an attribute checklist, to which the majority responded. A copy of the checklist and a summary of the results of the survey are presented in the Main report.

2.4.3 Primary visitor data and expenditure data

The 'forest' and 'individual' models required primary data on the number, type and frequency of forest visits, whilst primary data was also required on day visit expenditures. This data was collected in a visitor survey, the specific aims of which were:

- To provide visitor and trip specific data to inform the development of the "forest" and "individual" TGF models;
- To collect data on the tourism expenditures of visitors to forests
- To collect data on the importance of forests in trip decisions for apportioning forest-related tourism expenditures;
- To collect data on the attitudes of forest visitor towards the environment and forests for recreation (see chapter 5).

The structured questionnaire[14] comprised of seven main sections:

1. Introduction to questionnaire
2. Identification of the type of tourist
3. Visit and visitor characteristics
4. Forest importance in visit decisions
5. Visitor expenditure
6. Attitudes towards the environment and forests
7. Socio-economic characteristics

The survey was carried out at a sample of 44 sites from the 101 sites identified above. The sample was stratified geographically, by ownership and in terms of visitor numbers. In order to ensure that differences in expenditure patterns between the three study countries were captured, an approximately equal number of sites were selected in each country. Within each country, sites were selected to represent a broad geographical distribution. Of the 44 sites selected, 30 were owned by Forest Enterprise, whilst five sites were Woodland Trust owned and nine owned by the RSPB. The sample was also stratified by size of site, in terms of visitor numbers. All sites in the sample frame were classified into one of three groups[15] based on annual visitor counts: small (up to 15,000 visitors per annum) medium (between 15,000 and 70,000 visitors per annum) and large (over 70,000 visitors per annum). An approximately equal number of sample sites were selected from each size group. A summary of the sample is presented in Table 2.3 and the geographical distribution presented in Figure 2.4.

[14] A copy can be found in the appendix to the Main report.

[15] The size brackets are arbitrary, dividing the sample frame into three groups of approximately equal size.

Table 2.3 Summary of sample sites

		Number of sites by ownership/management		
	Number of visitors	Public	Private*	Total
England	Small (<15K)	1	2	3
	Medium (15K-70K)	1	2	3
	Large (>70K)	9	0	9
	Total	11	4	15
Scotland	Small (<15K)	2	3	5
	Medium (15K-70K)	5	2	7
	Large (>70K)	1	1	2
	Total	8	6	14
Wales	Small (<15K)	4	3	7
	Medium (15K-70K)	5	1	6
	Large (>70K)	2	0	2
	Total	11	4	15
GB	Small (<15K)	7	8	15
	Medium (15K-70K)	11	5	16
	Large (>70K)	12	1	13
	Total	30	14	44

*RSPB or Woodland Trust

The sites were also selected to ensure specific site attributes were represented in sufficiently large numbers in order to be able to test for significance in terms of influencing visit numbers and to avoid problems of collinearity. The site attributes most likely to be statistically significant in influencing forest visit numbers were identified from the literature review, and included visitor centres, picnic sites, cycle trails etc.

2.4.4 Secondary data on number and socio-economic characteristics of population and substitute woodlands

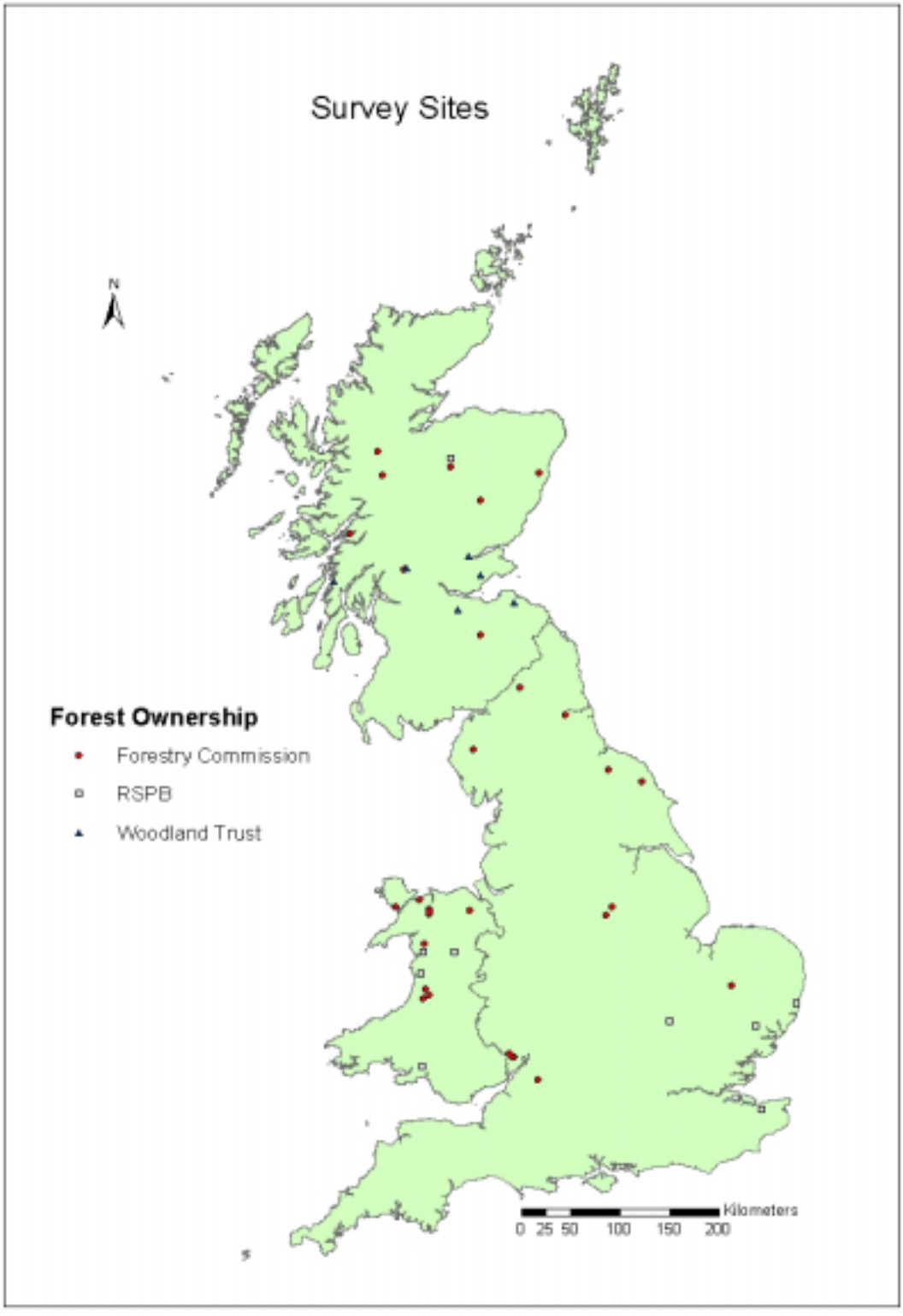
Based on previous studies, independent variables relating to the size and characteristics of the local population and the availability of substitute tourist destinations can influence the number of visitors to a given woodland site. Extensive use was made of Geographical Information Systems (GIS) to collect data. Following Lovett *et al.* (1997) and Brainard *et al.* (2001) six travel time zones around each forest site were defined using cost-distance modelling. The travel time bands were:

(i) 0-15 minutes
(ii) 15-30 minutes
(iii) 30-45 minutes
(iv) 45-60 minutes
(v) 60-90 minutes
(vi) 90-120 minutes

A range of demographic information was summarised for each zone. Following Jones *et al.* (2002), an index of relative accessibility to substitute forests was devised based on the availability of other woodlands in the proximity of visitor outset locations (i.e.

enumeration district or census output area centroids) in relation to a given forest site. Full details of the methods used are set out in the Main report.

Figure 2.4 Location of 44 forest survey sites



Outline based on Bartholomew's Digital Database

CHAPTER 3 QUANTIFYING THE ECONOMIC SIGNIFICANCE OF FOREST TOURISM – A SUMMARY OF THE KEY RESULTS

3.0 INTRODUCTION

The results for the quantification of the economic significance of forest-related tourism are presented in five main sections. The first section presents a summary analysis of the primary visitor data collected in the visitor survey. The second section presents the results of the TGF modelling which drew on the results from the visitor survey. The third section presents the results of the application of the TGF and expenditure models to a sample of sites in GB. The fourth section presents estimates of the economic significance of forest-related tourism at site level. The fifth section presents estimates at the country and GB level.

3.1 FOREST VISITOR SURVEY

This section presents a summary of the key results from the visitor survey. A more detailed presentation of the results is given in the Main report. A total of 1,906 face to face interviews with adults (aged 16 or over) were undertaken at a stratified sample of 44 sites located throughout England, Scotland and Wales. They were carried out during the months of July, August and September 2002 and spread across weekdays and weekends. Interviews were generally conducted at entrance/exit points of each forest site. Each site had one interviewer and respondents were selected for interview on a continuous survey basis, where-by the next person to pass the interviewer after completion of the previous interview was approached. Where a group of people were approached, one person was selected for interview. A quota of 45 interviews was set at each site, although not completed at some sites where visitors were particularly sparse. No other quotas were set.

3.1.1 The sample

Table 3.1 presents the data analysed by trip type and between GB residents and visitors from overseas. The data is presented for the whole sample and has not been weighted to take into account country stratification. Overall, 96% of respondents were resident in GB. This is consistent with findings from other recent surveys of visitors to woodland sites in GB.

Table 3.1 Trip type by origin of respondents[#] (%)

	n	GB	Overseas
On a short trip (of less than 3 hours) from home	*922*	100	0
On a day out (of more than 3 hours) from home	*211*	100	0
On a holiday away from home staying in area	*618*	92	8
On holiday visiting friends and relatives in area	*83*	83	17
Passing through area to/from holiday destination	*57*	79	21
Other	*5*	100	0
Total	*1896*[*]	96	4

*# Sample from summer 2002, GB data not weighted to account for country stratification, * Shortfall due to incomplete questionnaires*

Over half (51%) of all GB resident respondents were on a short day trip from home of less than 3 hours and were not, therefore, counted as a 'tourism' visit for the purpose

of this study. Not surprisingly, all respondents on a day trip from home were GB residents. Only 8% of those on holiday staying in the area were overseas visitors, although this represents about two thirds (64%) of all overseas respondents. Table 3.2 presents the same breakdown but for the tourism visit categories only, analysed by country.

Table 3.2 Type of trip for all respondents by country (%)

	E	S	W	GB[#]
N	*340*	*264*	*370*	*974*
On a day out (of more than 3 hours) from home	35	29	5	22
On a holiday away from home staying in the area[*]	47	56	84	63
On holiday visiting friends and relatives in the area[*]	12	7	6	9
Passing through the area[*] to/from your holiday destination	6	8	5	6
Total	100	100	100	100

E = England, S= Scotland and W = Wales. * The area was undefined, with the respondent deciding whether they were staying in the "area" or not. # This is a simple mean of the data and is unweighted, i.e. it does not take into account country stratification.

The differences in the pattern of trip types between countries was statistically significant (chi-square 130.8, $p < 0.001$), with tourist visitors in Wales much more likely to be holidaymakers than in England and Scotland. The reason for such a low resident to holidaymaker ratio in Wales is not immediately obvious, and could be due to a bias in the sample sites selected. In the total (unweighted) GB sample, only around a fifth of all tourism visits were made by GB residents on a day trip from home, with 78% being made by holidaymakers. This is higher than that found in an analysis of Forestry Commission data, where only 62% of tourism visits to forests were made by holidaymakers[16]. However, it is possible that both studies were subject to sample bias.

3.1.2 The importance of forests in trip location decisions

As set out in Chapter 2, the general method for apportioning forest-related tourism expenditure requires that a distinction be made between forest visits on the basis of trip purpose. Respondents were asked whether:

- they had specifically set out to visit the forest and not do anything else,
- they had set out to visit the forest as part of a trip combining a range of activities, or
- they had not initially intended to visit the forest but had decided to visit while passing.

Table 3.3 presents 'tourism' visits analysed by current trip purpose

Table 3.3 Trip purpose for tourist forest visits (%)

	E	S	W	All
n	*340*	*264*	*370*	*974*
Forest only	76	62	65	68
Forest combined	17	23	17	19
Casual	7	15	18	13
Total	100	100	100	100

[16] From an analysis of 32,000 interviews at GB forests sites undertaken by the Forestry Commission.

E = England, S= Scotland and W = Wales.

For 68% of all tourism day trips the forest visit was the main reason for the trip, whilst 19% combined their forest visit with other activities on their day trip. Only 13% had not initially intended to visit a forest on their day trip. There was a significant difference between countries in terms of the percentage of visits made by each trip purpose (Chi-square 30.65, $p < 0.001$). That is, tourists in Wales and Scotland on a day trip are more likely to combine their visit to a forest with a visit to another destination, than tourists in England on a day trip. Once again, it is not immediately clear why this should be the case, but it may be related to the higher proportion of holidaymakers surveyed in Scotland and Wales.

3.1.3 Tourism expenditure

Individuals were asked to specify for their current trip, the amount they or their group[17] had spent or expected to spend for their trip. Table 3.4 presents the mean day visit expenditures for 'tourism' visits (as defined in Section 1.2), split between day visits from home and day visits from holiday bases[18].

Table 3.4 Mean total expenditure by type, region and purpose (£ person^{-1} visit^{-1})

Region	Type	Forest only	Forest-combined
England	Day out from home	6.39	9.60
	Day out from holiday base	8.44	23.16
Scotland	Day out from home	5.93	5.24
	Day out from holiday base	12.57	14.97
Wales	Day out from home	10.97	10.33
	Day out from holiday base	7.15	8.15

* These values refer to day visits from home of over 3 hours and to all day visits from a holiday base. Visits from home of less than 3 hours are excluded.

For England and Scotland, mean total expenditure is higher for holidaymakers than for day visitors from home. However, this is reversed in Wales, where day visitors had the highest and the holidaymakers the lowest mean total expenditure levels for the three countries[19]. Overall the figures are in line with those reported by the UKDVS for tourism[20] day trips to the countryside of £15.20 and to woodlands of £8.90 in GB respectively (Countryside Agency, 1999). From the visitor survey, the proportions of mean total expenditure for the different expenditure categories for 'Forest Only' trips are presented in Table 3.5.

[17] Where expenditure figures were given for a group they were divided by the party size to get the mean expenditure per person per trip.
[18] Due to the relatively small numbers of visitors in each category, a single holiday maker category was used.
[19] The reason for this is not immediately apparent.
[20] The UKDVS definition of a tourism visit is a trip with a duration of 3 hours or more and non-regular in nature, for day visits from home only.

Table 3.5 Expenditure per category for Forest Only tourist visits expressed as proportion of mean total expenditure figures (%)

	England		Scotland		Wales	
	Trip from home	Trip from holiday base	Trip from home	Trip from holiday base	Trip from home	Trip from holiday base
n	*96*	*157*	*54*	*99*	*12*	*220*
Travel	45	34	58	26	58	42
Food/drink	33	49	39	39	24	34
Entertainment	16	8	0	13	0	5
Clothing etc.	0	0	0	1	0	1
Gifts/souvenirs	5	5	0	6	11	17
Other	1	4	3	15	7	1
Total	100	100	100	100	100	100

The proportion of mean total expenditure for each expenditure for 'Forest Combined' trips is presented in Table 3.6.

Table 3.6 Expenditure per category for Forest Combined tourist visits expressed as percentage of mean total expenditure figures (%)

	England		Scotland		Wales	
	Trip from home	Trip from holiday base	Trip from home	Trip from holiday base	Trip from home	Trip from holiday base
n	*14*	*41*	*11*	*49*	*3*	*59*
Travel	41	16	57	24	60	41
Food/drink	52	70	36	36	40	35
Entertainment	6	4	0	13	0	6
Clothing etc.	0	0	0	1	0	4
Gifts/souvenirs	1	6	6	7	0	13
Other	0	4	1	19	0	1
Total	100	100	100	100	100	100

Overall, these figures are broadly consistent with those reported by the UKDVS for the pattern of expenditure of tourist day visit trips from home to woodland (Countryside Agency, 1999). However, the small sample sizes for some categories of visitor suggest due care is required when using the results at a country level.

3.1.4 Apportioning tourism expenditures for combined trips

The general method for apportioning forest-related tourism expenditure was set out in Chapter 2. In order to inform the 'expenditure partition' approach, it was necessary to gauge the relative importance of forests in motivating combined trips compared to other reasons for making a trip. Respondents were asked to specify up to four[21] reasons why they had made their say trip, other than to visit the forest, and score each reason from 1-10, where 1 was not important and 10 was very important. Respondents were then asked to score the importance of the visit to the forest in motivating their

[21] From the pilot survey most respondents generally specified four or less reasons for undertaking a day trip.

trip relative to their other reasons. Table 3.7 presents the mean forest score as a proportion of the mean sum of the scores for all trip motivating reasons analysed by country.

Table 3.7 Mean forest importance score as proportion of sum of scores for factors motivating day trips (%)

	E	S	W	Total
n	*55*	*59*	*58*	*172*
	46.7	44.7	42.8	44.7

E = England, S= Scotland and W = Wales.

The results show that the relative importance of the visit to a forest in motivating a combined trip is similar across the three countries, with the forest visit being only slightly more important in England, than in Scotland or Wales. Overall, the differences between the countries were not statistically significant. Thus, it was assumed that 44.7% of all expenditure for combined visitors was attributable to forest-related tourism. This is approximately midway between the possible range of 2-91% based on the method used.

3.2 MODELLING VISITS TO GB WOODLANDS

As set out in Chapter 2, an extensive regression modelling exercise was carried out, full details of which can be found in the Main report. For the purpose of this project the 'forest' model (equation 1) approach was preferred to the 'individual' model (equation 2) for practical reasons. The data for the dependent variable of the 'individual' model were derived from the survey of forest visitors and consequently suffered from truncation and sample selection bias (see Dobbs, 1993). Truncation bias occurred due to the fact that the model was based on forest visitor data only, with no data on individuals that chose not to visit the site. This would limit any application of the model to those individual residents and holidaymakers that chose to make at least one visit to the forest in question in the period under consideration. Despite the sample selection bias[22], most visitors surveyed made only one or two trips to any one forest site in any one year, giving a highly skewed distribution in trip frequency. The predominance of visitors who had many only one or two trips was even greater for 'tourism' visits; consequently there was insufficient variability in the data for a model to be fitted to tourists alone. A further drawback was the lack of data from which to accurately derive and characterise the resident and holidaymaker populations around each site that made 'tourism' forest visits, and to which any 'individual' TGF would need to be applied. The models presented in the remainder of this section are those used in the aggregation exercise. These are not necessarily the models with the greatest explanatory power, but were selected largely for pragmatic reasons. Full results of all 'individual' and 'forest' regression models investigated are presented in the Main report.

3.2.1 Model specification

Using the primary and secondary data collected for the 44[23] forest sites only, a model was developed to predict "tourism visits" at unsurveyed sites. Here the dependent variable was the total number of visits to a site in 1999, as measured by the managing

[22] Sample selection bias occurs due to the fact that a frequent visitor is more likely to be captured in the sample than an occasional one. Consequently, the sample will tend to contain more frequent visitors and fewer infrequent visitors than the population from which it is taken (Dobbs, I.M. 1993).

[23] One site was excluded from modelling due to missing data.

organisation, multiplied by the proportion of 'tourism' visits made to that site based on the results from the forest visitor survey (i.e. the ratio of tourism to non-tourism visits)[24].

Following the **general** form of the model set out on equation 1, independent variables were derived and selected from each of the following four groups:

a) Forest attributes and site location.
b) Population within six travel time zones around each forest.
c) Substitute accessibility indices for small, medium and large woodlands in six travel time zones around each forest.
d) Socio-economic characteristics of population within six travel time zones.

In the first instance a series of bi-variate correlations were fitted, taking each specified independent (predictor) variable in turn and examining its independent influence over the variation in the dependent variable. Results from this were then used to inform specification of multiple regression models, which take relative influences into account and aim to identify the most parsimonious models that explain visitor numbers to sampled woodlands using backward stepwise techniques. Full details of the predictor variables considered and the simple and multiple regression results are presented in the Main report. From the results of the bi-variate correlations, the variables considered for inclusion in the multivariate model are listed in Table 3.8. Only those variables for which 'reliable' data could feasibly be collected for the aggregation exercise were included. Certain variables that had a statistically significant influence, but for which the interpretation was ambiguous, were also excluded.

Table 3.8 Predictor variables included in the multivariate 'tourist' 'forest' model

Attribute variables	
ln(UNWT19)	Natural logarithm of un-weighted attribute index
TOILET	Toilet (1,0)
PICNIC	Picnic site (1,0)
CYCLE	Cycle track (1,0)
VIEWPNT	Viewpoint (1,0)
VISITCEN	Visitor centre (1,0)
Location variables	
ENGLAND	Site located in England (1), Scotland and Wales (0)
SCOTLAND	Site located in Scotland (1), England and Wales (0)
Population variables	
ln(UKTOUR)	Natural logarithm of annual tourist nights for UK residents in the tourist region*

* From the UKTS (2002).

[24] Due to the small size of the samples and the large confidence intervals around the resulting ratios, the ratios used were Bayesian estimates of probability.

The attribute variables included a number of individual site facilities and an un-weighted attribute index[25]. Also included were variables identifying site location (i.e. England, Scotland and Wales). The interpretation of the significance of these location variables is not immediately clear. They could feasibly be picking up a number of different factors influencing recreation demand. Nevertheless, they were included in the modelling exercise. The only population variable included in the multivariate modelling was the number of annual holiday staying nights by UK residents in the area around the site, a general indicator of the tourist population around the site. The best fitting model[26] was:

$$\ln(\text{VISIT99}_i) = \alpha + \beta_1 \text{PICNIC}_i + \beta_2 \text{TOILET}_i + \beta_3 \ln(\text{UKTOUR})_i + \beta_4 \text{ENGLAND}_i + \beta_5 \text{SCOTLAND}_i - \ln(p_i) + \varepsilon_i$$

where ln(VISIT99$_i$) was the natural logarithm of the estimated number of tourism visits at forest site i, α is the intercept, $\beta_{1,2,3,4,5}$ are slope coefficients and ε is the error term or residual. The results for the model are presented in Table 3.9.

Table 3.9 Multivariate model of tourism visits for a sample of 43 forest sites in GB –Model I

Variable	Coefficient	s.d.	95% Confidence Interval	90% Confidence Interval
Intercept	0.685	2.955	(-5.214, 5.489)	(-4.188, 6.436)
PICNIC	2.222	0.555	(1.138, 3.322)	(1.315, 3.138)
TOILET	1.546	0.468	(0.632, 2.477)	(0.783, 2.318)
ln(UKTOUR)	0.601	0.333	(-0.048, 1.262)	(0.059, 1.148)
ENGLAND	1.405	0.492	(0.434, 2.377)	(0.601, 2.216)
SCOTLAND	1.56	0.579	(0.421, 2.707)	(0.617, 2.512)

The square of the correlation between the fitted values from this model and the estimated 'observed' number of tourists to the site (number of visits in 1999 × estimated proportion of tourists from the model) is 0.61[27]. All coefficients of the predictor variables are positive. At the 95% confidence interval the coefficient for the ln(UKTOUR) variable includes zero. Thus, it is possible that at this level of confidence this particular variable may not explain any variability in the data. However, the coefficient for the ln(UKTOUR) variable is positive at the 90% level, justifying its inclusion. The same model was fitted omitting the two country dummy variables as there is some debate over their interpretation. The results are presented in Table 3.10.

[25] This is similar to the approach employed by Brainard *et al.* (2001) who used a number of facilities' variable to circumvent problems of multi-collinearity in trying to incorporate many site traits.

[26] The model was fitted using the Markov Chain Monte Carlo method. By fitting the model in this way it was possible to allow for the uncertainty in the proportion of tourists at each site (pi) which arises from the small sample size. For example, if no tourists were observed in a sample of 45 visitors to a particular site, this does not mean that the total number of tourists visiting the site is zero, since the 95% confidence interval for the proportion of tourists is between 0% and 8%. Estimates of the proportion of tourists at each site were obtained using the available data and a uniform (0,1) prior.

[27] This is an R^2 equivalent measure of the goodness of fit.

Table 3.10 Multivariate model of tourism visits to a sample of 43 forest sites in GB excluding country variables – Model II

Variable	Coefficient	s.d.	95% Confidence Interval	90% Confidence Interval
Intercept	0.356	3.19	(-5.995, 6.621)	(-4.902, 5.573)
PICNIC	1.915	0.546	(0.849, 3.006)	(1.026, 2.815)
TOILET	1.161	0.501	(0.186, 2.155)	(0.344, 1.986)
ln(UKTOUR)	0.806	0.358	(0.101, 1.518)	(0.220, 1.395)

The ability of the model to explain the variability in the data is reduced, with the square of the correlation between the fitted values and the estimated 'observed' number of tourists to the site being 0.50. Nevertheless, as in other similar studies the results show that a relatively high degree of variability in visitor data can be explained using simple models of population and site characteristics (e.g. Brainard *et al*., 2001).

3.2.2 Model transfer and validation

The models presented above drew on information from all sites for which visit and survey data was available. Although the extent to which these sites are representative of the population of forest sites in GB is unclear, in principle, the models specified above can be used to predict visitor numbers to other, unsurveyed, forest sites. The efficacy of transferring the models can be tested. Following Jones *et al*. (2002), the model was cross-validated by re-fitting a series of 'omit' models to predict visitor numbers for forest sites systematically excluded from the sample[28]. Resulting coefficients were used in conjunction with information on predictor variables for the omitted site to predict visitor numbers to that site. An observed-to-predicted ratio was then calculated to assess validity of the model, and in turn its suitability for aggregation. This provides a form of cross-validation[29] in that the same data set as was used to develop the model is not being used to assess the quality of predictions. Thus, prediction errors will not have an over-optimistic bias. The exercise also provides a 'transferred estimate' of visitor arrivals in that we do not have information on any other sites with which to test the efficacy of the model for aggregation purposes. Resulting transferred estimates and validation ratios are presented in Table 3.11**.**

[28] The validation exercises for Model I was carried out using Ordinary Least Squares (OLS) regression analysis with the log of the Bayesian tourism visit estimate as the dependent variable. Performing the cross-validation using the Markov Chain Monte Carlo method would have proved too time consuming, whilst equivalent OLS estimates and ratios are adequate for validation purposes.

[29] As there were only 44 case study sites in the analysis the option of fitting the model on 60% of the observations and testing the model on the remaining 40% was not a feasible option.

Table 3.11 Results of cross-validation of Model I using OLS 'omit' models

Site ID	Site name	Observed	Predicted	Ratio Obs:pred
1		93391	57904	1.61
2		161184	16974	9.50
5		8115	9725	0.83
6		22788	12282	1.86
7		62237	19957	3.12
8		9210	5408	1.70
15		89842	70612	1.27
24		122817	56253	2.18
25		57826	11629	4.97
26		39732	63342	0.63
27		48495	136162	0.36
30		8605	25377	0.34
31		12460	1709	7.29
33		7468	2075	3.60
34		11242	1310	8.58
36		41930	35344	1.19
37		55746	129971	0.43
38		34085	27668	1.23
48		15811	21273	0.74
50		3024	12409	0.24
52		7064	11501	0.61
53		42632	9962	4.28
54		2672	12469	0.21
55		61346	13603	4.51
56		10371	16019	0.65
57		1328	33604	0.04
60		41310	76948	0.54
64		18934	37864	0.50
65		466	2145	0.22
66		27461	8593	3.20
71		152	439	0.35
72		17839	8327	2.14
73		3298	12287	0.27
74		7252	16465	0.44
81		233	1307	0.18
82		2124	877	2.42
86		1264	2546	0.50
87		892	2653	0.34
89		192	1489	0.13
97		13439	23335	0.58
99		17681	10715	1.65
101		118704	9115	13.02
102		4125	2025	2.04
Mean		30391	23992	1.27

The results of this exercise indicate that the model is only moderately effective at predicting visitor arrivals to individual sites that haven't been used to help derive the coefficients, and is a poor predictor for a small number of sites, i.e. those with adversely high/low observed-predicted ratios. However, the transferred estimates are split relatively evenly between under- and over-predictions and at an aggregate level the model appears to work well, with an aggregate observed-predicted ratio of 1.27.

A consideration of the confidence intervals around the predictions provides a further check of the transferability of the model. These show a high degree of uncertainty in the estimates and suggest the need to exercise caution when transferring the models presented here to predict visit numbers at unsurveyed sites. Given the predictive effectiveness of the full model, the results of the cross-validation are not far from what can be reasonably expected.

3.2.3 Evaluation of the modelling exercise

Whilst there is clearly room for improvement, the results presented here suggest the forest model approach offers potential for developing transferable TGFs. The model explains a relatively high degree of variation in the visit data. The unexplained variation data is likely to be as much due to inaccuracies in the original visitor counts as to 'missing' or inaccurate independent (predictor) variables. The independent variables are derived from a combination of primary surveys and secondary sources, such as national statistical databases. In the case of the former, the data on site attributes is from a highly reliable source and can, for the most part, be objectively determined and reliably measured, although some woodland characteristics are inherently subjective in nature and present greater measurement challenges. The accuracy of the independent variables derived from secondary statistical data sources is largely dependent on the quality of the original data set. Here, most of the data is derived from national statistical databases, with the input variables calculated using sophisticated GIS technology. Thus, factors that are likely to influence recreation demand, such as substitute recreational opportunities and resident population characteristics, can be measured to a relatively high level of spatial resolution. However, the periodic production and limited spatial resolution of some of certain data sets can limit the accuracy and relevance of derived data. For example, the recently produced ONS census for 2001 was unavailable at the time of this study. Consequently, socio-economic data was derived from the 1991 ONS census. Likewise, the lack of data for day visitors and UK and overseas holidaymaking populations to a high level of spatial resolution was also a limiting factor on the quality of input data. However, given these limitations, the model explains a relatively high degree of variability in the data. Whilst it may be possible to improve this result by improving the quality of the independent variables, there is an inherent 'noise' that is always likely to affect trip generation functions of this nature, where many facets of visitor behaviour and local contextual factors will inevitably remain un-accounted for, however reliable the data inputs.

Overall, the area with the greatest potential for improvement for modelling purposes is in relation to the dependent variable, i.e. site visit data. This could be improved by

- The adoption of a common definition of a 'site' for visitor monitoring purposes;
- The adoption of a common definition of forest 'site' attributes.
- A larger number of sites monitored for visitor counts;
- A more representative sample of sites monitored for visitor counts, particularly in terms of ownership;
- More accurate and comprehensive monitoring of total visitor numbers at sites;
- More accurate and comprehensive monitoring of tourist visitors at sites;
- More transparency in the assumptions used to translate counts into total visit numbers

- Estimation of the potential error range in visit estimates in order to gauge the reliability of the data[30]
- Surveys of households as well as forest visitors to capture future visiting behaviour of non-forest visitors;

Clearly, the availability of this information will not guarantee the development of TGF models that can explain all visits to all forests. However, it should go some way to reducing the uncertainty inherent in the current generation of TGF models.

3.3 PREDICTING VISITS TO UNSURVEYED FOREST SITES

3.3.1 Site data

A main aim of the study was to predict the annual number of visits to all publicly accessible forests in GB. However, attribute data was only available for a sample of around 3,000 individual publicly accessible forest and woodland "sites". As with the data used in the TGF modelling exercise, there was no consistent definition of a "site" between data providers. Nevertheless, it is the most comprehensive data set of publicly accessible woodland in GB that is currently available. A summary of the sites is presented in Table 3.12, analysed by ownership and country. A considerable proportion of the data was provided by ADAS[31], with the remainder coming directly from the respective site owner/manager organisations.

Table 3.12 Sites for which the necessary data was available for use in site aggregation exercise

	Total Sites			
	England	Scotland	Wales	GB
Private Owners	195	311	4	510
Local Authority	252	51	16	319
Wildlife Trust	121	41	0	162
National Trust	102	1	0	103
National Park	15	0	0	15
English Nature	41	-	-	41
National Forest	29	-	-	29
RSPB	15	9	5	29
SNH	-	38	-	38
Woodland Trust	792	78	113	983
FE	299	248	86	633
Total Sites	1,861	777	224	2,862

- Single country institutions.

There are a number of obvious differences in the data available between the three countries. A much larger proportion of Scottish sites are privately owned, compared to England and Wales, where the Woodland Trust accounts for the largest proportion of sites. England has a higher proportion of Local Authority owned sites. There is no way of knowing whether these differences reflect actual differences in ownership patterns. There are a number of key issues that arise from the use of this data set in an

[30] This may require research into the reliability and accuracy of the different counting mechanisms

[31] ADAS are currently undertaking a survey to identify all publicly accessible woodland in GB on behalf of the Forestry Commission.

aggregation exercise. First, it is difficult to ascertain what proportion of publicly accessible woodland the final data set represents given that:

- the total area of publicly accessible woodland is unknown;
- area data is not always provided with the available site data;
- in many cases the proportion of 'site' area represented by woodland is unknown; and
- even where area data is available, the accuracy of this data is questionable.

Second, it is not possible to say how representative the site data is of the woodlands for each country, and therefore at the GB level.

Overall, it was estimated[32] that the data collected accounted for a high proportion of woodland under Charity ownership, but only a fifth of Local Authority woodland and only about 3% of privately owned woodland. Whilst it is reasonable to assume that the site data accounts for the majority of the woodland under FE ownership, overall the data is estimated to represent only around 35% of all woodland in GB (by area).

3.3.2 Predicting tourism visits to unsurveyed forest sites

Predicted annual visits were estimated by applying the models, as set out in Table 3.8 and 3.9, to each of the 2,862 sites for which data was available. Estimates of the mean predicted annual visits are presented in Table 3.13.

Table 3.13 Predicted annual tourist visits to sites in GB

		Model I		Model II	
	No of.sites	Total Visits (000's)	Mean site^{-1} *	Total Visits (000's)	Mean site^{-1} *
England	*1861*	19,399	10,424	14,613	7,852
Scotland	*777*	7,444	9,581	4,499	5,790
Wales	*224*	275	1,228	699	3,120
GB	*2862*	27,118	9,475	19,811	6,922

* It is not known how representative the sample of sites are for each country or for GB and therefore country means should be treated with due care.

Model I predicted a total of over 27 million annual visits to the 2,862 sites, a mean of 9,475 visits per site, whilst Model II predicted just under 20 million visits with a mean of 6,922 visits. On average, sites in England under Model I had the highest number of visits receiving just under 10% more than sites in Scotland and 8.5 times as many visits as the average site in Wales. The relative difference between sites in Wales and the other countries was less under Model II. The relative differences in the mean number of visitors per site are not in line with expectations based on a consideration of the estimated volume of tourism day visits from home as presented in the UKDVS[33] (Countryside Agency, 1999), and the respective areas of forest over which these visits are distributed (Smith and Gilbert, 2001). The UKDVS indicates that some 90% of tourism day visits from home to woodland in GB take place in England, which only has about 40% of the total woodland area in GB. Only 6% of visits take place in Scotland, which has just under 50% of all GB woodland. This compares with

[32] Based on a comparison of area data for the sites presented in Table 3.12 and data from the National Inventory of Woodland and Trees (Smith and Gilbert, 2001).

[33] Whilst the UKDVS does not take into account tourism day visits by holidaymakers, it provides a reliable indication of the relative orders of magnitude of tourism day visits to woodland across England, Scotland and Wales.

3% of visits, half that of Scotland, but 11% of woodland in Wales. Thus, from these figures expectations were that the mean number of tourism visits to individual sites would be considerably higher in England than both Wales and Scotland, with sites in Wales receiving higher numbers of tourism visits per annum on average than in Scotland. Clearly, these expectations were based on certain assumptions, including similar numbers of sites per unit area of woodland. The differences between predicted and expected results could be due to a number of factors, including an unrepresentative sample of sites in the aggregation. In addition to the uncertainties inherent in the models, this suggests that the results from the model application should be treated with due care.

This conclusion is further supported by comparing an estimate of total forest tourism day visits per annum at the GB level, based on model results, with estimates from alternative sources. If it is assumed that the 2,862 sites represent around 35% of the total woodland area of GB, that they are fairly representative of the sites in each country and that the remainder of the sites are similarly distributed (all strong assumptions in themselves), then based on these estimates the total number of tourism visits to woodland in GB would be in the order of 60-80 million. However, the UKDVS (Countryside Agency, 1999) suggests there were around 114 million tourism visits to woodland in GB in 1998. Furthermore, these were day visits from home only. From the visitor survey, day visits from home represent only 22% of all tourist day visits to woodland, with holidaymakers accounting for the balance. This would suggest that the estimates based on the TGF model are considerably understated. Furthermore, the mean visits per site for Model I and II are considerably below the observed and predicted mean number of visits to the 43 sample sites on which the models were based. This would suggest that the 43 sites owned by the FE, RSPB and WTS were not representative of the 2,862 sites in the aggregation sample.

3. 4 ESTIMATING FOREST-RELATED TOURISM EXPENDITURE

This section presents the results of the application of the forest model and tourism expenditure figures to calculate forest-related tourism expenditure for the aggregation sample of forest sites in GB.

3.4.1 Dissagregation of total ‘tourism’ visits by trip type and purpose

As the proportion of forest-related tourism expenditure for each visit varies by trip purpose, as does the distribution of total trip expenditure between expenditure categories, it is necessary to split total forest tourism visits between ‘forest only’, ‘forest combined’ and ‘forest-casual’ visits. Based on the results presented in Table 3.3, it was assumed that 76%, 62% and 65% of all predicted tourism visits were ‘forest only’ trips, whilst 17%, 23% and 17% were ‘forest combined’ trips in England, Scotland and Wales respectively. Table 3.14 presents the mean number of predicted tourism visits per site by trip purpose. Forest casual visits are not shown as they are not relevant for the estimation of forest-related tourism expenditure.

Table 3.14 Mean number of predicted 'tourism' visits per site by trip purpose

	Model I		Model II	
	Forest-only	Forest-combined	Forest-only	Forest-combined
England	7,922	1,772	5,968	1,335
Scotland	5,940	2,204	3,590	1,332
Wales	798	209	2028	530
GB	6,443	1,800	4,707	1,315

Mean expenditure levels also vary by trip type. From the visitor survey, Table 3.15 presents the proportional split between visitors travelling from home and from a holiday base for 'forest only' and 'forest combined' visitors.

Table 3.15 Proportion of tourist trips by trip type for each region (%)

Region	Type	Forest only	Forest-combined
England	Day trip from home	38	24
	Day trip from holiday base	62	76
Scotland	Day trip from home	36	18
	Day trip from holiday base	64	82
Wales	Day trip from home	5	5
	Day trip from holiday base	95	95

The results show considerable variation in the proportional split between visitors from home and holiday bases for 'forest only' and 'forest combined' visitors in England and Scotland. However, the proportional split in trip types is the same for both categories of trip purpose in Wales. The proportional split presented here suggests that on average in England just under two thirds of the total number of 'forest only' day visits are made by holidaymakers, compared to three quarters of the 'forest-combined' visits. The proportional split for 'forest-only' visits is similar in Scotland, but the proportion of holidaymakers rises to 82% in Scotland for 'forest-combined' visits. In Wales, the figures rise to 95% for both categories. The figures for Wales were higher than expected and need to be treated with due care given the relatively small sample sizes on which they are based. For the purpose of estimating forest-related tourism expenditures, the figures in Table 3.15 were used to further sub-divide the visitor estimates with the exception of the proportional split for Wales. Here a proportional split of 38:62 was used for day visits from home and holidaymakers respectively, for both forest-only and forest-combined visits based on figures supplied by the Forestry Commission (see section 3.1.1).

3.4.2 Mean total forest-related tourism expenditures per forest site

The mean expenditure levels per person per day trip were presented in Table 3.4. However, some cells only had small sample sizes and since the data are highly skewed outliers are very influential. In particular, the very high value for holidaymakers on a combined trip in England is due to an outlier of £521. To reduce the influence of outliers, the expenditure data for the aggregation exercise were

derived using a modelling approach. The data were transformed[34] and regression used to determine which factors were statistically significant in influencing expenditure levels. The factors considered were the country in which the trip took place (i.e. England, Scotland or Wales), the type of trip (i.e. day trip from home or holiday base) and the purpose of trip (i.e. forest only, forest-combined or forest-casual). The results showed that country, trip type and purpose were all significant. However, the only interaction between these variables that was significant was between region and type of tourist, i.e. there was a significant difference between mean trip expenditure by trip type within each country. These terms were therefore fitted to the original untransformed data. The regression gave the following parameter estimates (model coefficients):

Variable type	**Variable**	**Coefficient**
	Constant	10.76
Country	Scotland	-1.13
	Wales	3.50
Trip type	Day trip from holiday base	4.05
Trip purpose	Forest casual	0.33
	Forest only	-4.57
Interaction	Scotland. Day trip from holiday base	2.82
	Wales. Day trip from holiday base	-7.18

Using the coefficients presented above, modelled mean expenditure figures were calculated. The expenditure predictions from this model are presented in Table 3.16, with the confidence intervals presented in the Main report.

Table 3.16 Modelled mean total expenditure predictions by type/region and purpose (£ person^{-1} visit^{-1})

Region	Type	Forest-combined	Forest only
England	Day trip from home	10.76	6.19
	Day trip from holiday base	14.81	10.24
Scotland	Day trip from home	9.63	5.06
	Day trip from holiday base	16.51	11.93
Wales	Day trip from home	14.25	9.68
	Day trip from holiday base	11.12	6.55

These modelled mean expenditure figures were used as the basis for the estimates of total tourism expenditures of day visits to the 2,862 forest sites by multiplying the mean expenditure per visit for each visitor category by the estimated number of visits for each visitor category. However, prior to estimating total tourism expenditure it was necessary to take into account seasonality effects. There is some evidence to suggest that there are seasonal differences in levels of tourism expenditure per visit. The expenditure figures presented above are based on the data from the visitor survey, which was undertaken throughout the summer months of July to September. In order to estimate the seasonal effect on forest-related-tourism expenditure it is necessary to estimate both the distribution of forest visits across the year, as well as any fluctuation

[34] The data were transformed by taking log(expenditure+0.01).

in the total expenditure per visit. Table 3.17 presents the distribution of visits to woodlands from the UK Day Visit Survey (Countryside Agency, 1999).

Table 3.17 Seasonality of visits* to forests based on UK DVS (%)

	Jan-Mar	Apr-June	July-Sep	Oct-Dec	Total
Mean	24	31	25	18	100

**The results are for all day visits from home, not just tourism day visits, and exclude day visits by holidaymakers.*

The results show a similar number of visits undertaken in the first and third quarters. As noted by Jones *et al.*, (2002), this is in contrast to evidence from site specific studies raising questions over the reliability of the UKDVS derived seasonality data. Table 3.18 presents an estimated breakdown of forest visits (tourism and non-tourism) across a 12 month period based on visit data from 207 forest sites recorded in the Visitor Monitoring Trends Index 1999-2000 (Forestry Commission, 2002).

Table 3.18 Seasonality of visits to forests based on Visitor Monitoring Trends Index 1999-2000 (%)

	No.of sites	Jan-Mar	Apr-June	July-Sep	Oct-Dec	Total
England	*105*	16	30	38	17	100
Scotland	*77*	15	30	37	18	100
Wales	*25*	16	31	37	16	100
Mean	*207*	16	30	37	17	100

More in line with expectations, the table shows a greater contrast in forest visits between the spring/summer and autumn/winter months, with the seasonal effects consistent across the three countries. These results are for all visits made to forests. Seasonal variation could be expected to be even more pronounced for 'tourism' visits to forests, particularly given the high proportion made by holidaymakers. However, there is insufficient information in the Forestry Commission's Trends Index to distinguish between different visitor categories. An examination of the International Passenger Survey 2000 (National Statistics, 2001) shows that the seasonal distribution of overseas visitors coming to the UK on holiday is very similar to the seasonal distribution of visits to forests presented in Table 3.18. Thus, for the purpose of estimating the seasonal effect on forest-related tourism expenditure, the mean seasonal distribution presented in Table 3.18 was assumed for 'tourism' visits to forests.

To take into account the seasonal fluctuation in expenditure levels, the mean tourism expenditure figures presented in Table 3.16 were adjusted using a seasonality index. Despite concerns over data reliability, in the absence of alternative data the index was based on expenditure data for visits to woodland from the UKDVS (Countryside Agency, 1999)[35]. As the expenditure data, based on data from the visitor survey (Table 3.16), was mainly collected in July and August of 2001, the third quarter is used as the base period for the seasonality index. Table 3.19 presents the mean total trip expenditure per day visit from the UKDVS and the derived seasonality index.

[35] These figures are for all day visits to woodland, not just tourism day visits.

Table 3.19 Seasonality of day visit expenditure (UKDVS, 1998)

	Jan-Mar	Apr-June	July-Sep	Oct-Dec
Mean expenditure per day visit (£)	2.49	3.69	4.58	2.70
Indexed to 3rd quarter	0.544	0.806	1.000	0.589

The results show that expenditure per day visit to woodlands in the first, second and fourth quarters was only 55%, 81% and 59% of expenditure per visit in the third quarter. These seasonal differences are high compared to other studies. For example, the Yorkshire Dales Visitor Study in 1992 found that day visit spending fell by only 5% in low season. However, for the purpose of this study the expenditure figures for predicted visits assumed to take place in each of these quarters were adjusted downwards by the respective percentages in Table 3.19.

The resulting expenditures represent the total expenditure for the predicted tourism day visits. However, as set out in Chapter 2, only the expenditure by forest-only visitors was assumed to be 100% forest-related. Based on the results of the visitor survey regarding the importance of forests in motivating trip decisions (Table 3.7), it was assumed that only 44.7% of forest-combined day visit expenditure related to forest tourism. Thus, that proportion of total expenditure from forest-combined visits that was not related to forest-tourism was removed. Table 3.20 presents the resulting mean total forest-related tourism expenditure per forest site, after taking into account seasonality effects and apportioning forest-combined expenditures.

Table 3.20 Mean total forest-related tourism expenditure per forest site (£)

	No of. sites	Model I	Model II
England	*1,861*	71,989	54,227
Scotland	*777*	69,863	42,220
Wales	*224*	6,583	16,725

The results based on visit numbers from Model I show that, on average, forest-related tourism expenditure associated with visits to forest sites in England is highest at around £72,000 per annum. This is equivalent to a mean value per forest-related tourism day visit (i.e. including forest-only and forest combined visits) of £7.43. Scotland had a similar mean value of expenditure per site at just under £70,000 (a mean of £8.58 per forest-related visit). Mean total forest-related tourism expenditure associated with forest sites in Wales is much lower than both England and Scotland, at only £6,500 per site, mainly due to the much lower mean number of visits per site, although, mean forest-related expenditure per visit was only slightly less at £6.54. The total forest-related tourism expenditures per site estimated using Model II show a similar pattern, although the gap between sites in Wales and the other two countries is reduced. This is entirely due to the differences in mean visits per site, as the mean expenditure figures per visit do not change. Drawing on the results presented in Tables 3.5 and 3.6, the mean total expenditure figures per site apportioned to the different expenditure categories are presented in Table 3.21.

Table 3.21 Mean total forest-related tourism expenditure per forest site by expenditure category (£)

	MODEL I			MODEL II		
	England	Scotland	Wales	England	Scotland	Wales
Travel	23,599	21,175	3,273	17,776	12,797	8,316
Food/drink	35,870	26,677	2,051	27,019	16,122	5,211
Entertainment	6,322	7,662	195	4,762	4,630	495
Clothing etc.	45	486	57	34	294	144
Gifts/souvenirs	3,712	3,868	808	2,796	2,337	2,053
Other	2,442	9,995	199	1,839	6,040	505
Total	71,989	69,863	6,583	54,227	42,220	16,725

These estimates should be interpreted with due care for the various reasons already outlined. Nevertheless, the results presented here represent our 'best guess' of mean forest-related tourism expenditure for individual sites in GB.

3.5 ECONOMIC SIGNIFICANCE OF FOREST-RELATED TOURISM AT THE COUNTRY AND GB LEVEL

The lack of reliable data regarding publicly accessible forest sites for the majority of the wooded area of GB currently presents an insurmountable barrier to the use of the TGF approach to estimate the total number of tourism day visits to publicly accessible woodland in GB. This section sets out the alternative approach used to estimate the economic significance of forest-related tourism day visits in GB.

3.5.1 Total annual tourist visits to forests/woodlands

The following forest visit estimates are based on figures taken from the UKDVS (Countryside Agency, 1999). Table 3.22 presents a summary analysis of the type and volume of 'tourism'[36] visits made from home.

Table 3.22 Summary of the volume of tourism visits in GB (millions) (Countryside Agency, 1999)

	England	Scotland	Wales	GB
Woods/forests	104.1	6.5	3.6	114.2

In 1998, there was an estimated 114 million 'tourism' day visits from home to woodlands, 104 million made by people living in England, 6.5 million made by people living in Scotland and 3.5 million made by those living in Wales. Virtually all of these trips took place within the country of origin. The UKDVS 1998 includes only those visits made from home. In addition, it is not possible to distinguish between forest-only, forest combined and forest casual trips[37]. After deducting forest-casual visits, and drawing on the data from the visitor survey on trip type and purpose[38], Table 3.23 presents the estimated total tourism woodland visits in GB analysed by trip type and purpose.

[36] The definition of tourist visits is that used for this project, i.e. a trip with a duration of 3 hours or more, rather than the UKDVS tourism definition which also excludes regular users.
[37] It is assumed here that all three trip types are included in the UKDVS 1998 figures.
[38] The same assumptions were adopted here as those set out in section 3.4.1 for the purpose of estimating site level expenditure.

Table 3.23 Total number of tourism woodland visits by trip type and purpose based on UKDVS estimates of tourism day visits from home (millions)

	England	Scotland	Wales	GB
Forest only				
Day out from home	85.9	5.0	2.4	93.3
Day out from holiday base	140.1	8.9	3.8	152.8
Total	226.0	13.9	6.2	246.1
Forest combined				
Day out from home	12.1	1.0	0.6	13.7
Day out from holiday base	38.5	4.2	1.0	43.7
Total	50.6	5.2	1.6	57.4
All forest visits				
Day out from home	98.0	6.0	3.0	107.0
Day out from holiday base	178.6	13.1	4.8	196.5
Total	276.6	19.1	7.8	303.5

After taking into account day visits by holidaymakers, the total annual number of tourism day visits to forests in GB is estimated to be in the region of 304 million, of which 107 million are day trips from home and 197 million are trips made by holidaymakers. Just under 277 million of these took place in England, with only 19 million in Scotland and 8 million in Wales.

3.5.2 Total annual forest-related tourist expenditure

The 'best guess' estimates of total annual forest-related day visit tourism expenditure are presented in Table 3.24 after applying the same assumptions that were applied in the site based aggregation regarding:

- the modelled mean expenditure per trip,
- the apportionment of forest-related tourism expenditure,
- the influence of seasonality on expenditure levels; and
- the proportional breakdown of expenditure between expenditure categories.

Table 3.24 Forest-related tourism expenditure by expenditure category (£ Millions)

	England	Scotland	Wales	GB
Travel	673.2	49.5	25.3	748.0
Food/drink	1,023.2	62.4	15.8	1101.5
Entertainment	180.0	17.9	1.5	199.5
Clothing etc.	1.9	1.2	0.4	3.5
Gifts/souvenirs	105.8	9.0	6.2	121.0
Other	69.9	23.4	1.5	94.8
Total	2,054.1	163.4	50.8	2268.3

The results suggest that forest-related tourism expenditure for day visits in GB is in the region of £2.3 billion, over £2 billion of which was in England. The forest-related tourism expenditure in Scotland is £163 million, and around £51 million in Wales.

3.5.3 Economic significance of forest-related tourism day visits in GB

Table 3.25 relates the 'best-guess' estimates of forest-related day visit tourism expenditure to total tourism expenditure in GB.

Table 3.25 Forest related tourism's share of GB tourism expenditure (£millions)

	England	Scotland	Wales	GB
GB residents holiday tourism[a]	19,890	3,699	1,654	25,243
Overseas tourism [b]	11,358	817	267	12,442
GB residents day visit from home [c]	28,300	2,100	900	31,300
Total GB tourism spending	59,548	6,616	2,821	68,985
Forest related expenditure	2,054	163	51	2,268
Forest related expenditure (% share)	3.4	2.5	1.8	3.3

Sources: [a] UKTS, [b] IPS; [c]UKDVS

It is estimated that forest-related day visit tourism accounts for over 3% of total tourism expenditure in GB. The proportionate share is highest in England at 3.4%, compared to 2.5% and 1.8% in Scotland and Wales respectively. This can be interpreted as the ratio of business turnover that is explained by the existence of forest related tourism. This implies, for instance, that travel or entertainment activities (and others, see Table 3.24) rely to some extent on the forest-related tourism to stay in business. Similarly, forest related tourism safeguards existing employment[39] in those sectors to a certain extent.

These figures are sensitive to the methodological assumptions on which they are based. The analysis presented in Table 3.26 highlights the sensitivity of the results to some of the assumptions adopted, specifically in relation to expenditure per trip, the apportionment of forest-related expenditure for forest-combined trips, the proportion of forest tourism visits made by holidaymakers and day visitors from home respectively, and seasonality. To inform the sensitivity analysis with respect to the proportion of forest tourism visits made by holidaymakers and day visitors from home, the figures used in the sensitivity analysis draw on an earlier Forestry Commission study which showed the proportion of visitors from home to be higher. However, it is possible that this may have also been subject to potential sample bias.

[39] Translating these expenditure figures into an employment effect presents a number of difficulties due to the lack of reliable information. Available employment statistics focus on "employees", whilst many of those working within the sectors affected are self-employed, for which no reliable data is available.

Table 3.26 Sensitivity analysis: individual assumptions

	England	Scotland	Wales	GB
Scenario 1 – Assuming upper 95% confidence limit for modelled mean expenditure per trip				
Forest related tourism expenditure	3,481	227	77	3,785
% of total GB tourism expenditure	5.8	3.4	2.7	5.5
Scenario 2 – Assuming lower 95% confidence limit for modelled mean expenditure per trip				
Forest related tourism expenditure	1,336	113	31	1,480
% of total GB tourism expenditure	2.2	1.7	1.1	2.1
Scenario 3 – Assuming 50% of expenditure of forest-combined trips attributable to forests				
Forest related tourism expenditure	2,112	170	52	2,334
% of total GB tourism expenditure	3.5	2.6	1.9	3.4
Scenario 4 – Assuming a mean ratio of visits by holidaymakers and visits from home of 62:38 for all countries				
Forest related tourism expenditure	1,864	118	51	2,033
% of total GB tourism expenditure	3.1	1.8	1.8	2.9
Scenario 5– Assuming seasonality of visits based on UKDVS visits to woodland				
Forest related tourism expenditure	2063	172	51	2286
% of total GB tourism expenditure	3.5	2.6	1.8	3.3
Scenario 6 – Assuming a 5% seasonal difference in expenditure between winter & summer				
Forest related tourism expenditure	2816	237	70	3123
% of total GB tourism expenditure	4.7	3.6	2.5	4.5

Scenarios 1 and 2 present the results where, *ceteris paribus*, the upper and lower 95% confidence intervals for the expenditure figures per trip[40] are adopted. The results show that at the 95 % confidence level based on modelled expenditure figures per trip, that the proportion of total GB tourism expenditure represented by forest-related day visit tourism expenditure lies somewhere between 2.1 and 5.5%. In scenario 3, the sensitivity of the results to assumptions adopted regarding the apportionment of forest-related tourism expenditure is considered. In the initial 'best guess' estimate a figure of 44.7% of forest-combined expenditure was assumed to be forest-related, from a range of between 2-91%. Scenario 3 presents the results where, *ceteris paribus*, this proportion is increased to 50%. The results show that this assumption has only a minor influence on the overall estimates of economic significance, increasing the proportion of GB tourism from 3.3% to 3.4%. Scenario 4 examines the impact on the economic significance of changes in the proportion of forest tourism day visits made by holidaymakers and day visits from home. In the 'best guess' estimate, country level estimates were used, with there being considerable variation in this proportion across the three countries. Scenario 4 presents the results where, *ceteris paribus*, the same proportion of holidaymakers and day visits from home, based on FC data, is used for all countries, i.e. 62:38. This has the effect of reducing the economic significance in both England and Scotland, with the proportionate share of GB tourism expenditure dropping to 2.9%. Finally, scenarios 5 and 6 consider, *ceteris paribus*, the influence of changes in the assumptions regarding seasonal differences in visits and expenditure respectively. In scenario 5, the UKDVS derived estimates of seasonal differences are adopted. Scenario 6 assumes only a 5% seasonal difference in expenditure between winter and summer. The results show that a change

[40] The expenditure per trip figures presented in Table 3.16 were results from a model in order to reduce the influence of outlying values.

in the assumptions regarding the seasonality of visits has a much smaller influence on the overall economic significance compared to the changes in expenditure assumptions. Taking into account the influence of the different factors, the estimates of economic significance are clearly most sensitive to the assumptions adopted here regarding the value of expenditure per day visit.

Table 3.27 presents some combined assumptions to give a higher and lower inclined estimate of the economic significance of forest-related day visit tourism.

Table 3.27 Sensitivity analysis: combined assumptions

	England	Scotland	Wales	GB
Combined scenario 2 and 4 – lower estimate				
Forest related tourism expenditure	1,222	80	31	1,333
% of total GB tourism expenditure	2.1	1.2	1.1	1.9
Combined scenario 1 and 6 – upper estimate				
Forest related tourism expenditure	5179	347	111	5637
% of total GB tourism expenditure	8.7	5.2	3.9	8.2

The results suggest that the economic significance of forest-related day visit tourism is somewhere between £1.3 and £5.6 billion, about 1.9% and 8.2% of total GB tourism expenditure respectively, with a conservative 'best guess' of £2.3 billion (3.3%). The estimates presented here may be subject to review following the publication of the 2002 UK DVS.

3.6 DISCUSSION AND CONCLUSIONS

Following a line of research that has received considerable recent attention, this part of the study has investigated the use of linear regression TGF models to predict woodland recreation demand. Whereas many of the previous studies using TGF models have been concerned with estimating economic benefits or the 'value' of woodlands for recreation in a single country or locality, the focus of this study was an assessment of the economic 'significance' at the country and GB level. Previous similar studies have generally suffered from limited data on visits to forest sites. Whilst also the case here, this study has benefited from the availability of the latest data on visit numbers to forests managed by the Forestry Commission and other organisations, as well as primary data from an extensive visitor survey, both data sets covering sites throughout GB. In line with the more sophisticated modelling approaches in this field of research, the study considered a wide range of predictor variables found to be significant in explaining arrivals to GB woodlands in past studies. As well as including detailed information on site attributes from a survey of forest managers, the models incorporated travel costs, the socio-economic traits of the users, and substitution effects through an index of availability of alternative woodland sites for recreation. Despite strong theoretical grounds for their inclusion, surprisingly few of these variables had any statistically significant explanatory power in the models. This raises the issue, also noted in previous studies, that modelling approaches such as those employed in this study require high cost primary data and use complex and costly data handling and statistical analysis techniques which, despite their sophistication, cannot make up for the inherent data quality constraints on model inputs. Whilst many facets of visitor behaviour and local contextual factors

will inevitably remain unaccounted for in studies of this nature, improvements in the quantity and quality of tourism visit data have the potential to greatly enhance the future development of statistically defensible transferable models. At present, the Forestry Commission are the only land managers that monitor visits to woodlands on a regular basis at a significant number of sites. Other organisations (e.g. WT) do record visitor numbers but not in such a systematic and co-ordinated fashion. A wider range of landowners/managers recording visit[41] data in a consistent and reliable way at sites, also defined in a consistent way, would undoubtedly enhance the quality and transferability of 'forest' (zonal) models. The key areas for improved visitor monitoring are:

- The adoption of a common definition of a 'site' for visitor monitoring purposes;
- The adoption of a common definition of forest 'site' attributes.
- A larger number of sites monitored for visitor counts;
- A more representative sample of sites monitored for visitor counts, particularly in terms of non-FC privately and publicly owned woodlands;
- More accurate and comprehensive monitoring of total visitor numbers at sites;
- More accurate and comprehensive monitoring of tourist visitors at sites;
- More transparency in the assumptions used to translate counts into total visit numbers;
- Estimation of the potential error range in visit estimates in order to gauge the reliability of the data[42];
- Surveys of households as well as forest visitors to capture future visiting behaviour of non-forest visitors;

There are also other key practical constraints to the transferral of TGF models and their use in any kind of aggregation exercise to country and GB level. In particular, the development of a reliable database of forest sites in GB, again using a common 'site' definition, must be a key objective if any aggregation exercise is to be comprehensive. At a minimum, this database must also include information on the site attributes that are predictor variables in any model. A further consideration for any future project is that the processing time required to calculate the necessary secondary data using GIS should not be underestimated. Even for the relatively simple models used in this study, secondary data collection and calculation for nearly 3,000 privately and publicly owned sites was an onerous task.

Nevertheless, the type of models developed in this study are, in theory at least, suited to economic significance analysis at the country and GB level. They can also be used to assess additionality of changes in forest management at a local level, and therefore to inform forest and tourism policy decisions in terms of investment priorities between alternative sites and recreational facilities. However, from the approach adopted in this study it is not possible to quantify the additionality of forests at the country and GB level. Such a question could not be answered by simple aggregation of the results using the type of models developed in this study and would require an altogether different methodological approach.

[41] Where tourism is the main focus of interest, then some means of distinguishing between visitor types is also necessary.

[42] This may require research into the reliability and accuracy of the different counting mechanisms

In conclusion, the figures presented here are ‘best guess’ estimates of the economic significance of forest-related day visit tourism at site, country and GB level. Whilst the site level estimates could be improved upon, particularly with respect to quality improvements in the relevant data inputs for the models used, these estimates clearly indicate that the forest-related expenditures on tourism day visits to forests make an important contribution to the tourism economy of GB.

CHAPTER 4 QUANTIFYING THE ECONOMIC SIGNIFICANCE OF FORESTS TO TOURISM IN THE COUNTRYSIDE

4.0 INTRODUCTION

The previous sections were concerned with the economic significance of forest-related tourism day visits at the site, country and GB level. As well as being a destination for day visitors, forests attract people to visit the countryside more generally. It can be argued that where forests are a factor in attracting day or staying visitors to a specific area a proportion of that expenditure can be associated with forests, regardless of whether they visit a forest site. The aim of this part of the study was to quantify, in economic terms, the significance of forests in attracting tourists to the countryside, comparing areas contrasting in their forest characteristics across England, Scotland and Wales. Thus, it differed from the first part of the study in four key respects:

(i) it was focussed at the local area level;

(ii) it was concerned with visitors to the countryside, rather than just to forest sites;

(iii) it was concerned with both staying and day visitors; and

(iv) it measured economic significance in terms of "forest associated expenditures"[43], as opposed to "forest-related expenditure" as defined for the first phase of this study.

This chapter presents the methods used and a summary of the key results.

4.1 METHOD

For each case study area, the study examines the importance of the local forests in determining decisions to visit the area. The importance of forests in trip decisions is then used to estimate the economic significance of forests in the context of tourism expenditures. Six case study areas were selected based on the assumption that they would differ in terms of the importance of forests and woodlands in relation to tourism and recreation. Two areas in each of England, Scotland and Wales were selected in consultation with the Forestry Commission. These were: the New Forest and the Lake District in England; the Trossachs and the Borders in Scotland; and Snowdonia and the Wye Valley in Wales. These areas were selected on the basis of the following criteria:

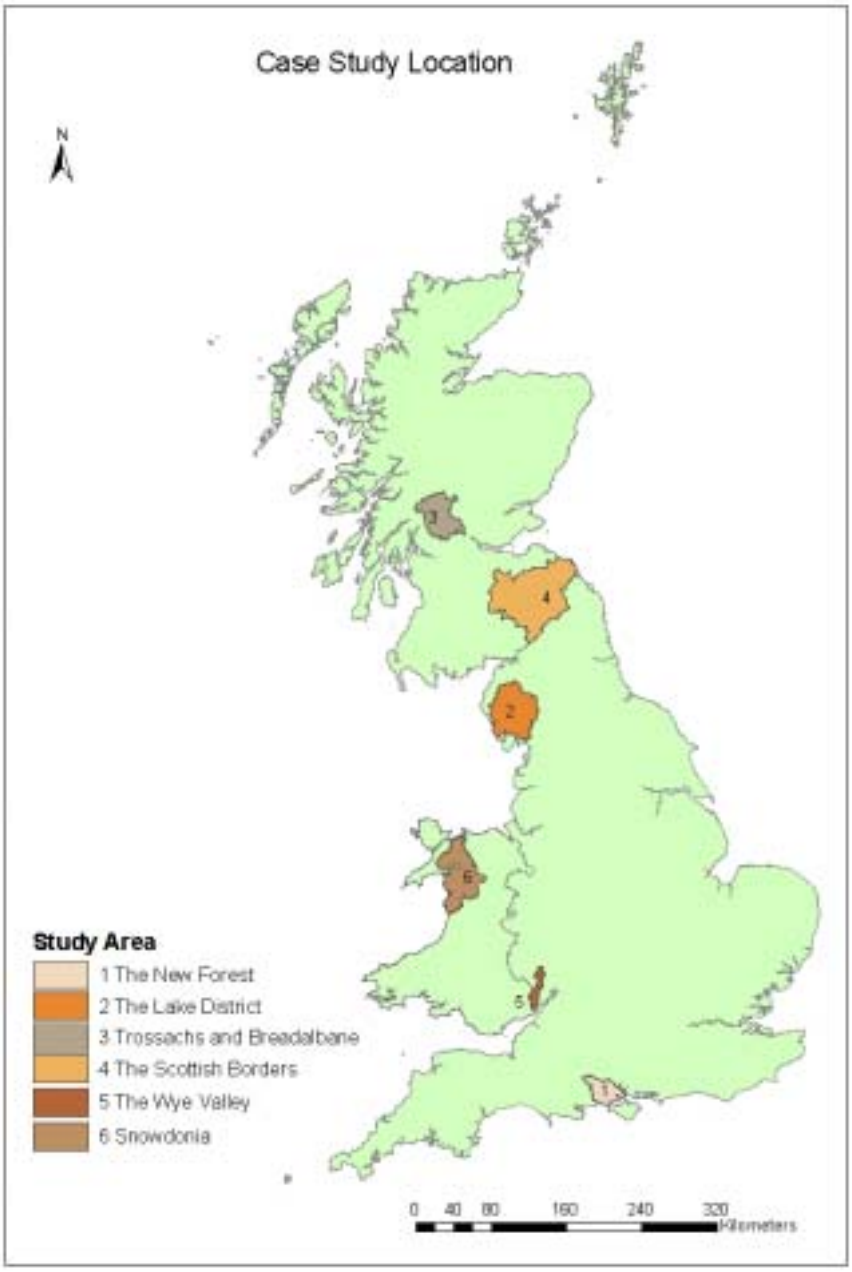
- Each area had a significant[44] coverage of woodland and forest.
- Each area represented a distinct regional tourism destination[45].
- For each country, an area was selected where forests/woodlands were strongly associated with the area, and therefore might be reasonably assumed to be an important factor in tourist decisions to visit or stay in the area.

[43] Forest associated expenditures are defined as the proportion of total trip expenditure incurred by a day or staying visitor that is associated with an area's forests through the influence of those forests on the choice of trip destination. This can be distinguished from "forest-related tourism expenditure" which is directly related to forest recreation activity.
[44] Here, significant was interpreted as being similar to the national average.
[45] A key aim of the survey was to establish why tourists had chosen to visit or stay in the area, consequently it was important that the case study areas selected were, as far as possible, resonant with the tourists within those areas.

- A second area in each country was selected where the association with forests/woodlands was less strong.

Figure 4.2 shows the locations of the case study areas[46], whilst the boundary definitions, size of the areas, percentage of forest cover and location of survey sites within each area are detailed in Table 4.1.

Figure 4.1 Location of six case study areas



Outline based on Bartholomew's Digital Database

46 Ideally for comparative purposes, the case study areas would also have been defined in terms of statistically equivalent boundaries. However, the tourist locations selected did not always lend themselves to such easy characterisation. Consequently, the case study areas are defined in terms of a range of different types of administration or designated area boundaries.

Table 4.1 Profile of countryside visitor survey case study areas

	England		Scotland		Wales	
	New Forest	Lake District	Trossachs	Borders	Wye Valley	Snowdonia
Boundary definitions	Unitary Authority	National Park	Scottish Tourist Board	Scottish Admin. Region	Area of Out-standing Natural Beauty	National Park
Area (km^2)	753	2,292	1,508	4,731	328	2,132
Forest cover (%)*	23%	9%	19%	12%	20%	13%
Forest profile	High	Low	High	Low	High	Low
Survey site	Lyndhurst	Winder-mere	Aberfoyle	Selkirk/ Jedburgh	Tintern Abbey	Betws-y-Coed

*Forest cover calculated using Bartholomew's 1:200000 UK Digital Database. These figures will vary to other sources and are presented here as an initial indication of relative differences between areas.

The areas selected as the basis for the case studies ranged significantly in both size and in percentage of forest cover. The New Forest, the Trossachs and the Wye Valley were chosen as areas where forests were considered an important part of the tourism identity. The percentage of forest cover in these areas is considerably higher than the country and GB average. The Lake District, the Borders and Snowdonia were selected as areas where forests were assumed to be less important to tourism. In these areas the proportion of forest cover is fairly similar to the country and GB average.

4.2 THE COUNTRYSIDE VISITOR SURVEY

4.2.1 The Survey

A visitor survey was undertaken in the six areas with the main objectives:

- To collect data on the tourism expenditures of visitors to the countryside.
- To collect data on the importance of forests in trip decisions to visit or stay in the areas.
- To collect data on the attitudes of countryside visitors towards forests (presented in Chapter 5).

A total of 739 face to face interviews with adults (aged 16 or over) were completed across the six case study areas throughout the months of July, August and September 2002. Interviews were conducted at busy sites in popular tourist locations (not forests) within the case study areas. Each case study area had one interviewer and respondents were selected for interview on a continuous survey basis, whereby the next person to pass the interviewer after completion of the previous questionnaire was approached. Where a group of people were approached one person was selected for interview. A quota was set of 120 interviews in each location. No other quotas were set. For the purpose of this part of the study, only individuals whose trips were non-routine in nature were interviewed.

A structured questionnaire was used comprised of seven main sections:

1. Introduction
2. Identification of the type of tourist
3. Visitor characteristics

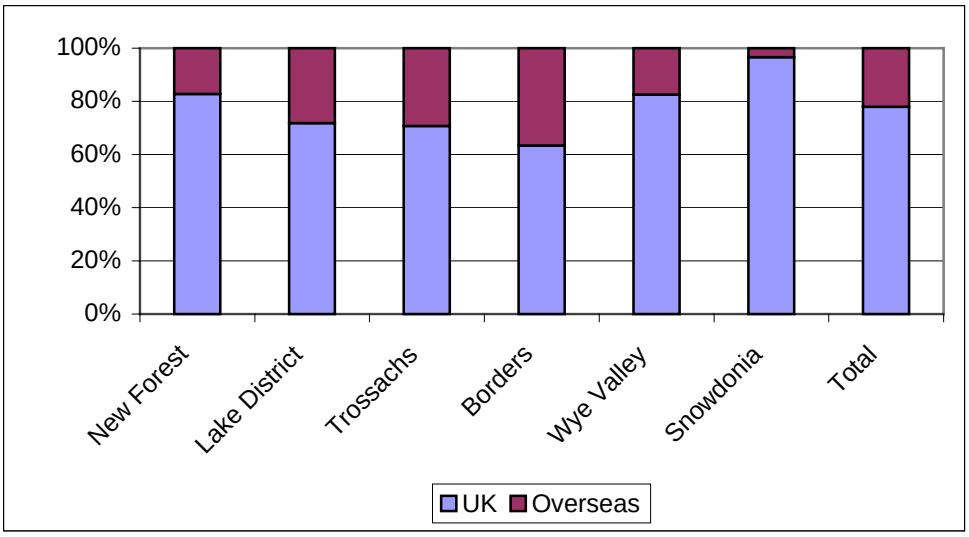
4. Visitor expenditure
5. Attitudes towards the environment and forests
6. Socio-economic characteristics
7. Interviewer feedback

Each questionnaire was accompanied by a map identifying the case study area in order to familiarise respondents with the area under consideration and to avoid any confusion over the area boundaries. A copy of the questionnaire can be found in the Main report.

4.2.2 The sample

Figure 4.2 presents a breakdown of UK and overseas resident respondents across the six areas.

Figure 4.2 UK and overseas respondents (%)



On average across the six areas UK residents accounted for 78% of respondents. However, there was considerable variation between areas. Snowdonia had the lowest proportion of overseas resident respondents at only 3%, whilst the Borders had the highest proportion at 37%. Table 4.2 provides a breakdown of respondents by type of trip.

Table 4.2 Type of trip (%)

	New Forest	Lake District	Tross-achs	Borders	Wye Valley	Snow-donia	Total
n	*128*	*124*	*124*	*123*	*120*	*120*	*739*
Day visits from home	25	19	32	18	42	31	28
Staying inside area	50	60	35	35	27	43	42
Staying outside area	12	6	22	28	21	21	18
Passing through	12	11	6	17	10	4	10
Other	1	4	5	2	0	1	2
Total	100	100	100	100	100	100	100

On average across the six areas, 42% of visitors were on holiday away from home staying inside the case study area, 28% were on holiday away from home staying outside the area or passing through, whilst 28% were day visitors from home[47]. There was considerable variation in the profile of respondents by trip purpose across the six areas. The Wye Valley had the largest proportion of day visitors from home (42%) whilst the Borders (18%) had the lowest. The Wye Valley had the lowest proportion of respondents on holiday staying inside the area (27%), reflecting its popularity as a day visit destination and also possibly reflecting the relatively small size of the area.

4.2.3 The importance of forests in trip location decisions

For the purpose of this part of the study, estimates of trip expenditure attributable to forests were based on the importance of forests in the decisions of individuals to visit or stay in the area for a day trip or holiday. Each visitor was asked, for their current trip, to identify up to four[48] main reasons why they had chosen to visit or stay in the case study area (as opposed to any another destination). For each main reason cited, respondents were asked to score its relative importance from 1-10, where 1 was "not at all important" and 10 was "very important". Tourism expenditure was to be partitioned by dividing the forest score (where specified) by the sum of the total possible scores for all trip motivating reasons. The proportion of the total possible scores unaccounted for by specified trip motivating reasons, was assumed to relate to unspecified reasons for making the trip. Where forests were unspecified as one of the main reasons for coming to the area, and thus fell into the latter category, respondents were asked to score the importance of forests and woodlands in their trip decision from 0-10, relative to their most important characteristics. By prompting this group of respondents, this final step could possibly result in the overstatement of the importance of forests in relation to trip-location decisions. However, examination of the results showed that these respondents always scored forests lower than the main reasons specified. The method adopted means that the proportion of expenditure attributed to forests could range between 0-100%, i.e. where only forests are specified and scored 10, then 100% (10/10) of trip expenditure is attributed to forests and where

[47] Only 2% of all respondents lived or worked within the case study areas.

[48] There are a large number of factors that any individual may take into account when selecting a trip destination. However, based on results from the pilot survey respondents were generally unable to specify more than four main reasons for choosing a specific destination.

forests score 0, 0% of expenditure is attributed to forests. Table 4.3 presents the mean percentage of expenditure attributable to forests for the main trip types.

Table 4.3 Importance of forests in motivating trips to case study areas – mean forest score as a proportion of total possible score (%)

	New Forest	Lake District	Tross-achs	Borders	Wye Valley	Snow-donia	Total
Day visits from home	12	11	11	13	18	13	14
Staying inside area	16	12	14	10	16	12	13
Staying outside area	15	12	13	11	17	11	13
All visitors	15	12	13	11	17	12	13

The mean forest score as a proportion of the sum of possible scores across the six case study areas was 0.13. Thus, it was assumed that 13% of the total mean tourism expenditure was associated with forests. The results are in line with the area classification, i.e. those case study areas where forests were assumed to be more important in trip location decisions (New Forest, Trossachs and Wye Valley) have the highest percentages of expenditure attributable to forests. Overall, the results suggest that forests are an important factor influencing both day visitors and staying visitors to visit the countryside.

4.2.4 Tourism expenditure

Respondents were asked to provide details of their trip expenditure for the whole of their current trip, including any expenditure on accommodation. The expenditure figures presented in Table 4.4 represent all expenditures incurred on the overall trip, both in and outside the case study area. For visitors staying away from home, daily expenditures are calculated by dividing the total expenditure by the total length of trip in nights to give a mean daily expenditure.

Table 4.4 Mean total expenditure (£ person^{-1} day^{-1})

	New Forest	Lake District	Tross-achs	Borders	Wye Valley	Snow-donia	Total
Day visitors from home	14.67	22.66	15.59	19.45	20.50	10.68	16.91
Staying inside area	38.01	44.14	35.37	39.11	41.52	25.98	37.60
Staying outside area	39.68	47.78	54.40	50.68	37.71	20.96	43.34

On average, holidaymakers spend more per trip than day visitors from home, primarily due to the inclusion of accommodation expenditure. The Lake District had the highest mean total expenditure per person for day visitors from home and holidaymakers staying inside the area. For holidaymakers staying outside the area, visitors to the Trossachs had the highest expenditure. Snowdonia had the lowest expenditure figures across all three categories. Based on the proportions presented in

section 4.2.3, Table 4.5 shows the estimates of the "forest-associated tourism expenditure" for visitors to each case study area.

Table 4.5 Mean total forest-associated tourism expenditure (£ person^{-1} day^{-1})

	New Forest	Lake District	Tross-achs	Borders	Wye Valley	Snow-donia	Total
Day visitors from home	1.74	2.42	2.03	2.34	3.69	1.39	2.37
Staying inside area	6.08	5.30	4.95	3.91	6.78	3.12	4.89
Staying outside area	5.95	5.73	7.07	5.57	6.41	2.23	5.63

The forests of the Wye Valley had the highest level of forest-associated day visit expenditure for day visitors from home and holidaymakers staying in the area, whilst the forests of the Trossachs had the highest level for visitors staying away from home outside the area.

4.3 DISCUSSION AND CONCLUSIONS

This part of the study set out to assess the influence of forests on tourism to the countryside and the associated economic significance for six case study areas. The six areas considered differ in terms of their general characteristics as well as in terms of forest characteristics. These general characteristics include location in relation to areas of population as well as other physical factors, facilities etc., all of which undoubtedly influence tourism activity and mix in any given area. However, this survey has shown that forests play a positive and significant role in influencing tourists to visit forested areas of the countryside in GB. The research has also been able to attempt an initial quantification of the resulting economic significance, in terms of the expenditure associated with visits to the area due to the presence of forests. Although the expenditures were not spatially tracked, the results presented here give a general indication of the economic importance of forests to the case study areas considered and to the countryside more generally.

Significantly, and in line with expectations, the survey showed that forests were more important in attracting visitors to stay in or visit the New Forest, the Trossachs and the Wye Valley than the other case study areas. These areas were selected based on assumptions that they were tourism destinations renown for their forests. Whilst these were also the most heavily forested areas, the general extent of forest cover is just one of many characteristics of the forests likely to influence tourism decisions to visit an area. Other characteristics will include the specific attributes of the forests themselves, whilst the general marketing of an area is also likely to have an influence. Further research would be required to identify the specific forest-related factors that attract people to visit each area and their respective economic significance.

CHAPTER 5 MEASURING VISITOR ATTITUDES TOWARDS THE ENVIRONMENT AND FORESTS

5.0 INTRODUCTION

Undertaking a visit to a forest or the countryside, and spending money to do so, are specific examples of individual behaviour. Understanding the factors that motivate these behaviours can provide useful information for those organisations engaged in managing forest-related tourism. Attitudes[49] are generally considered to be a major motivational factor influencing behaviour. Where an individual maintains a positive attitude towards a behaviour it is likely (given that situational demands are satisfied) that that behaviour will be undertaken, whereas, when the reverse is true, the behaviour is unlikely to be performed. For example, when an individual maintains a positive attitude towards recreation in forests it is likely that they will undertake recreational activities and this will, in turn, be reflected in spending levels. This chapter describes the approach used to measure the attitudes and outlines the key findings.

5.1 ATTITUDES AND BEHAVIOUR

Social psychologists postulate that attitudes are amongst the most important motivators of behaviour. The central theory in this field is that developed by Fishbein & Ajzen (1975) – the *theory of reasoned action* – which postulates that attitudes (as influenced by belief structures) are used to construct behavioural intentions, and that, given favourable circumstances and opportunities, these behavioural intentions then lead to action. The attitude component of this study is premised on the notion that the decision made by the individual to visit forests is strongly influenced by their attitude towards the overall importance of forests for leisure and recreation, both on an individual level and for the well-being of the nation, and that this preference will then be reflected in recreational spending patterns. The general conceptual model is laid out in Figure 5.1.

Figure 5.1 Conceptual framework for attitude work

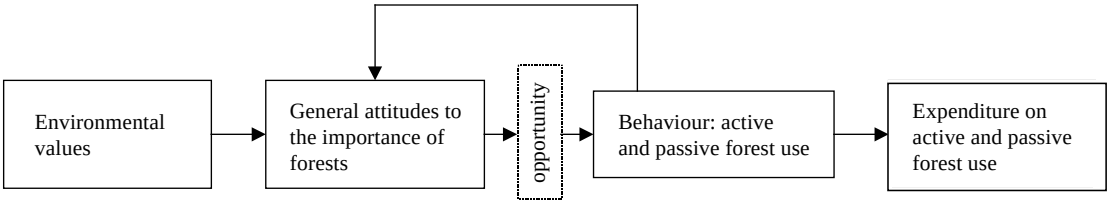


Figure 5.1 shows the conceptual model which is loosely based on the theory of reasoned action. In order to subscribe to the conditions for attitude-behaviour consistency laid out in the Fishbein-Ajzen models, an indication of the role of opportunity (i.e. circumstances that allow the expression of attitudes as a behaviour) is

[49] The conceptual definition of an attitude used here is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993).

included. Opportunity concerns features such as the presence of woodland, the desires of other family members to perform the same behaviours etc.

5.2 DEVELOPMENT OF THE INSTRUMENT

5.2.1 Measurement of attitudes

As a psychological construct attitudes are not directly observable and their existence must, therefore, be inferred from overt responses. The most common way to measure attitudes is to use psychometric scaling techniques: measures which allow the individual to evaluate belief statements on an ordinal scale ranging from a strongly positive response to a strongly negative response. To get an accurate result, attitude should be measured across a number of different situations in which it might be expressed rather than taking a single item measurement as is often the case. To investigate attitudes an attitude *scale* – a series of belief statements designed to measure different aspects of the underlying attitudinal construct – was developed. The "*The Forest Importance Scale*" (FIS) used for this study is presented in Table 5.1. Details of the development of this scale are presented in the Main report.

Table 5.1 The FIS attitude scale used in the questionnaire

Construction[50]		Statement
1. GA soc	+	Forests are an important part of our national heritage.
2. GA soc	+	Forests for recreation and leisure are important for the wellbeing of the nation.
3. GA soc	-	Our landscape would look just as beautiful even if there were no forests
4. GA soc	+	We should view the wildlife and plants in our forests as a national treasure
5. GA ego	-	Forests offer me little or no opportunities for leisure and recreation.
6. GA ego	+	Visiting forests is important for my wellbeing.
7. GA ego	+	I feel perfectly safe when visiting forests
8. GA ego	+	Forests make great holiday destinations for me and my family

'Environmental values' were also evaluated on the premise that they are a contributory factor to general attitudes towards forest use. Here, environmental values are conceived of in terms of people's general attitudes towards the environment. General attitudes towards the environment were measured using a 6-item scale based on the General Awareness and Consequences (GAC) environmental attitude scale, initially developed by Stern *et al.* (1995a; 1993; 1995b) and subsequently extended by Spash (1998).

[50] Refers to whether the question is constructed from an individual (ego) or societal (soc) perspective.

Table 5.2 The GAC items selected for the study

Statement
A clean environment provides me with better opportunities for recreation
Environmental protection will provide a better world for me and my children
Tropical rainforests are essential to maintaining a healthy planet earth
Environmental protection is beneficial to my health
Environmental protection benefits everyone
The effects of pollution on public health are worse than we realise

Interviewees in both the forest and countryside surveys were asked to assess each item by indicating their strength of agreement or disagreement using a five point Likert-type scale ranging from strongly agree to strongly disagree.

5.3 SURVEY RESULTS

5.3.1 Environmental/ forest attitudes of visitor types

There are interesting differences in the attitudes of the different types of visitor to the forests (see Table 5.3).

Table 5.3 Type of trip against environmental/forest attitudes and features of forest visits *(Figures given are the mean rank score using a Kruskal-Wallace analysis (KW)[51])*

	GAC	FIS	Visit length	No. visits[52]
Trip less than 3 hours	995.98	992.86	811.10	1185.31
Trip more than 3 hours	824.10	753.07	1215.23	900.89
Holiday staying in area	894.43	911.27	1062.87	606.24
Holiday visiting friends	962.39	929.92	1097.69	590.87
Passing through area	750.75	762.05	643.47	586.21
Chi-square	31.382	41.915	161.844	203.078
d.f.	4	4	4	4
Significance	.000	.000	.000	.000

In particular, visitors with the highest scores for both general environmental attitude and attitudes towards the importance of forests are those who are making frequent short-term trips to forests, followed by those who are holidaying in the area In addition, there is another category of forest visitor for whom attitudes to the environment/forestry provide less of a motivation to visit forests, namely those using the forest as a short rest-stop to break a longer journey. Unlike the short term visitors, this group are infrequent forest users.

[51] The Kruskal-Wallace analysis is a non-parametric test of whether there are statistically significant differences between the 5 groups.
[52] Visits to forests in the last year

5.3.2 Number, length and frequency of visits to forests

If attitudes to the importance of forests are influencing behaviour it may be expected that individuals with high FIS scores are likely to spend more time in forests and to make more frequent forest visits. Table 5.4 shows the correlations (SR) between attitudes and frequency/length of forest visits.

Table 5.4 Length and frequency of visits to forests and attitudes

	Correlation coefficient	N	Sig. (2 tailed)	GAC/FIS
Times visiting forest during trip	.168**	664	.000	GAC
	.101**	660	.010	FIS
Length of visit	.082**	1884	.000	GAC
	.100**	1872	.000	FIS
Visits to *this* forest in last 12 months	.059*	1834	.012	GAC
	.071**	1823	.002	FIS
Frequency of forest visits in last 12 months	.195**	1868	.000	GAC
	.192**	1858	.000	FIS

There is clearly a strong relationship between forest visits and both environmental attitudes and the importance of forests – although the FIS scale shows a slightly stronger relationship than the more general environmental attitudes. As might be expected, individuals with higher scores are making both longer and more frequent visits to woodland. The frequency of forest visits by respondents in the countryside visitor survey also correlated strongly with the strength of both environmental attitudes (SR = .228, N = 727, P < .001) and forest attitudes (SR = .323, N = 724, P < .001).

5.3.3 Importance of forest facilities – relationship with attitudes

Table 5.5 is an analysis of the facility that was *most important* in influencing the decision to visit the forest. The table shows those facilities (site attributes) that were correlated with attitude scores. It is interesting that while some of the facilities have a positive relationship with attitude, for others the relationship was negative. This tended to divide along two types of facility. Facilities that involved direct leisure activities amongst the trees themselves, such as cycling trails, forest walks and fishing access were associated with high environmental/forest attitudes. However, those who considered facilities which involved use of cars (car parking, forest drive, viewpoint) important or did not involve direct contact with the trees themselves (visitor centre, picnic site) tended to have lower attitudes. Ownership of cars in general shows a strong negative relationship with both environmental and forest attitudes. It appears the more cars owned the less concerned individuals were about both environmental protection in general (SR = .159, N = 1795, P < .001), and the importance of forests (SR = .120, N = 1786, P < .001).

Table 5.5 Facilities at the forest that were ranked as 'most important' against GAC and FIS scores[53]

		GAC Sig. (2 tailed)	FIS Sig. (2 tailed)
Forests/Environment important	Cycle trail	.012	.000
	Forest walk	.000	.015
	Water feature	.004	NS
Forests/Environment unimportant	Visitor centre	.000	.000
	Picnic site	.000	.000
	Forest drive	NS	.001
	Viewpoint	NS	.003
	Car parking	.039	NS

5.4 ASSESSMENT OF THE MODEL AND APPROACH

While it is not possible to assess the value of the attitude approach as a forecasting tool without further monitoring of the individuals who participated in the research, the relationship between attitudes and behaviour can be assessed on the basis of past behaviours. In the study, there were four measures which could be used as behavioural indicators of pro-forest behaviours: namely, the frequency of visits to forests, the number of visits to forests on the current holiday, the length of the current visit to the forest, and the first alternative choice if this forest was closed (Table 5.6).

Table 5.6 Behavioural measures of forest activity against FIS score

	Forest	Passive
Number of visits to forests in last 12 months	P < .001 **	P < .001 **
Number of visits to forests on this trip	P = .010 **	
The length of the current visit to the forest	P < .001 **	
Visit another forest if this site closed?	P < .001 **	

The results show that respondents' behaviour is consistent with their attitudes to forests. High scores on the forest attitude scale indicate that respondents are likely to be more frequent visitors to forests (both in general and on their current trip) and, if this visit can be said to be typical, are likely to plan to remain at the forests for longer periods of time. Further, high scores also indicated respondents were more likely to visit another forest if they could not gain access to their chosen one.

The overall objectives of the study and time constraints meant that it was not possible to conduct an adequate assessment of the extent to which the lack of opportunity may be affecting the relationship between the FIS and behaviour (see model Figure 5.1). However, as a crude assessment a subgroup of respondents were selected that (a) had high FIS scores and (b) either had not visited a forest in the last 12 months or only visited forests a few times in 12 months – i.e. their attitudes appear to be inconsistent

[53] Note, for a number of activities there were insufficient respondents to enable a reliable statistical test to be conducted of the results, whilst others were non-significant and were therefore omitted.

with their behaviour. The cut-off point was arbitrarily decided as the first 10% respondents with high FIS scores but low forest visit frequency. Possible constraining factors to be looked at were income, accessible capital (spending per person per day for trip), access to private transport and age.

Table 5.7 Respondents with noticeable discrepancy between attitude and behaviour and potential constraining factors (MW)

	Forest sample	
Income	P = .811	[similar incomes]
Spending per person for day	P = .016 *	[higher spending]
Vehicles in family	P = .017 *	[more vehicles]
Age	P = .098	[possibly higher age]

The results (shown in Table 5.7) suggest that in general the respondents with high attitude scores but low behaviour scores did not appear to be limited by lack of opportunity. Income levels of both groups were not significantly different, and respondents in this group actually had higher spending per person per day and access to transport than others. As the analysis was only partial, it is entirely possible that other constraining factors such as commitments to job or family matters have caused the discrepancy. There may be a relationship, however, between age and the opportunity to express attitudes as behaviour, with older people having positive attitudes to forests but making less frequent visits possibly because of mobility reasons – although it should be stressed that this is only significant at the 90% confidence level.

The relationship between pro-forest attitudes and expenditure levels is complex. A simple correlation between FIS (SR, -.043, N = 1803, P = .068) and GAC (SR, -.065, N = 1814, P = .006) attitudes and expenditure per person per day shows that people with higher attitudes scores, if anything, were likely to spend *less* money (despite having significantly higher incomes). This may simply be because people with higher FIS and GAC scores were likely to spend more time in forests which provides cheaper entertainment than more structured forms of tourism. However, the fact that there is no significant relationship between the frequency of forest visits on this trip and the spending per person per day would suggest this may not be the case. An alternative possibility is that the preference for nature associated with pro-environmental attitudes may be linked with a dislike of commercial forms of tourism. From existing data it is impossible to say whether people with higher assessments of the importance of woodland would be prepared to pay more for access, however, given the overall neutral to negative nature of the relationships, it seems unlikely.

The development of the FIS and GAC provided an opportunity to incorporate attitudinal variations of forest visitors into trip generation functions (TGF's) to predict annual visits to forest sites. The results, presented in detail in Chapter 4 of the Main report to this study, indicate that the FIS is a useful contributor to TGF's for both tourist and day visits. When modelled alongside other individual and trip-specific characteristics, the FIS remained in the most parsimonious functions to predict individual visits, alongside distance travelled to site, party size, mode of transport, number of attributes in the decision to visit and educational level. Restricting the sample to predict trips by day visitors only, the FIS remained alongside distance

travelled and party size, although the former accounts for the majority of the observed variation in trip counts.

5.5 DISCUSSION AND CONCLUSIONS

Drawing on methods employed by social psychologists, this study has developed a novel instrument for investigating the extent to which individuals consider forests important for their personal wellbeing and the wellbeing of the nation and then used this instrument to explore the relationship between attitudes and behaviour. The general conclusion of the research has been that attitudes are an important motivational force behind the nature, type and frequency of forest visits. Although there is a strong relationship between general environmental attitudes and the forests attitudes, not all of the behaviour is attributable to the association of forests with positive environmental values. Utilitarian concerns such as the provision of car parking and picnic areas are also important for some, and these people tend to have less strong forest attitudes.

While the study used the theory of reasoned action as the foundation of its conceptual framework it must be emphasised that this was never intended to be a full test of the model, i.e. it has not looked at the role of social norms (social pressure) or perceived behavioural control in influencing behaviour. Including these items in the study and running the full model may have provided a more thorough test of the relationship between attitude and behaviour, but this was not possible in the context of this study. The scale developed may be useful in further studies as a means of assessing how a community is likely to respond to the creation of a new forest area or the opening up of a new forest for recreation. In particular, where telephone or postal surveys are to be used, the 6-item scale developed may provide a simple measure of attitudes towards forest importance and therefore forest usage.

CHAPTER 6 SUMMARY, CONCLUSIONS & RECOMMENDATIONS

The study has focussed on the economic significance of forest-related tourism day visit expenditures, and the economic significance of forests in relation to tourism in the countryside, as well as the link between attitudes towards forests and forest visiting behaviour.

Site level estimates of the economic significance of forest-related tourism day visits were calculated for England, Scotland and Wales using TGFs to predict visit numbers at individual sites and by drawing on findings from an extensive survey of forest visitors. The TGFs were derived from an extensive modelling exercise using sophisticated statistical and data handling techniques. In this modelling exercise a wide range of predictor variables were considered. These included variables measuring travel cost, the availability of substitute woodland sites, the socio-economic characteristics of the users and their attitudes towards forests for recreation. This involved an extensive and costly primary and secondary data collection exercise, along with the use of GIS techniques to derive spatial statistics. However, the resulting models were only moderately effective at predicting visits to unsurveyed sites. Consequently, the transfer exercise, applying the models to unsurveyed sites, was not strictly statistically defensible. Despite the access to the most comprehensive and up to date visitor monitoring data available, the lack of reliable visit data proved to be one of the key constraints to the modelling exercise. Ultimately modelling exercises of this nature will always be constrained by the quality of the data inputs. Here, the benefits from having improved models for policy analysis must be weighed up against the costs of improving input data quality.

Although limited in their transferability, these models were applied to a sample of unsurveyed sites. The collection of site data involved a further extensive survey due to the lack of an existing database of publicly accessible woodlands. This exercise was made considerably easier by the availability of data from a parallel study currently being undertaken by ADAS. The results from the model application gave mean estimates of tourism visit numbers to GB woodland sites, which were combined with expenditure data from the visitor survey. The results suggested that mean forest-related tourism day visit expenditure per site in England was between £54,000 and £72,000. The figures in Scotland were slightly lower at £42,000 to £70,000, with the lowest mean figures in Wales at £6,000 to £16,000. Mean forest-related expenditure per forest-only and forest combined visit was £7.43, £8.58 and £6.54 in England, Scotland and Wales respectively. These results represent ‘best guess’ estimates, but were subject to considerable uncertainty and consequently should be treated with due care.

Despite the inherent limitations of this modelling exercise, with some improvements in statistical robustness, such TGF models have considerable potential to contribute to the development of local and regional economic development strategies and policies of forestry and non-forestry organisations. Key measures to enhance their application potential are:

- The development of comprehensive and co-ordinated programme for monitoring visits to a representative sample of publicly and privately owned woodland sites,

including a common set of monitoring protocols and common definition of a "site", is a key priority.

- Where 'tourism' is the key focus of interest, the collection of data on visitor type in future forest surveys is required to more accurately assess the ratio of tourism to non-tourism day visits to forests and woodlands across GB.

- Further research into the development of model input variables, particularly in the use of social psychology theory to explore factors motivating trip location decisions and the use of GIS to derive spatially explicit socio-economic and recreation variables such as substitute recreation site indices.

- Household surveys to ascertain how changes in forest cover and management will affect current and future forest tourism day visit and holidaymaking behaviour at a local and national level.

- The development of a national database of publicly accessible forest "sites", both privately and publicly owned, including details on site characteristics and attributes defined on a common basis. The database should also incorporate accurate information about the size of wooded area included in each "site".

Ultimately, even with a more statistically reliable TGF, the lack of a readily accessible comprehensive database of publicly accessible woodlands was a key constraint to achieving the initial objectives of the study. Consequently, it was necessary to draw on data from the 1998 UKDVS (Countryside Agency, 1999) in order to estimate the economic significance of forest-related tourism day visits at the country level. It was estimated that the forest-related tourism expenditures on day visits to forests contribute about £2.3 billion to the GB economy per annum. These figures do not take into account the expenditure undertaken through organised activities in woodlands or that proportion of general holiday expenditures that could be attributable to forests for holidays involving forest-related activities. Nevertheless, it was estimated that in terms of economic significance this represented in the region of 3.3% of all tourism expenditure in GB, giving an indication of the considerable importance of tourism day visits to forests to the GB tourism economy.

A second aim of the study was to quantify the influence of forests on tourism to the countryside and the associated economic significance for six case study areas. The study showed that forests play an important role in attracting people to the countryside, even where they don't visit forests specifically. On average across the six areas considered, 13% of all tourism expenditures incurred by tourists visiting and staying in these areas were "forest-associated tourism expenditures". For those areas more renowned for their forests, this estimate was even higher showing that the forests of these areas are an important economic asset.

The study also developed a novel instrument for investigating individuals attitudes towards forests for recreation and how attitudes relate to behaviour. The study has shown that there is a clear link between individuals attitudes and their forest visiting behaviour. Again, as with the TGF models, the attitude scale has the potential to be used in the development of local forestry policies.

Together the results from the different parts of the study highlight the important and integral role of woodland and forests in the tourism economy. In terms of recommendations, these findings suggest the need for:

- close integration of woodland and forestry policies with those on tourism, recreation and land use;
- close liason between the Forestry Commission and those organisations charged with the responsibility for collecting statistical data on tourism in GB;
- further development and promotion of multi-purpose forestry by public and private organisations.

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GLOSSARY

Additionality: Additionality is a general concept and is defined relative to the counterfactual. In the context of forest-related tourism, forest additionality is the extent to which forests lead to tourism visits and expenditures over and above that which would occur in the absence of those forests.

Attitudes: The conceptual definition of an attitude used in this study is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993).

Backward stepwise regression: In multiple regression analysis, backward stepwise variable elimination enters all of the variables in a block in a single step and then removes them one at a time based on removal criteria defined in probabilistic terms.

Bayesian analysis: Bayesian analysis is a statistical technique that allows new information to update the conditional probability of an event.

Binomial distribution: The binomial distribution is the name given to the probability distribution of an outcome occurring from a series of independent events when there are only two possible outcomes with known probabilities for each event.

Casual forest visitor: A visitors who did not specifically set out to visit a particular forest site on their day trip but, during the course of their outing, decided to spend some time in a forest. The forest plays no role in motivating their day trip, which would be made regardless of whether or not a specific forest existed.

Collinearity: A statistical term relating to multiple linear regression analysis, also sometimes referred to as multicollinearity. Informally, collinearity occurs where an independent (explanatory or predictor) variable is highly correlated with one or more other independent variables.

Correlation: The strength of linear association between two variables.

Counterfactual: The counterfactual is a statement of what would have happened without policy intervention, or if policy intervention had taken a different but specified form.

Dependent variable: A statistical term relating to multiple linear regression analysis, where the dependent variable is a linear function of a combination of independent variables. It is also referred to as the response variable.

Displacement: The extent to which the extra demand on resources (or output) resulting from a policy intervention leads to less supply of resources (or output) in a given area.

Economic significance: An estimation of the economic importance of an activity to an economy based on expenditure taking place within the economy.

Economic impact: An estimation of the economic importance of an activity to an economy based on the injection of "new money" from elsewhere into an economy.

Expenditure partition method: An arbitrary method of attributing expenditures to given economic activities, in this case expenditures associated with forest-related and countryside tourism.

Forest: The term forest is a general term used here to describe all trees and woodland in a landscape.

Forest-associated tourism expenditure: The proportion of total trip expenditure incurred by a day or staying visitor that is associated with an area's forests through the influence of those forests on the choice of trip destination. This can be distinguished from "forest-related tourism expenditure" which is directly related to forest recreation activity.

Forest-combined visit: A visitor who combines a visit to a forest with other activities on their day trip.

Forest model: The forest model refers to a trip generating function that predicts the number of visits made by a given population to a specified site in a given time period.

Forest-only visitor: A visitor who makes a conscious decision to visit a specific forest on their day trip and for whom the forest is of central importance to their decision to make the trip.

Forest-related tourism expenditure: The proportion of day visit expenditure that is directly related to a visit to a forest site through the importance of the forest visit in relation to other trip motivating factors.

Forest sites: This is a general term used to refer to a distinct location that is characteristically wooded or partially wooded. As well as the actual woodland, the forest site itself includes man-made site attributes such as paths, visitor centres etc. and natural physical site characteristics such as water features (rivers, lakes etc.) located within the site.

Independent variable: A statistical term relating to multiple linear regression, where the dependent variable is a linear function of a combination of independent variables, which may also sometimes be referred to as explanatory or predictor variables.

Individual model: The individual model refers to a trip generating function that predicts the number of visits made by a given individual to a specified site in a given time period.

Multiple linear regression: A statistical technique used to study the dependence of one variable (the dependent variable) on more than one explanatory (independent) variable.

Multiplier: The second round effects on the level of economic activity (output, income or employment), generally associated with a policy intervention. There are

several types of multiplier (income, long-run, short-run and supply), the size of which depends on the time period over which it is measured and the geographical area considered.

Poisson distribution: The Poisson distribution is the name given to the probability distribution of the number of times an event occurs in a certain time interval.

Tourism day visits: For the purpose of this study tourism day visits includes day trips from home that last 3 hours or more in duration, and all day trips by holidaymakers regardless of trip duration.

Trip Generating Function (TGF): A trip generating function is a linear equation used to predict the number of visits made to a given site by a given individual or population. The number of visits is the dependent variable, whilst the independent variables include travel cost, socio-economic characteristics, the availability of alternative (substitute) recreation locations, etc.