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Forest of Dean Day Visitor Survey

R J Colenutt R M Sidaway



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An Analysis of the Demand for
Day Visitor Facilities

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FOREWORD

The problem of forecasting recreation demand has attracted much attention in recent years. A local initiative in the Forest of Dean in 1967 prompted the research work which forms the basis of this report.

Dr R. J. Colenutt and local Forestry Commission staff carried out a survey of day visitors to the Forest of Dean during the summer of 1968, and this work formed the basis of Dr Colenutt's doctoral thesis submitted to the University of Bristol in 1970.

This work is a valuable contribution to the study of demand prediction and should assist others contemplating similar investigations.

The second part of the report considers the planning implications of the study and has been written by R. M. Sidaway who at the time of the survey was a field officer in the Forest of Dean. He is now concerned with recreation research in the Planning and Economics Branch of the Commission's Management Services Division.

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A large number of people have contributed to the design, organisation and implementation of this research. We are grateful for their assistance and guidance.

We would like to express our appreciation to the Forestry Commission who made the study possible by allowing the survey to be carried out in the Forest of Dean and by contributing financially. The Ministry of Transport, now part of the Department of the Environment, also made a grant towards the research into the value of time on recreation trips and provided computer time.

Many members of the local staff of the Forestry Commission assisted and encouraged us at various stages. We must mention R. G. Sanzen Baker, then the Deputy Surveyor of the Forest of Dean. The present high reputation and standards of the Dean Forest Park owe much to his hard work during difficult years. Many Commission staff in the Dean and Forestry School students assisted with the Interview Survey. We must thank in particular Mike Dunn, the Forest Warden, and Mrs Mary Hyett for their help. At the Forestry Commission Research Station David Lindley was particularly helpful in getting the data ready for preliminary analysis.

The late Neil Mansfield of the Highway Economics Unit of the Ministry of Transport was instrumental in imposing some rigour into the value of time analysis. His stimulating and frequent criticism was of great value to the study and his untimely death is a real loss to recreation research.

Other people gave help at different and usually critical times. Mr Church at the Rothamsted Experimental Station gave us advice concerning the interview sample frame. John Palmer and the Gloucestershire County Planning Department undertook some of the interviewing and traffic counts as well as adding their encouragement, while David Jones of the Gloucester County Traffic Engineering Department lent and helped us to set up the traffic counters for the traffic count survey.

At the Geography Department at the University of Bristol, Marcia Merry and David Campbell acted as research assistants for short periods, and along with Rodney White and Keith Bassett, provided continuously stimulating company and commented intelligently on almost everything, including the thesis.

We must thank Professors David Harvey and Peter Haggett of Bristol University for their interest and supervision of the project and for their useful comments on successive drafts of the thesis.

Many people made valuable comments on this manuscript, in particular Mrs Joan Davidson and Arnold Grayson, and we are grateful to them. However, we must make it clear that the responsibility for the views expressed in the report is ours alone. Nor can these views be taken to represent official Forestry Commission policy.

Finally, our thanks are due to John Williams for his work on the figures, Frank Thompson for his excellent photographs, including the cover picture; and Mrs F. Edwards for her patience in typing several versions of a bewildering manuscript.

BOB COLENUTT
ROGER SIDAWAY

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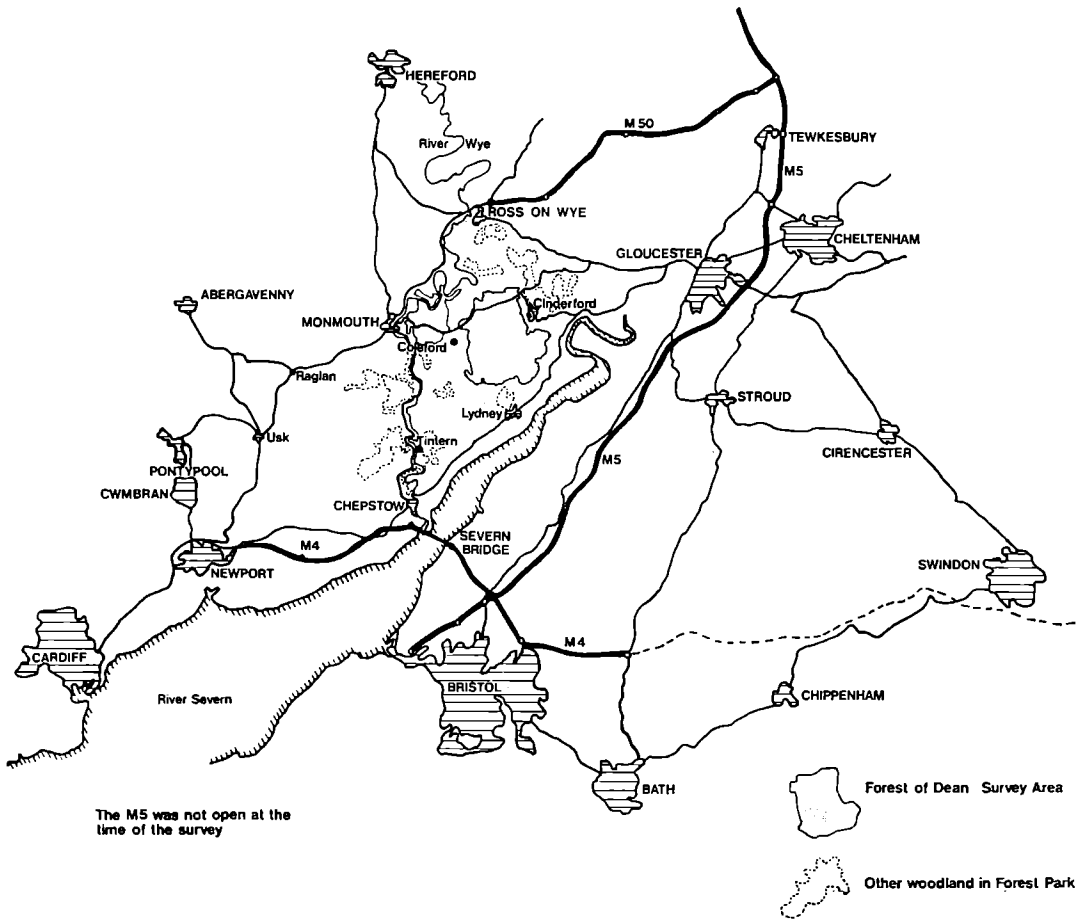


Fig. 1. Location map showing the Forest of Dean.

INTRODUCTION

The Focus of the Study

This report is a description and assessment of research into the use of the Forest of Dean by day visitors. The forest forms part of the Wye Valley and Dean Forest Park which was designated by the Forestry Commission in 1938. The park attracts many kinds of recreational use but by 1967 it was realised that there was very little factual information available on the most significant users—the day visitors. This realisation led to Dr Colenutt's study which is based on a survey carried out in the summer of 1968.

The central theme of the study is the prediction of recreational use of the Forest of Dean by day visitors. Several approaches have been made to the problems of forecasting recreational use and it may be helpful at the outset to clarify the approach that has been adopted and define some of the major terms used.

One approach to demand studies is to attempt to identify the factors underlying participation amongst households in a given recreation activity, using data based on a home interview survey of a sample of a residential population. An alternative approach is adopted in studies in which the origin and destination of participants is examined. Such studies tend to focus either on origin or destination but both would be studied in a full traffic model.

The term trip generation has been widely used for these studies but such usage seems likely to cause confusion about what exactly is being studied. Stricter use of terms is advocated in the *Countryside Recreation Glossary*.¹

Where the focus of the study is the destination, the term "trip attraction" is suggested while "trip generation" is reserved for studies where origins are the study focus. This appears a valid distinction and one we have chosen to adopt.

Another useful distinction made in the Glossary is between trips and visits. A visit is defined as "the presence of an individual on a recreation site during all or any part of a 24-hour period measured from midnight to midnight". A trip is a journey from home or holiday base and back, and includes any visits made to sites. These distinctions have been recognised in the report and usage of "tripper" and "visitor" has, wherever possible, been consistent.

Later in the report the term "day visitor" is used in a special sense which is defined.

The 1968 Dean study falls in the third category listed in Table 1. It is concerned with forecasting visits attracted to the Forest of Dean. Visitors were interviewed at locations in the forest and gave

TABLE 1
TYPES OF RECREATION STUDY

Term	Sampling Point	Sampling Unit
Participation studies	Home population	Households
Trip generation studies	Origins e.g. towns	Trips
Trip attraction studies	Destinations e.g. recreation areas	Visits

information on their journey and their stay in the forest. Inferences can therefore be made about the trips and visits of visitors to the forest. But as this is not a sample of all trippers from each of the contributing towns we can say little about the trip generation characteristics of the populations of the towns.

The Layout of the Report

There are two parts to the report. The first, written by R. J. Colenutt, is based on his doctoral thesis and it follows approximately the sequence of the investigation itself. In this way the pattern of the research process should be evident. This will, it is hoped, be a helpful way of communicating the findings of the study.

Part II, written by R. M. Sidaway, discusses the survey's usefulness for recreation planning in forestry recreation areas in general, and in the Forest of Dean in particular.

Part I is arranged in the following way. In Chapter 1, factors thought likely to influence attendance at the Forest of Dean are discussed. From this "theoretical" analysis, a set of initial hypotheses about the factors influencing demand is postulated. A sample survey designed to test these hypotheses and to collect additional background information is described in Chapter 2, with emphasis placed on a critical evaluation of the survey design and reliability of the data.

The survey data are analysed in Chapter 3 and the hypotheses about factors affecting demand are examined. Numerous difficulties of inference and interpretation arise; it is recognised that some of these difficulties and uncertainties are caused by deficiencies in the survey design.

¹ Countryside Recreation Research Advisory Group (1970) *Countryside Recreation Glossary*, Countryside Commission, London.

In spite of the inconclusive nature of some of the results, models for predicting attendance at different places in the Dean are developed. The results are somewhat surprising, and hence a detailed appraisal of the methods and predictions is included in the final chapter of Part I.

In Part II the local and general significance of the survey results are considered. Of local interest are

the survey findings which give guidance to the management of individual sites in the Forest. The predictions for future use of the area have major implications for the planning of the Forest Park and possible strategies are suggested on the basis of the survey data and local knowledge. In the final section further research work and general policy considerations are discussed.

Part I

**AN ANALYSIS OF THE FACTORS WHICH AFFECT
DAY TRIPS TO THE FOREST**

By Robert J. Colenutt

Chapter 1

THE IDENTIFICATION OF FACTORS INFLUENCING DAY TRIPS

The main focus of the study is the identification of factors that affect the levels of day trip attraction to the Forest of Dean on summer weekends from the surrounding towns. Two sets of factors appear to be important.

- (a) The socio-economic characteristics of trippers and, hence, of the towns generating trips to the Dean;
- (b) Geographical factors of location, accessibility and attraction of the Forest of Dean, and of different recreation areas within the forest.

When the study was being designed most of the available literature that might give guidance on the relevant socio-economic characteristics was concerned with day trip participation based on home interview surveys. Consequently it emphasised variables related to *individual* participation rates of people and/or households. Moreover, some of this literature is a little difficult to interpret because of the varying definitions of day trip activity. The Outdoor Recreation Resources Review Commission (ORRRC) defined a category called "pleasure driving" which is separate from "sightseeing", "picnicking", "boating" and other outdoor recreation activities.¹ The National Opinion Polls survey of leisure activities in the Northern Region of England distinguished between "day trips to the countryside" and "day trips to coastal resorts".²

Finally, the Government Social Survey study of leisure established a class called "excursions to the country or to the seaside".³ Each of these surveys identified factors that seem to influence levels of participation among individuals or households.

In the 1962 ORRRC Survey it was suggested that participation in pleasure driving rose with income, education and social class up to higher income ranges at which point it levelled off. This finding was partly supported by the 1965 Bureau of Outdoor Recreation Survey in which it was found that participation rates for pleasure driving were highest among middle income groups.⁴

In the United Kingdom, the National Opinion Polls 1969 Survey found that occupational status and family incomes above £1,700 were not associated

with higher levels of participation but that day trips tended to increase with levels of car ownership. They also noticed a slight tendency for higher income and occupational groups to visit the country rather than the seaside.

The importance of car ownership was observed, also, by the Government Social Survey's study of leisure. The survey concluded that participation rates among different socio-economic groups were approximately proportional to car ownership rates among these groups, although there was slightly lower participation among higher income car owners. The relative absence of younger age groups (18-25 years) was also characteristic of day tripper parties.

Thus, the literature suggests that the most important social factors affecting participation by households are:

- (a) The ownership of a car or its availability to the household;
- (b) Socio-economic group of the head of the household;
- (c) Stage in the family life cycle as reflected by the relative absence of the 18-25-year age group.

Although propensity to take a day trip is also related to other personal factors such as relative preferences for participating in various types of leisure activities, and the amount and distribution of time available, these factors were not investigated.

As well as socio-economic factors, there are important geographical factors which determine demand for trips to a particular recreation area from a particular town. These factors include the location and accessibility of the Forest of Dean with respect to the main centres of population, the relative attraction and location of competing day trip destinations, and the amount of knowledge that trippers have about different recreation areas available to them.

Locational effects have generally been handled in recreation studies by regarding travel time or distance as a cost to the tripper. On this assumption it is to be expected that trippers will visit recreation opportunities which are closer to their home (and are

¹ Outdoor Recreation Resources Review Commission (1962) *National Recreation Survey*. Report No. 19, Washington, DC: US Government Printing Office.

² National Opinion Polls (1969) *Outdoor Leisure Activities in the Northern Region*, National Opinion Polls Ltd, London.

³ Sillitoe, K. K. (1969) *Planning for Leisure*, Government Social Survey, Report SS388, HMSO, London, pp. 99-102.

⁴ Bureau of Outdoor Recreation (1967), *1965 Survey of Outdoor Recreation Activities*, Washington, DC: US Government Printing Office, 201 pages.

therefore cheaper) more frequently, all other things being equal, than opportunities further away. Thus, forests that are closer to centres of population are more likely to receive larger numbers of visits than more remote forests of equal attractiveness.

This problem of the effect of distance and the role of travel time in determining both demand at a particular site and day trip travel behaviour, constituted the most important subject for study in this research. The emphasis arises out of the debate among analysts of outdoor recreation about the nature of the day trip experience. How do people perceive the drive to a recreation area? Is it seen as a cost to be minimised or as an enjoyable and essential part of the day's outing and therefore a benefit? Perhaps only certain parts of the journey or sections of the route are regarded as costs.

Clawson, in his studies of demand for recreation areas, implied that travel in terms of both time and distance were costs.⁵ This notion was a basic assumption of the demand curve methodology he used for estimating the net benefits gained by visitors to (say) a national park. His demand functions showed that as price (distance) increased demand fell. This simple model provides a method of estimating and forecasting demand for recreation areas and has been employed by many researchers. However, our concern here is whether the model provides a reasonable interpretation of day visitor behaviour.

The geographical distribution and influence of competing recreation places are only indirectly accounted for by the Clawson demand curve. Differences among parks in reputation, prestige, and proximity to scenic routes, are sometimes incorporated in recreation traffic flow studies using variations of the gravity model.⁶ Problems of measuring relative attraction and allowing for intervening or intermediate recreation opportunities arise in these studies.

The general question of the effect of intervening opportunity was, unfortunately, not investigated in detail in this research. Nor was any study made of people's knowledge of the opportunities, although some inferences were drawn on the influence of scenic routes and intermediate opportunities on the travel patterns of trippers, by examining the route choices and travel behaviour of a sample of Forest of Dean visitors.

Finally, we must recognise the effects of the internal variation of the Forest of Dean on trip attraction. If the forest contains several different recreation environments, each may attract different types of visitors. It may therefore be necessary to build a series of trip attraction models to explain satisfactorily important variation that would be obscured by a single model for the forest. In this study the sample of day visitors to the Forest of Dean was found to contain several such sub-groups.

⁵ Clawson, M. (1959) *Methods of measuring the demand for and the value of outdoor recreation*, Resources for the Future Inc., Reprint Series No. 10, Washington, DC.

⁶ See for example: Crevo, Charles, C., "Characteristics of Summer Weekend Recreational Travel," *Highway Research Record*, No. 44 (1963), pp. 51-59; Schulman, Lawrence and William Greco, "Some Characteristics of Weekend Travel to Indiana State Parks," Purdue University Highway Research Center, Indiana, 1964 (Mimeographed); Cesario, Frank J., "Operations Research in Outdoor Recreation," *Journal of Leisure Research*, Vol. I, No. 1 (1969), pp. 33-51; Ellis, Jack B. and Carlton S. Van Doren, "A Comparative Evaluation of Gravity and System Theory Models for Statewide Recreational Traffic Flows," *Journal of Regional Science*, Vol. VI, No. 2 (1966), pp. 57-70.

Chapter 2

SURVEY DESIGN AND THE BASIC DATA FOR THE ANALYSIS

Problems of Design

The phenomenon of acute peaking of recreational use is well known. The crowded conditions in recreation areas that cause concern amongst recreation planners and managers occur mainly on fine summer Sunday afternoons. The same area in other weather conditions, at other times of the year, on other days of the week and at other times of day will be hardly used. While it is economically inefficient to gear facility provision to peak use it is reasonable to concentrate most effort in studying these occasions. Meanwhile it is important to know the numbers of visitors at other times.

Even though attention is focused on day visitors at weekends, it should be clear from the previous chapter that the population is still rather varied. The survey and sample design literature indicates that a clear idea of the expected sources of variation is required for an efficient sample design.¹ This variation can then be efficiently included by stratifying and randomising the sample. But since the number and size of important sub-groups in the tripper population, which would form the basis of stratification, cannot be predicted, it becomes almost impossible to formulate a completely efficient design. Some sources of variation are likely to remain undetected and others will be insufficiently sampled for any significant conclusions to be drawn.

The usual solution to this problem is to conduct a pilot survey and this would have had many advantages. But a full pilot survey covering the summer season was not attempted in this study as it would have delayed the main fieldwork until 1969. Piloting would not necessarily help with the problem of identifying members of the visitor sub-groups in advance, particularly in an informal recreation setting. Frequently the only alternative is to obtain as large a sample as possible with the interviewing resources available. The design of the Forest of Dean Survey attempted to take the following sources of variability into account:

- (a) Fluctuations in the flow of visitors to the Dean over time;
- (b) Variations in the use of different parts of the Dean.

The approach adopted was twofold. Firstly, an estimate was made of the numbers of visitors to the forest from traffic counter readings on picnic places augmented by counts of cars parked elsewhere in the forest. Secondly, a sample was taken of day visitors who came to the popular parts of the forest on weekend afternoons. A two-stage questionnaire was used to gather data on this sample, the first part in an on-site interview, the second to be returned by the respondent on arrival home. Further details of the procedures are set out below.

The Car Count Survey

The quantitative base for the interview survey was provided by a complementary car count survey. The purpose of this count was to make it possible to estimate sampling fractions at the sampling points, and to estimate total use of the Forest of Dean by all day visitors during the survey period of June 1st to September 30th. Traffic counters were set up at the four main sites and read every Friday night and Monday morning over the period. Then as a check on the counters and in order to calculate a ratio between arrivals at the main sites and arrivals over the rest of the Forest, sample counts of all cars arriving in the Forest between 2 and 6 p.m. were undertaken on four occasions. These counts were supplemented by checks on the accuracy of the traffic counters on other occasions.² The counts produced the volume figures from which sampling fractions were estimated and these are shown in Table 2.

A major difficulty in estimating the efficiency of a sample design is deciding the relevant population. The sample fraction may be taken as the number of successful interviews (1,048) expressed as a proportion of the total of day visitor parties on summer weekends. However, if every day of the summer season is included, the sample size is much less adequate.

Sampling Strategy

The problem then remained of allocating a limited number of volunteer interviewers to the greatest advantage over a whole series of possible occasions and sites. We wished to account for seasonal

¹ Davidson, Joan (1970) *Outdoor Recreation Surveys: The Design and Use of Questionnaires for Site Surveys*. The Countryside Commission, London.

² Small pneumatic traffic counters are designed for fast moving traffic travelling over firm road surfaces. In informal picnic places with many access points, the traffic is slow and often turning and the ground surfaces tend to be loose. In these conditions counters do not work satisfactorily and they were found to be unreliable on three of the Dean sites. They were also subject to vandalism. Conditions at Symonds Yat car park were more suitable.

TABLE 2

ESTIMATES OF USE OF THE FOREST OF DEAN BY DAY VISITORS DURING THE SUMMER OF 1968

Period	Cars	Visits (a)	Sampling Fraction (%) for Day Visitor Parties
Summer Period June 1–Sept. 30 Day Visitors	99,000	320,000	1.06
Day Visitors from home	77,000	245,000	—
Weekends (Day Visitors)	45,000	166,000	—
Weekend afternoons (2–6 p.m. Day Visitors)	13,500	50,000	7.75

Note:

(a) The number of persons per car is higher at weekends than in the rest of the week. In calculating estimates of seasonal use, an average car-occupancy rate of 3.2 persons per car has been used. This is based on 1970 observational data. For the weekend estimates a value of 3.7 persons per car, based on responses to question 17 of the questionnaire, has been used.

variations by interviewing day visitors on a number of weekends in the summer, and to account for variations in the distribution of visitors, by interviewing at several different sites. It was therefore decided to conduct interviews on eleven occasions: namely every third weekend afternoon from June 1st to October 1st. On the basis of counts of parked cars made in the afternoons of the 1967 Whit Bank holiday, the Forest of Dean was stratified into four main sites, four medium-use sites and six light-use sites³ (see Figure 2 for the location of these areas). These sites were sampled in approximate proportion to their use; the four main sites for four hours on each occasion, the medium sites for three hours on every fourth occasion, and the light-use sites for one hour on two occasions. The light- and medium-use sampling was cycled in the manner shown in Table 3.

This sampling scheme could be conducted by five interviewers on each occasion with four on the main sites, while one toured the other sites according to the arrangement shown in Table 3. A fixed interview rate of six interviews per hour was set, so that the scheme could yield a maximum of 1,440 interviews. Hence the sample size was, in effect, determined by the number of interviewers that could be guaranteed on any occasion and it was hoped that the scheme was able

TABLE 3

PATTERN OF INTERVIEWING ON THE DISPERSED SITES

Date	Time			
	1400–1500	1500–1600	1600–1700	1700–1800
Sunday June 2	L2	M1	M1	M1
Saturday June 15	M2	L1	M2	M2
Sunday June 23	M3	M3	L4	M3
Saturday July 6	M4	M4	M4	L5
Sunday July 14	L1	M1	M1	M1
Saturday July 27	M2	L6	M2	M2
Sunday Aug. 4	M3	M3	L3	M3
Saturday Aug. 17	M4	M4	M4	L5
Sunday Aug. 25	L2	M1	M1	M1
Monday Sept. 2	M2	L4	M2	M2
Saturday Sept. 14	M3	M3	L3	M3
Sunday Sept. 22	M4	M4	M4	L6

Medium-use Sites —M1 — Readypenny
M2 — Kensley Entrance to the Dilke Hospital
M3 — Cannop Crossroads to Parkend
M4 — Moseley Green to Strikes Quarry and Roman Road to Bullocks Beech

Light-use Sites —L1 — Mireystock via Cannop Crossroads to Concrete Utilities
L2 — Hangerberry/Worrall Hill to Coverham (both roads) excluding Edge End
L3 — Coalway via Dark Hole Bridge to Clearwell Bandstand
L4 — Dark Hole Bridge via Parkend to Knockley
L5 — Sutton Bottom, Abbotswood to Lower Soudley
L6 — Speech House to the Barracks

to account for most of the main sources of variation with only minor biases.

The Interview and Postal Questionnaire

The questionnaire was administered in two parts. A ten minute on-site interview was conducted with the car driver or head of party on arrival at the interview site. The respondent was then handed the second part of the questionnaire to be completed on arrival home and returned in a prepaid envelope. These questionnaire forms and the accompanying maps are shown in Appendix I. The on-site interview was designed to obtain information about the origin of the visitors, their exact route to the Forest of Dean,

³ Medium- and Light-use sites were later aggregated for subsequent analyses into "Dispersed Sites". The precise locations of the four main sites are Symonds Yat (National Grid Reference SO 35642158), Speech House (SO 36232123), Beechenhurst (SO 36142119) and Edge End (SO 35962136).

FOREST OF DEAN DAY VISITOR SURVEY

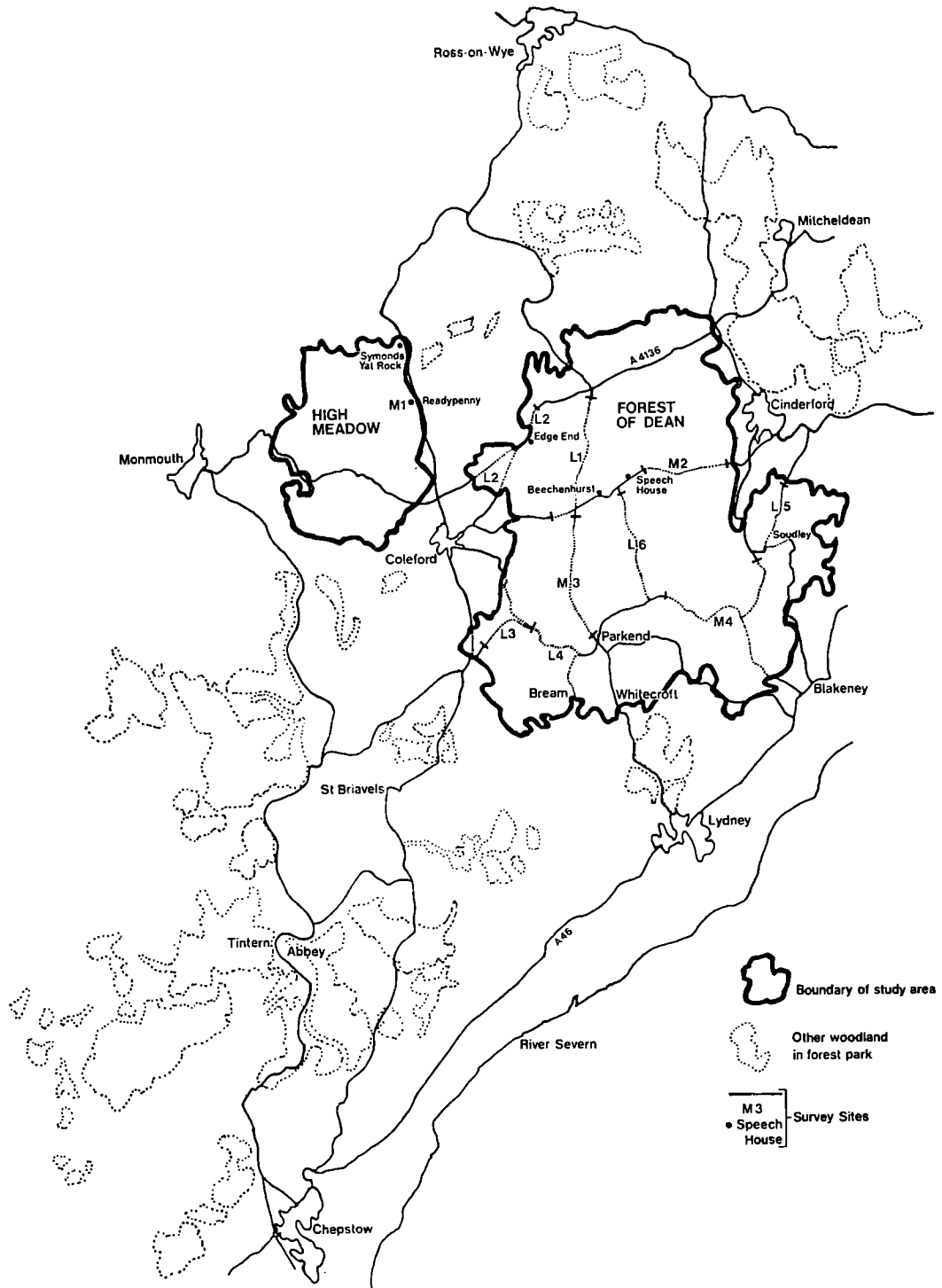


Fig. 2. Survey sites in the Forest of Dean.

and their socio-economic characteristics, while the postal questionnaire requested information about the activities of the visitors in the Forest of Dean, their length of stay, and their exact route from the Forest of Dean back home. This information constituted the main data base for the study.

The survey staff were all volunteers, none of whom had had previous interviewing experience. Most of them were local Forestry Commission supervisory staff while valued help was given by students from the Forester Training School and members of the Gloucestershire County Council Planning Department.

TABLE 4(a)
THE EFFECT OF ONE WAVE OF REMINDERS ON THE POSTAL RESPONSE RATE

Response rate (%) one week after interview	Response rate (%) one week after reminder	Base = all respondents (1,048)
58	78	

Note:

Response rate after reminder does not necessarily equal total response since questionnaire returns were accepted up to three weeks after the interview survey.

TABLE 4(b)
REGIONAL VARIATION IN POSTAL QUESTIONNAIRE RESPONSE RATE

Town	Per cent Response	Number of Respondents
Cardiff	93	46
Gloucester	92	100
Bristol	91	121
Birmingham	90	30
Newport	81	57
Local Residents	70	105
<i>Mean</i>	87	Total = 459

Note:

The towns or areas listed yielded 30 or more respondents.

Postal Questionnaire Response Rates

While response biases were neither expected nor obtained in the on-site interview survey (99% positive response), some biases were expected from the postal survey. However, it was hoped that these biases would be minimised by sending reminders to persons who did not return their questionnaire form within one week. This procedure was very successful in increasing the response rate (Table 4). The remaining non-response biases were located among residents

of the towns in the Dean itself. Table 4 also shows that this group returned fewer questionnaires than any other regional group, which means that the data slightly under-represent short local trips to the Forest of Dean and consequently over-emphasise long trips.

Clearly, the data do contain some biases, the most important of which is the oversampling of some of the lesser used sites, but it seems reasonable to suggest that the data do not suffer from severe biases that upset our conclusions about day trip demand.

The Raw Data for Analysis

In fact, of course, the sample survey turned out to contain a number of biases. As Table 5 shows, the four main sites were not equally used, although the sample design gave them equal weight. This could have been avoided by interviewing (say) every tenth car rather than adopting a fixed interview rate per hour. This was considered too difficult because some of the sites were too extensive to allow observation of all new arrivals.⁴ Again, because of the fixed interview rate, proportionately more interviews were conducted on poor weather days than on fine days so that the sampling fraction on each day tended to vary with the weather.

However, these biases proved less of a drawback in the subsequent analyses than the total size of the sample. This had seemed adequate when the survey

TABLE 5
THE LOCATION OF INTERVIEWS

Site	Number of Interviews		% of total interviews	% of total visits to the forest (b)
	Potential	Actual (a)		
Symonds Yat	288	243	23	30
Speech House	288	211	20	28
Beechenhurst	288	196	19	6
Edge End	288	210	20	7
Dispersed sites	288	188	18	30
Total	1,440	1,048	100	100

Notes:

(a) The shortfall between potential and actual number of interviews was partly because of weather (no interviews were carried out on the afternoon of September 14 because of heavy rain) and partly because the target of 120 interviews per afternoon was never reached. Success was lowest on the dispersed sites.

(b) Based on the results of the car counts. Percentages do not add up to 100 owing to rounding.

⁴ At all sites except the extensive light-use sites, interviews were conducted only with new arrivals to the sites so that length of stay bias was avoided.

TABLE 6
 VARIATION IN THE DISTRIBUTION OF VISITOR TYPES ON EACH SAMPLING OCCASION

Occasion	Sample size	Day Visitor types			Total	Weather
		(a) from home	(b) Transit	(c) Tourists		
Sunday June 2	102	% 83	% 5	% 12	% 100	Sunny, warm
Saturday June 15	97	70	15	16	100	Sunny, warm
Sunday June 23	94	80	11	10	100	Cool, cloudy
Saturday July 6	79	71	15	14	100	Sunny, warm, cloudy
Sunday July 14	103	85	7	8	100	Sunny, warm
Saturday July 27	83	64	16	20	100	Sunny, warm
Sunday August 4	110	83	5	13	100	Cloudy, windy, dry
Saturday August 17	82	59	15	27	100	Cloudy with showers
Sunday August 25	117	83	9	8	100	Cool, sunny intervals
Monday September 2	107	83	6	11	100	Sunny with showers
Sunday September 22	74	82	0	18	100	Cloudy with showers
<i>All days</i>	1,048	77	9	14	100	

Notes:

Definition of visitor types:

(a) who came from and returned to their home,

(b) who stopped in the Dean en route to or from holiday accommodation,

(c) who came from and returned to holiday accommodation.

Percentages do not always add to 100 owing to rounding.

TABLE 7
 TRIP ATTRACTION RATES AND DISTANCE MEASURES FOR THE TWENTY ORIGIN TOWNS

Origin Town	Weighted Trips (a)	1966 Population (b)	Trips per 100,000 people	Road miles to Speech House (c)
Cinderford	121	6,981	1,730	3
Coleford	52	3,386	1,540	3
Lydney	83	5,523	1,500	6
Mitcheldean	28	1,941	1,440	6
Ross	55	6,257	880	10
Chepstow	73	6,085	1,200	15
Gloucester	350	71,900	487	15
Cheltenham	145	72,390	200	24
Stroud	66	18,830	351	25
Hereford	66	45,070	146	26
Pontypool	52	37,580	138	28
Newport	201	111,140	181	30
Bristol	367	433,050	84.8	30
Gt. Malvern	24	26,460	90.7	30
Cwmbran	31	36,480	85.0	31
Worcester	28	68,660	40.8	41
Bath	24	79,620	30.1	41
Cardiff	159	253,920	62.6	42
Swindon	31	94,510	32.8	49
Birmingham	69	1,064,220	6.48	70

Notes:

(a) "Weighted trips" are obtained by multiplying the actual sample trips from a town by a constant representing the ratio between the actual and potential interviews sampled at sites in the Dean (see Table 5).

(b) Population data taken from the 1966 Sample Census.

(c) Road mileage represents the shortest road distance between either the centre of the town and Speech House in the case of towns under 100,000, or the centre of the closest large suburb and Speech House in the case of towns with over 100,000 population.

was designed but when interviews were classified by visitor type, the sample size turned out to be rather restricting. Three visitor types had been recognised; *day visitors from home*,⁵ who travelled from and returned home that day; *transit visitors* who stopped in the Dean en route to or from holiday accommodation, and *tourist visitors* who were visiting the Dean from and returning to holiday accommodation.

The trip attraction model can only easily incorporate day visitors from home for these are the only trip origins for which various population statistics suitable for forecasting are available. Day visitors from home made up 77% of the total sample (see Table 6). This number in turn was reduced to a

group of origin towns for which population statistics and accurate distances could be measured. This sub-sample represented 72% of all day trips from home; other towns from which trips originated have been ignored in the main analysis. To qualify as an origin town, 20 or more trips had to be attracted from a town after the original sample of respondents had been weighted to allow for the differences in actual and expected use of the interview sites (see Table 5).

The 20 towns with the number of weighted trips, their populations, distances from the forest, trip attraction rates and levels of car ownership are listed in Tables 7 and 8. They lie within a 70-mile radius of the Forest of Dean and their relative location is shown diagrammatically in Fig. 3.

TABLE 8

CAR OWNERSHIP LEVELS IN THE TWENTY ORIGIN TOWNS

Town	Cars Owned 1966	Households 1966	Cars/100 Households
Cinderford	1,230	2,274	54.09
Coleford	671	1,088	61.67
Lydney	1,282	1,872	68.48
Mitcheldean	342	598	57.19
Ross	1,155	1,999	57.78
Chepstow	845	1,786	47.31
Gloucester	10,870	22,270	48.81
Cheltenham	13,720	25,440	53.93
Stroud	3,730	6,390	58.37
Hereford	8,320	14,470	57.50
Pontypool	5,650	12,460	45.34
Newport	16,930	35,160	48.15
Bristol	72,420	143,560	50.44
Gt. Malvern	5,740	8,990	63.85
Cwmbran	6,550	10,880	60.20
Worcester	11,920	22,790	52.30
Bath	13,190	28,280	46.64
Cardiff	37,930	79,220	47.88
Swindon	13,330	29,310	45.48
Birmingham	152,090	338,280	44.96

Source: 1966 Sample Census.

Note:

The towns in this and subsequent tables are arranged in order of increasing distance from the Dean.

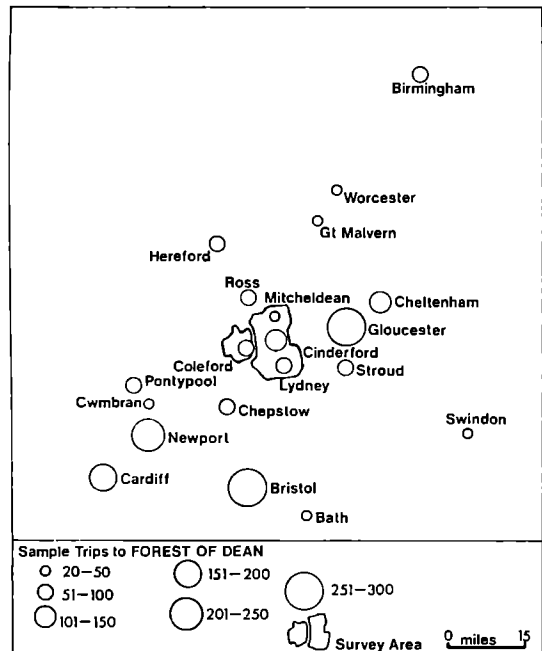


Fig. 3. Location of the twenty main origin towns in the Forest of Dean day visitor catchment area.

⁵ The subsequent analyses are concerned almost entirely with day visitors from home and they will normally be referred to as day visitors. Occasionally for clarity the term "day visitors from home" will also be used.

Chapter 3

AN ANALYSIS OF THE FACTORS AFFECTING TRIP ATTRACTION

Introduction

Many empirical investigations in the social sciences are conducted by searching through blocks or matrices of data for regularities that may or may not have been expected. The process is often not efficient and the findings are often speculative. The problem with any data collection survey is that the researcher is forced to specify what he is looking for before he begins his analysis. Inevitably there are negative findings as some variables turn out to be less significant than had been expected. Meanwhile, with hindsight, gaps can be seen where more information is required. It becomes possible to build a model from the Dean data but it is also clear that we have only just begun to unravel the structure of demand for day trips. In Chapter 1, a number of factors were suggested as explanations of the variations in the trips generated by towns surrounding a recreation area. These groups of factors are investigated in turn below.

Variation Due to the Characteristics of the Visitors

The results of the national surveys quoted earlier lead us to expect about the same proportions of day visitors in each socio-economic group as there are car owners in each socio-economic group in the population.¹ Data for the socio-economic group of "main drivers" is available for the national population and if this is taken to represent car owners in the Dean catchment, there is some evidence for such a relationship. This comparison is made in Table 9 and a Chi-Square test of the differences between the two distributions shows there is no significant difference at the 90% level of probability.

Consequently, if there is variation in car ownership among the 20 sample towns, these differences should be reflected in variations in trip attraction rates. A correlation between car ownership levels and trip attraction rates for the 20 towns produces a correlation coefficient of .51. Can we therefore conclude that differences between trip generation from the towns are partly explained by differences in car ownership?

This is where the dangers of making uncritical inferences from this type of survey become apparent.² Since both car ownership and the propensity to visit the Dean are negatively correlated with distance

TABLE 9

OCCUPATIONAL PROFILE OF DAY VISITORS COMPARED TO PROFILE OF CAR DRIVERS IN THE NATIONAL POPULATION

Occupational Classes (a)	Dean Day Visitors from home	Socio-Economic Group of "Main Driver" (b)
Sample size	804	13,000
	%	%
Managerial	15.0	14.0
Professional	8.0	7.0
Clerical	25.0	18.0
Supervisory	8.0	5.0
Skilled	27.0	28.0
Semi-skilled	8.0	11.0
Unskilled	2.0	2.0
Self-employed and others	7.0	16.0

Notes:

(a) Occupation Classes are groupings of Registrar-General's occupational classes. Managerial = 1 and 2; Professional = 3 and 4; Clerical = 5 and 6; Supervisory = 8 and 15; Skilled = 9; Semi-skilled = 7, 10, 16; Unskilled = 11; Self-employed and others = 12, 13, 14, 17.

(b) The "Main Driver" profile refers to the occupation of the principal driver in households to which a car is available. The data are taken from the Ministry of Transport's 1965 "National Travel Survey" (unpublished) supplied by Statistics Division A, Department of the Environment.

from the centre of the Forest, the positive correlation between car ownership and visits could be caused by the higher levels of car ownership of some towns (particularly Lydney) that are close to the Dean. This influence is confirmed by looking at the partial correlations between these three variables. They give an indication of the separate effects of car ownership and distance upon the number of trips attracted to the Dean. The correlations are set out in Figure 4.

While the correlation between trip attraction rate and distance was $-.966$, the partial correlation between these two variables with car ownership held constant was $-.958$. In comparison the partial correlation between trip attraction and car ownership appears low ($-.283$) and is not significantly different from zero.

This does not mean that the number of visits attracted from a town is unrelated to car ownership but that, in the Dean data, the relationship between

¹ See page 5.

² For an excellent discussion of methods for detecting and controlling for such problems, see Blalock, Hubert M. (1961) *Causal Inferences in Non-experimental Research* (Chapel Hill: University of North Carolina), 199 pp.

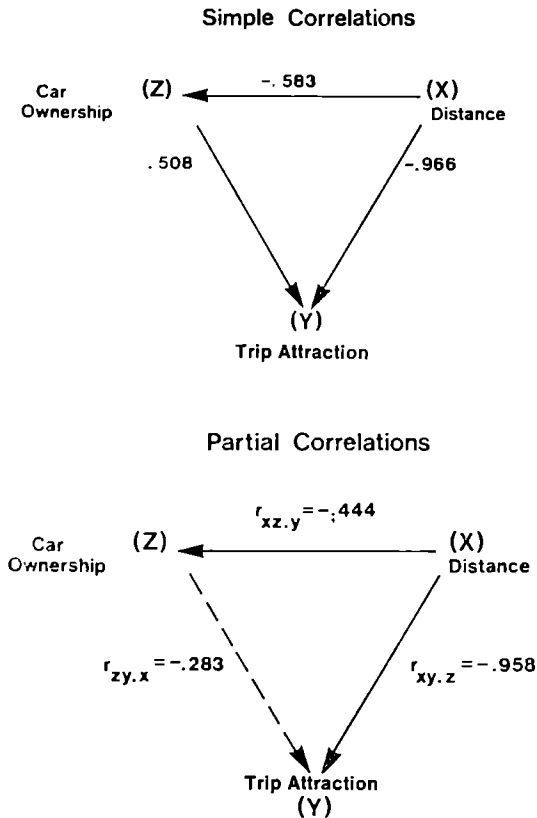


Fig. 4. Correlations between trip attraction, car ownership and distance.

the two variables is unclear. It appears that little of the variation in trip attraction rates among the sample of 20 towns can be directly attributed to differences in car ownership. If there were more towns in the sample at the same distances, it would be possible to control for the influence of distance and thus produce a satisfactory estimation of the effect of car ownership. Similar problems arise when the influences of the socio-economic characteristics of trippers are examined. It might be expected that the data would exhibit the phenomenon observed in the American ORRRC Surveys where persons in higher income occupations tend to travel further on recreation trips than persons in other occupational groups.

The trip length distributions of visitors in different occupational groups are compared in Table 10. A Chi-Square test shows that there is a significant difference between the three distributions at more than the 95% level of significance. However, the differences tend to decrease if visitors are grouped into 20-mile distance bands instead of 5-mile bands,

showing that the detection of weak relationships is very much affected by the way in which the data are grouped. There is a correlation of .57 between the percentage of managerial and professional visitors from a town and the distance of the town from the Dean, but this could be caused by a higher proportion of persons in upper occupational categories in the more distant towns. However, a Chi-Square test of the occupational profiles of the visitors from the seven towns, which produced more than 20 weighted trips, revealed neither significant difference nor similarity between the profiles. The results of this analysis are inconclusive. The most that can be said is that there is no evidence of a strong relationship between occupational group and visits to the Dean.

TABLE 10
TRIP LENGTH DISTRIBUTIONS OF OCCUPATIONAL GROUPS

	Managerial and Professional	Clerical	Skilled
	%	%	%
0-5 miles	4	2	4
6-10 "	4	4	8
11-15 "	8	11	4
16-20 "	8	8	9
21-25 "	9	5	5
26-30 "	11	11	14
31-40 "	24	21	23
41-50 "	7	15	10
51-60 "	5	9	7
61-70 "	10	3	5
71-80 "	6	2	4
81-90 "	1	3	2
91-100 "	1	3	1
Above 100 "	4	4	4
Total	100	100	100
Mean Trip Lengths	40.7	39.7	37.7
Sample Size	169	184	178

Note:

The occupational groups are combined classes of the Registrar-General's *Classification of Occupations*: Managerial and Professional = R.G.'s classes 1, 2, 3 and 4; Clerical = R.G.'s classes 5 and 6; Skilled = R.G.'s class 9.

The same conclusion applies to the other socio-economic variables that were examined; age, age of completion of full-time education, and family structure (visitor parties with and without children). The data are displayed in Appendix B but it appears that although these variables are likely to be important determinants of participation among *indivi-*

TABLE 11
ACTIVITIES OF RESPONDENTS AT EACH DESTINATION IN THE FOREST OF DEAN
(Percentage participating)

Base = respondents returning postal questionnaire	Symonds Yat	Speech House	Beechenhurst	Edge End	Dispersed Sites	All Sites
Sample size	145	144	138	134	141	702
Nature trail	21	32	20	11	27	22
Waymarked path	44	19	20	20	33	27
Look at view	92	59	75	78	67	74
Picnic	43	57	77	80	71	65
Walk less than $\frac{1}{2}$ hour	44	35	36	49	35	40
Walk more than $\frac{1}{2}$ hour	48	42	36	22	41	38
Walk with dog	13	16	24	11	13	16
Stayed near car	12	40	46	52	30	36

Note:

The 'destination' in this study is defined as the place at which the visitor was interviewed. However, this place may not have been his only destination.

duals, there is no clear relationship when the data are aggregated into origin towns.

It may well be that the socio-economic variables have not been measured in the most meaningful units or groups of units for this purpose. Alternatively, and this appears to be true of the Dean data, when measurements are made from the origin towns, these towns are large enough for their populations to show very little variation in socio-economic characteristics. In other words, for the limited task of predicting the numbers of visits attracted from the major towns in the Dean day visitor catchment, distance is a good proxy variable. At this level of aggregation distance appears to smother the independent effects of the socio-economic variables.

The Effects of the Internal Character of the Forest of Dean

One of the most important factors affecting the demand analysis is the relative attraction of different areas within the Forest of Dean. It has already been suggested that a general trip attraction model for the whole forest may be misleading unless individual picnic places are of the same character. Strong differences can be recognised within the Dean. Symonds Yat, on the western edge of the Forest Park, contrasts with the Forest of Dean proper centred on Speech House. Symonds Yat is a particularly well-known beauty spot with a viewpoint overlooking the Wye Valley. There is a large informal wooded parking and picnicking area close to the Speech House Hotel, the traditional centre of the forest, while the Beechenhurst picnic place is one of the few

open grassy spaces in the forest. It was formed by the levelling and restoration of the former Speech House Colliery and has a pleasant view over the Cannop Valley. In contrast the Edge End picnic place is sited on the A4136 Mitcheldean to Monmouth road and attracts a certain amount of holiday traffic passing through the Dean. It has a view of the Breconshire mountains to the west. The relative popularity of each of these places is shown in Table 5, while more detailed figures of their use are given in Part II.

Can the visitors to these sites legitimately be considered as one group? What differences are there among the characteristics of these visitors and their behaviour? Firstly, the sites provide opportunities for different types of recreation activity. Table 11 shows that while Symonds Yat visitors stop primarily to look at the view, those to the rest of the Forest of Dean spend more time near their cars and more have picnics. Secondly, Symonds Yat attracts visitors from much further afield than Speech House. This is clearly shown by comparing the trip length distributions for the two areas (Figures 5a and 5b).³

The difference between the beauty spot and the local recreation area is reflected in the entire behaviour pattern of the two main groups of trippers visiting the Forest of Dean. The first group is characterised by long-day trippers who spend at least five hours away from home, of which about three hours are spent in the Forest of Dean area. However, these visitors do not appear to be as interested in exploring the Forest of Dean *per se* as in sightseeing in the Wye Valley area, of which Symonds Yat forms a part. Conversely, the rest of the Forest of Dean attracts a greater proportion of

³ The distributions were significantly different at the 99% level of probability when the data were aggregated into 5-mile and 10-mile groups.

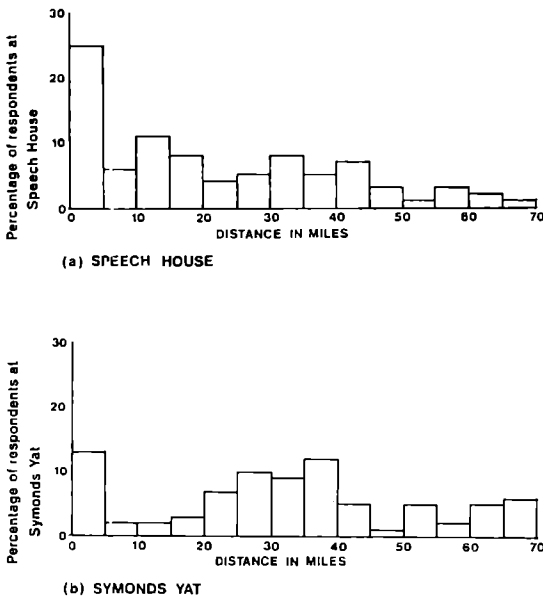


Fig. 5. Trip length distributions of day visitors at weekends to Speech House and Symonds Yat.

local visitors on shorter visits who perhaps save up their trips to Symonds Yat for off-peak periods.⁴

Do the characteristics of different sites in the forest influence the numbers and types of visitors attracted to it? It certainly seems reasonable to suggest that better known places attract visitors from more distant towns and that the reputation of Symonds Yat influences the total numbers visiting the forest. The characteristics of other less known sites are more likely to affect the distribution of visitors around the forest. It would now be helpful to be able to explore the relationship between knowledge of the forest and distance and their influences on day visitor behaviour. This at least emerges as one serious gap in our knowledge, one in which the Dean survey cannot help us. Other ways in which distance and relative location are fundamental to our understanding of trip attraction are explored in the next section.

The Role of Distance and Travel Time

It has already been suggested that distance plays a dominant role in explaining levels of trip attraction,

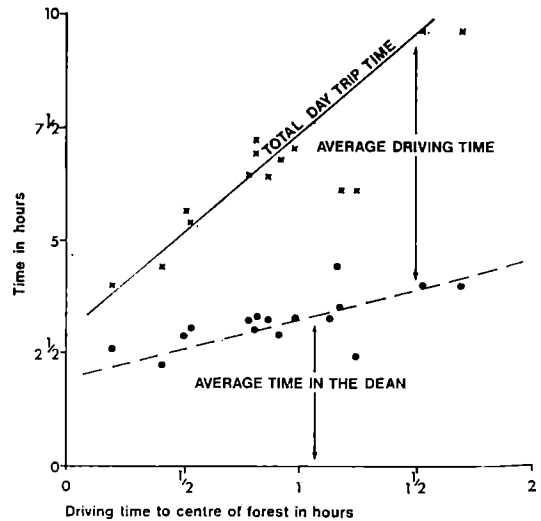


Fig. 6. The time budget of Forest of Dean day trippers from the twenty origin towns.

but the interpretation of this crucial variable has not yet been undertaken.

In the Clawson demand curve, distance is generally assumed to be a cost to the tripper. But if travelling is indeed a cost, then like any other consumer, the day visitor will attempt to minimise it as far as possible. We, therefore, have to determine whether trippers are sensitive to travel costs and if so whether trip generation rates are affected by travel time changes.

There are several methods of assessing the importance of travel time. The first method involves interviewing visitors and asking them how willing they would be to visit the recreation area at increased costs. Mutch employed this method in a survey of visitors to Forest Parks in Britain⁵ and concluded that visitors were not at all sensitive to travel costs. But such an approach produces unreliable results since the responses of visitors once they have reached their destinations may not reflect their real attitudes to travel costs.

This is suggested by some contrary conclusions reached by Mansfield in a study of trip generation to the Lake District.⁶ The method Mansfield used was

⁴ The two groups are not clearly demarcated in Fig. 6 but were identified by a principal components analysis of variables measuring activity, demand, and travel patterns of trippers from the 20 towns, and a further principal components analysis of the same data for individual trippers. For full details see Robert J. Colenutt (1970) *An Investigation into the Factors Affecting the Pattern of Trip Generation and Route Choice of Day Visitors to the Countryside*, unpublished Ph.D. Dissertation in Geography, University of Bristol, pp. 94-105.

⁵ Mutch, W. E. S. (1968) *Public Recreation in National Forests: A Factual Survey*, Bull. For. Comm., Lond. 21.

⁶ Mansfield, N. W. (1969) "Recreation Trip Generation", *Journal of Transport Economics and Policy*, Vol. 3, No. 2, pp. 152-164.

to investigate the elasticities of demand for day trips (measured as trip generation rates) with respect to distance and travel time. His data showed that trip generation was quite sensitive to travel time changes, although it was difficult to separate the independent effects of distance and travel time.

It was possible to undertake a similar analysis with the Forest of Dean data. Firstly, we have to fit an equation to the data shown in Table 7. The data are plotted in Fig. 7 giving a curve known as a trip attraction function which describes graphically the fall off with distance in the rate of trips attracted from a town. For convenience, distance in this instance is measured in road miles from the centre of the Dean.

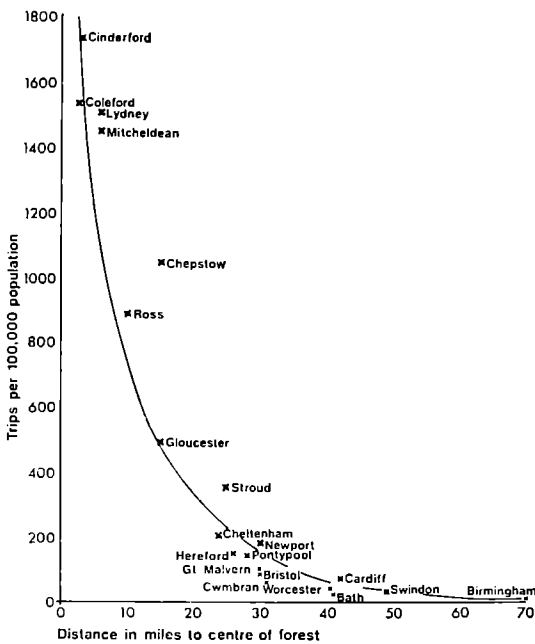


Fig. 7. The trip attraction function for Forest of Dean day visitors.

Generally, such curves tend to be typical exponential distance decay curves described by an equation of the form:

$$Y = e^{a-bx} \tag{1}$$

where Y equals the trip attraction rate from a town, x equals distance in miles, and e is the base of natural logarithms. Written as a linear equation, the curve is described by

$$\text{Log}_e Y = a - bx \tag{2}$$

Inserting the Dean trip attraction data into equation (2) gives the following values:

$$\text{Log}_e Y = 7.64 - 0.090x \tag{3}$$

(± 0.010)

(The standard error of the regression coefficient is shown in brackets)

where Y equals trips per 100,000 people and x equals distance in miles from Speech House.

One way of measuring the sensitivity of trippers to increasing distance is to calculate the elasticity of trip attraction with respect to distance which is equal to the b coefficient in equation (4)

$$\text{Log}_e Y = a - b \text{log}_e x \tag{4}$$

The data for the 20 towns around the Forest of Dean yield an elasticity of about 1.6, which means that a 1% increase in distance is associated with a 1.6% decrease in trips per 100,000 people. However, when the data are broken down into the sub-groups identified earlier, Symonds Yat elasticities are seen to be higher than Speech House elasticities (see Table 12) and there is some evidence to suggest that elasticities for long distance trippers are higher than those of short distance trippers.

TABLE 12
SENSITIVITY OF DAY VISITORS TO DISTANCE AS MEASURED BY THE ELASTICITIES IN EQUATION (4)

	Symonds Yat		Speech House		All Forest	
	b	R ²	b	R ²	b	R ²
All trips	2.43	(.77)	1.61	(.79)	1.60	(.83)
More than 15 miles	3.27	(.97)	3.31	(.88)	3.90	(.91)
Less than 15 miles	*(c)		0.51	(.49)	0.13	(.14)

Notes:

(a) The columns marked b are the elasticities expressed as the b coefficients in the equation

$$\text{Log}_{10} Y = a - b \text{Log}_{10} X$$

e.g. for the forest as a whole

$$\text{Log}_{10} Y = 4.36 - 1.60 \text{Log}_{10} X$$

(b) The R² values in brackets denote the proportion of variation accounted for by the regression.

The maximum value of R² is 1.0 where the regression is a perfect fit.

(c) * Denotes insufficient data to calculate coefficients.

These numbers can be interpreted in the following way. Since a high elasticity represents a high sensitivity to distance, we can infer that visitors on longer trips are more concerned with small relative differences in distance than visitors on short trips. If we consider changes in travel time brought about by improving the roads in and around the Dean, it seems reasonable to suppose that there would probably not be any significant increase in trips attracted from the local towns (say within 15 miles), but there

would be increases in trips from towns further away. This has important implications for predicting future use of the Dean since several new road developments are expected to make some of the more distant centres of demand more accessible to the Dean (e.g. Swindon via the M4).

The third method of estimating the importance of travel time should confirm our findings above. If travel time and distance have separate effects, they should exert separate effects on the level of trip attraction when we add travel time into our linear equation (2), to create (5):

$$\text{Log}_e Y = a - b (\text{Distance}) - c (\text{travel time}) \quad (5)$$

But it turns out that the travel time coefficient is not significant.

Fig. 8 tells us why this is so. Travel time and distance are so closely related ($R = .96$) that it is not possible for travel time to add to the explanation of the trip attraction rates made by equation (2).

This is perhaps surprising since there are a number of motorways within the Dean catchment area and one might expect some towns such as Birmingham and Worcester to have definite travel time advantages. Thus, we can either conclude that towns with travel time advantages do not generate more trips than those without, or that we have not measured the effects of travel time in the best way.

The main difficulty seems to lie in the very close relationship between travel time and distance, which makes it difficult to estimate the independent effects of the variables. A method of circumventing this difficulty has been suggested by Mansfield.⁷ He has proposed defining a new variable called "excess time" which is obtained from the residual of the time/distance regression shown in Figure 8. However, although the method might yield significant estimates of the importance of variables which are closely related in other research, the new variable did not prove to be significant in this analysis because time and distance were so closely related.

However, other ways of estimating the effects of travel time are available. It is a reasonable assumption that if travel time is important to the individual tripper, he will tend to choose the shortest route to and from the Forest of Dean. The shortest road distance from each origin town to the edge of the Dean was measured and compared with the actual road distance travelled by the tripper so as to give an index of the importance of travel time. The mean deviation from the shortest path for each of the 20 towns was calculated to produce Table 13. Now plotting these values against distance as in Figure 9, it is reasonably clear that local towns have larger

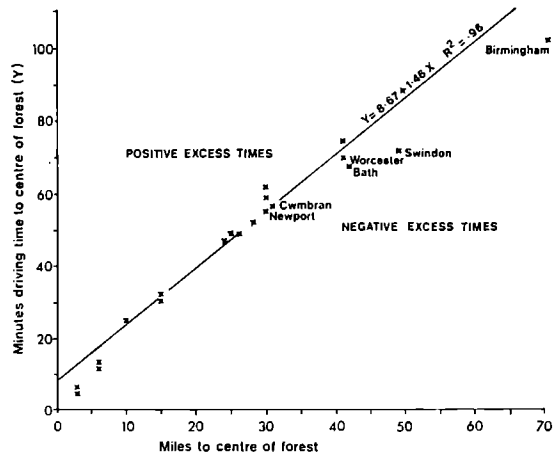


Fig. 8. The estimation of excess time values from the regression of time on distance for the twenty origin towns.

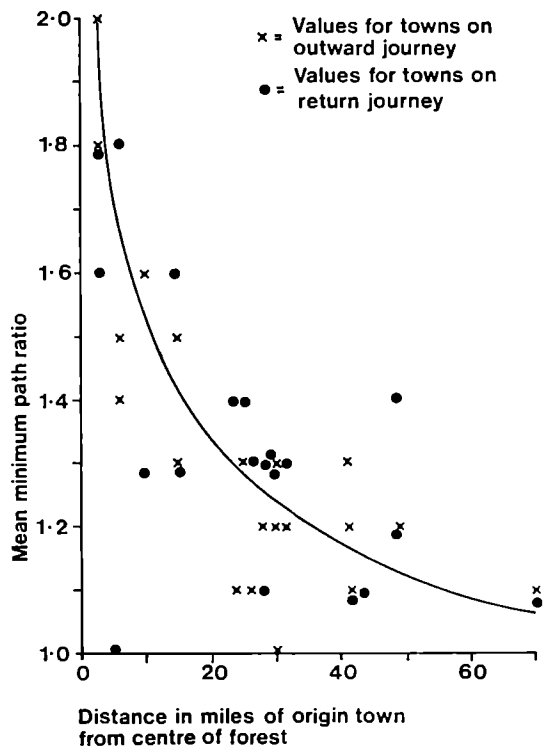


Fig. 9. The relationship between minimum path ratios and distance for outward and return journeys.

⁷ Mansfield, N. W. (1969) *Time Research Note No. 1*, Mimeographed Report, Highway Economics Unit, Ministry of Transport.

TABLE 13
MEAN OUTWARD AND RETURN JOURNEY MINIMUM PATH RATIOS

Base = Respondents from 20 origin towns	Outward Journey			Return Journey		
	Minimum Path Ratio (a)	Standard Deviation of Ratio	Mean Absolute Deviation (minutes)	Minimum Path Ratio (a)	Standard Deviation of Ratio	Mean Absolute Deviation (minutes)
Origin towns						
Cinderford	1.8	1.81	5	1.6	1.13	4
Coleford	2.0	(b)	6	1.8	1.12	5
Lydney	1.5	(b)	7	1.8	1.29	10
Mitcheldean	1.4	(b)	5	1.0	0.08	0
Ross	1.6	1.10	15	1.3	0.67	7
Chepstow	1.3	0.86	9	1.6	1.46	19
Gloucester	1.5	1.19	16	1.3	0.55	10
Cheltenham	1.1	0.30	5	1.4	0.49	19
Stroud	1.3	0.54	15	1.4	0.45	20
Hereford	1.1	0.26	5	1.3	0.54	15
Pontypool	1.2	0.26	10	1.1	0.18	5
Newport	1.2	0.33	11	1.3	0.52	16
Bristol	1.3	0.39	18	1.3	0.37	18
Malvern	1.2	(b)	12	1.3	0.40	19
Cwmbran	1.0	(b)	0	1.3	0.55	17
Worcester	1.3	0.50	21	1.1	0.08	7
Bath	1.2	0.27	15	1.4	0.43	30
Cardiff	1.1	0.19	7	1.1	0.13	7
Swindon	1.2	0.24	14	1.2	0.27	14
Birmingham	1.1	0.23	12	1.1	0.16	12

Notes:

(a) Minimum path ratios are the means of the ratios for each origin town calculated by dividing the actual trip distance to the place of interview by the shortest trip distance (both expressed in miles).

(b) Denotes standard deviation not calculated.

TABLE 14
THE DISTRIBUTION OF TRIPS FROM PARTICULAR TOWNS IN EACH TRIP SHAPE CATEGORY
(percentages)

	Sample Size	Direct (a)	Circuit (b)	Wye/Dean (c)	Long Trips (d)	Total
Gloucester	88	22.7	11.4	48.7	18.2	100
Cheltenham	42	23.5	5.9	59.7	11.9	100
Newport	48	16.7	47.9	13.5	22.9	100
Bristol	106	21.2	20.2	37.0	21.6	100
Cardiff	42	16.7	45.2	21.4	16.7	100

Definitions:

(a) Direct trips return by the same route.

(b) Circuit trips contain no duplication of route on the same journey.

(c) Wye-Dean trips include a tour in that area.

(d) Long trips only enter the Dean for a short period.

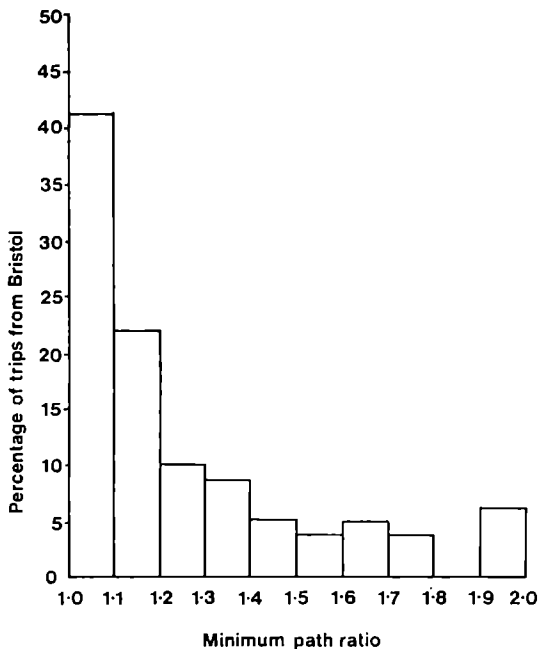


Fig. 10. The distribution of minimum path ratios for Bristol trippers.

ratios than non-local towns, and this confirms the conclusions reached earlier from the elasticity analysis that longer distance trippers are more sensitive to travel time.

Although about 60% of trippers to the Dean chose the shortest route to the edge of the forest park, deviations were often considerable. The distribution of minimum path ratios for Bristol trippers shown in Figure 10 illustrates the point.

A detailed analysis of travel patterns formed by a sub-sample of trippers from the major centres of origin, Bristol, Newport, Cardiff, Gloucester and Cheltenham, showed that route choice patterns varied with trippers from the same towns and also varied systematically between towns.⁸

Deviations from the shortest route can be accounted for by the different types of day trip. The main classes of trip seem to be:

- (a) Direct trips to the main centres of interest in the Dean which return by the same route (see Fig. 11 and 12);
- (b) Circuit trips to the forest in which there is no duplication of the route;
- (c) Trips to the Wye/Dean area that include a tour of that area (see Fig. 13 and 14);
- (d) Long meandering trips that only enter the Dean for a short period.

Classes (a) and (c) are more prevalent among this sub-sample of Dean visitors (see Table 14) but the percentage in each class tends to vary with the distance of the origin town from the edge of the Dean. There is the interesting possibility that the percentage of direct trips increases with distance from the edge of a recreation area such as the Dean, although other factors such as the configuration of the road network will have some effect on travel patterns. Since the most scenic routes in the Dean area such as the Wye Valley road (A466) and parts of the M4 and M5 are also the fastest, no firm conclusions can be drawn on the visitors' choice between scenic routes or shorter travelling times.

It appears that travel time is an important consideration for many visitors on at least one leg of their trip to the Dean. For certain types of visitors the provision of improved roads may well increase the number of trips attracted from the appropriate region. In studies of trip generation and attraction it may be crucial to recognise separate categories of visitors to build a suitable explanatory model.

A further crucial factor is the location of other recreation areas relative to the area under study. Unfortunately no conclusions can be drawn on this topic from the Dean study. In further investigations, it would be sensible to include special questions in the interview on this matter. One simple approach might be to ask visitors which places they had visited on their two previous day trips to the countryside.

The distribution of other recreation areas and places of interest is important for another reason. A certain proportion of day trips to the countryside do not consist of visits to just one recreation area or beauty spot such as Symonds Yat. The day trip may include a visit to Ross on Wye, Tintern Abbey, and even the Cotswolds. A significant proportion of the day trips to the Dean were of this type, as Table 14 indicates, and thus in considering day visits to the countryside it is necessary to think in terms of recreation "activity regions" rather than independent recreation areas. Clearly, the Forest of Dean does not constitute a coherent recreation area for many trippers and in further studies of this area, both the Dean and the Wye Valley (at the least) should be considered as one recreation region.

Conclusions

Two sets of factors were suggested as influences on the level of trip attraction from towns around the Forest of Dean. The first set was made up of socio-economic variables which appear, in this study, to exert a comparatively weak influence on trip attraction from the main towns in the Dean catchment.

⁸ For a full discussion of the methods used in this part of the research, see Colenutt, Robert J., *ibid.*, pp. 254-285.

However, these variables seem to be significant in influencing the propensity of individual households to undertake day trips. On the basis of the observations for the 20 origin towns used in this study, it seems clear that locational factors, principally distance from the forest, were the most important

factors influencing trip numbers. Differences in the character of various parts of the Forest of Dean produced variations in the types of visitors attracted to the area. The most important breakdown of visitors was into local and non-local categories. These groups tended to visit different parts of the

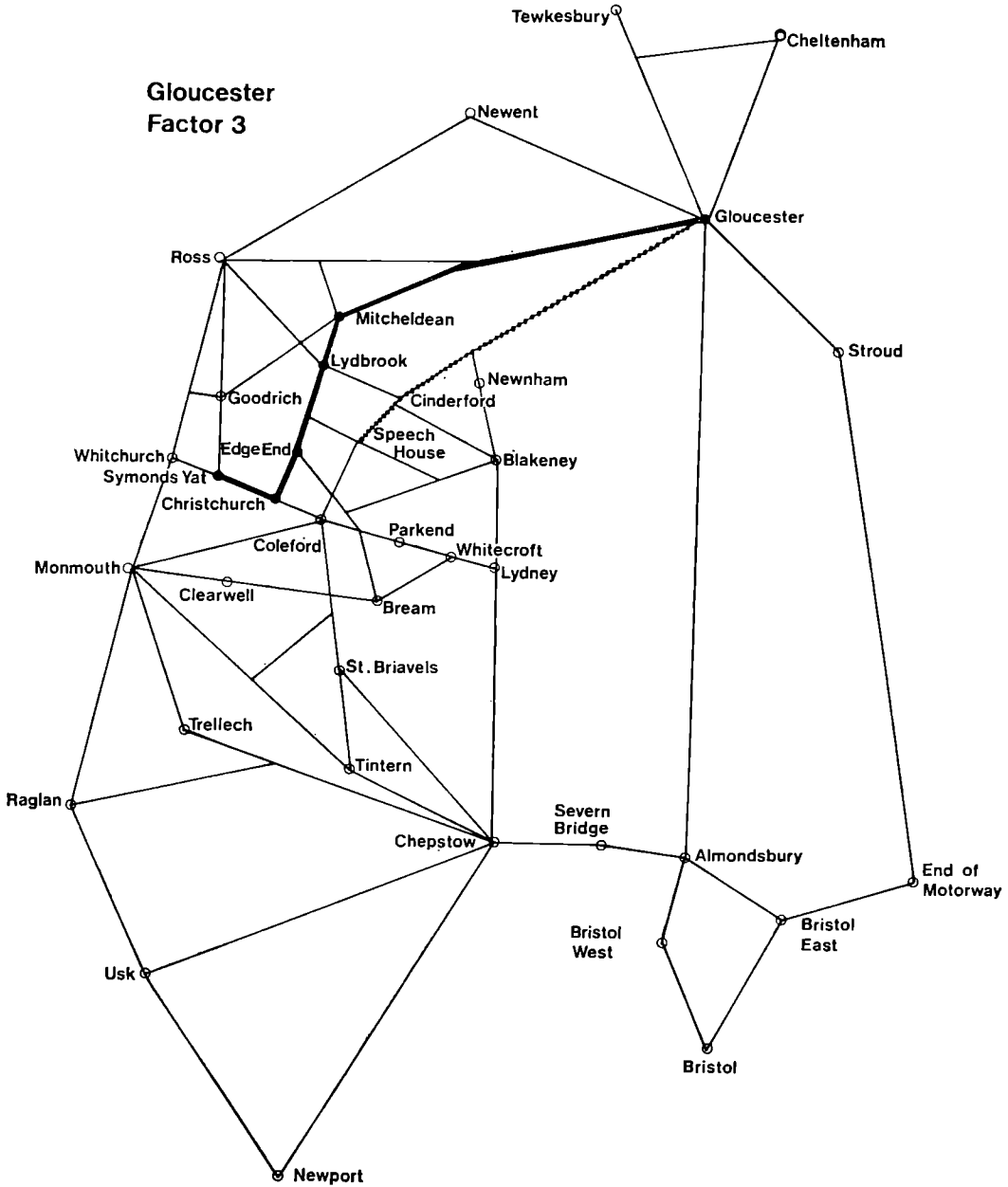


Fig. 11. Typical direct paths from Gloucester to Symonds Yat and Speech House as detected by a principal components analysis of trip patterns.

Dean and may regard their visits in a very different way. Families who visit the Dean for a couple of hours on a Sunday afternoon contrast with those who leave home before noon and return home late at night. These groups have different attitudes to travel, with longer distance visitors being more

concerned about the time savings than short distance travellers.

The major sources of variation in the Dean day trip data, therefore, appear to be:

- (1) Differences in trippers visiting Symonds Yat and the rest of the Forest of Dean;

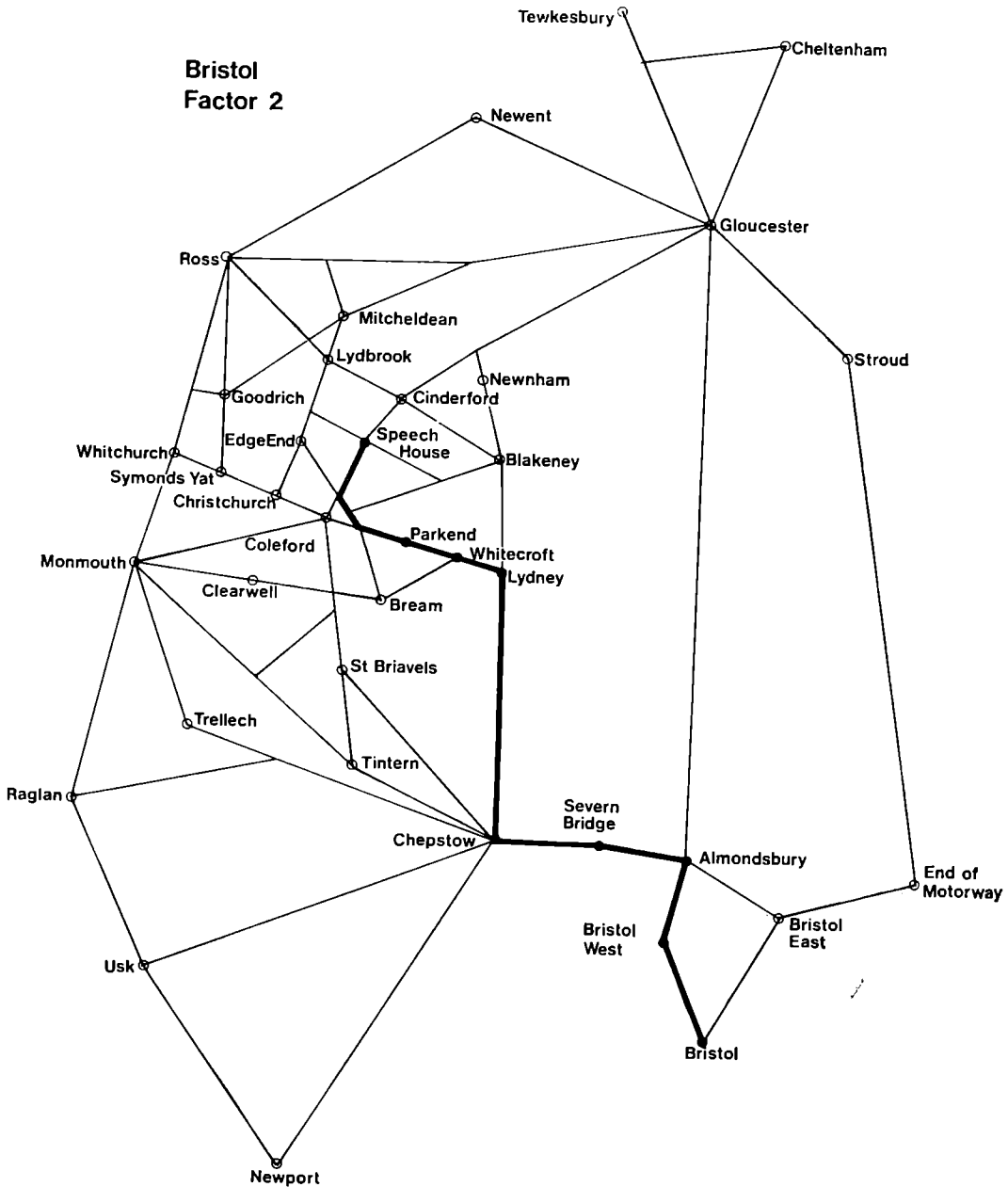


Fig. 12. Typical route from Bristol to Speech House as detected by a principal components analysis of trip patterns.

(2) Differences in attitudes to travel among short and long distance trippers.

population, and incorporating the two major sub-groups can provide an adequate basis for prediction of day trips to the Dean.

The question that now remains is whether a model based on car ownership, travel time, distance,

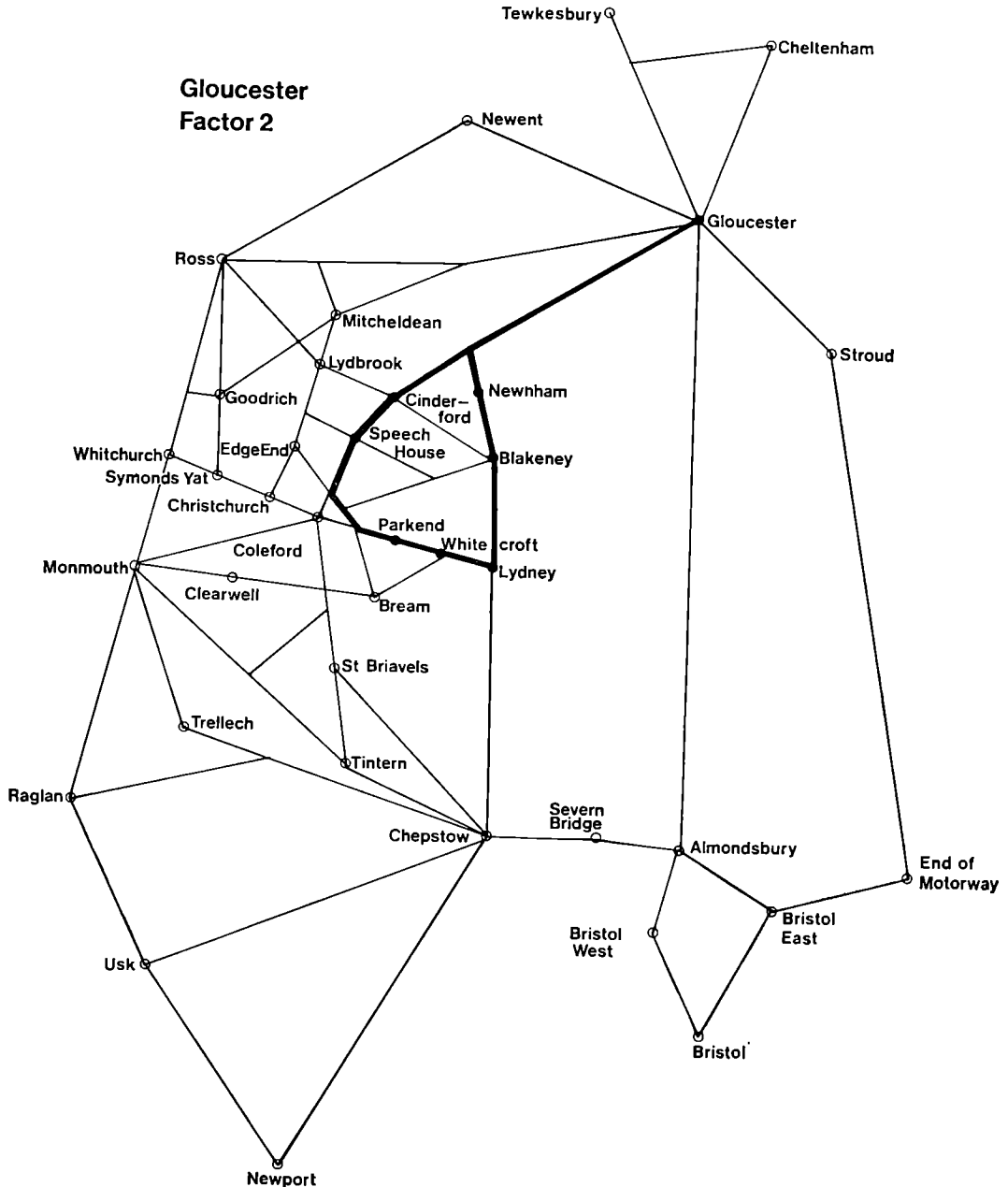


Fig. 13. Typical Wye/Dean trip from Gloucester as detected by a principal components analysis of trip patterns.

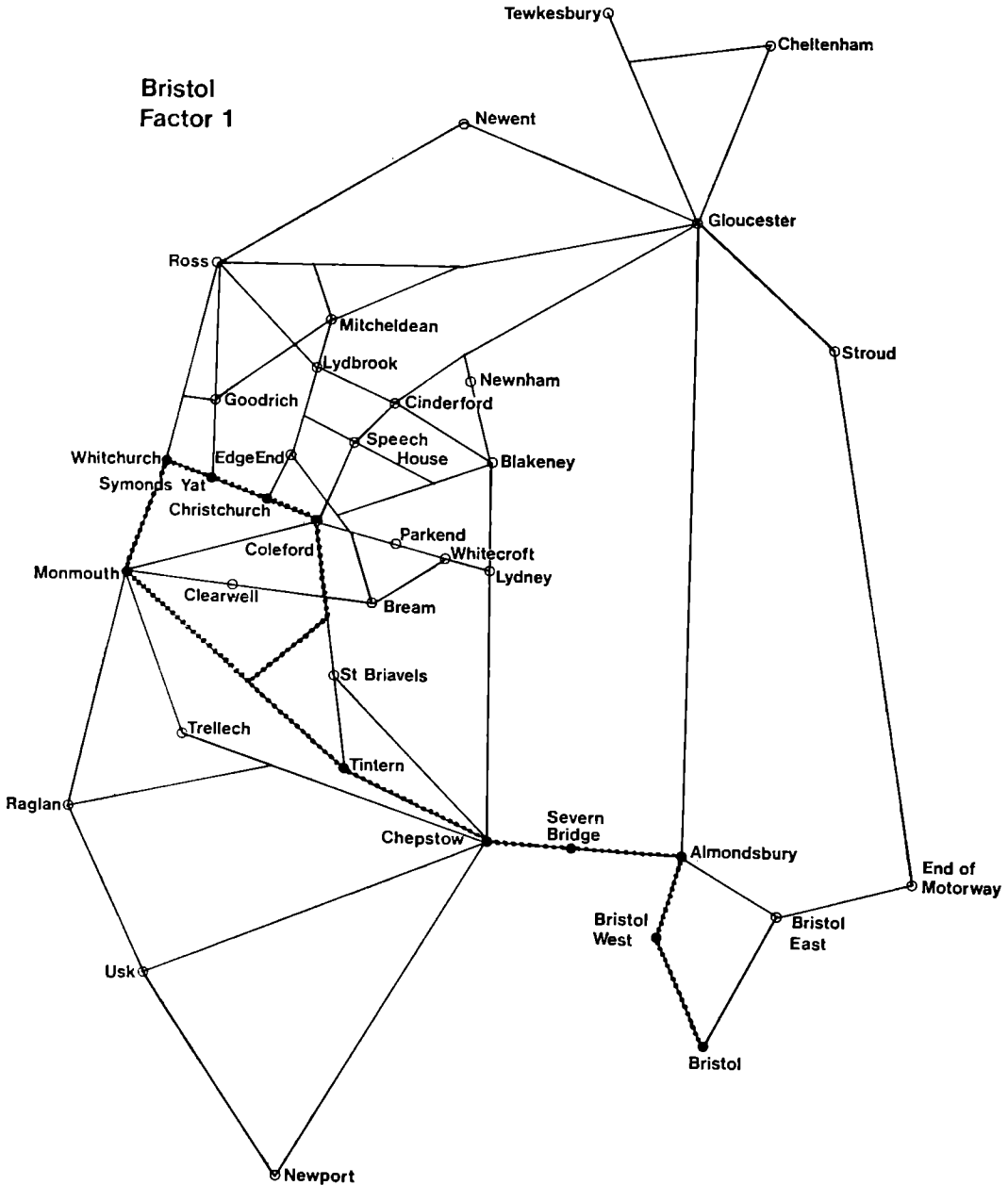


Fig. 14. Typical Wye/Dean trip from Bristol as detected by a principal components analysis of trip patterns.



Plate I. Paddling in the Blackpool Brook. This stretch of informal parking alongside the Blakney Straits in the south-east of the Forest of Dean was included in the sample of Dispersed Sites.



Plate II. The entrance to the Forestry Commission car park at Symonds Yat Rock in 1971. A one-way system operates inside the car park, the exit is just beyond the line of parked cars on the extreme right of the photograph. The direction of traffic flow within the car park has been reversed since the survey was made in 1968.

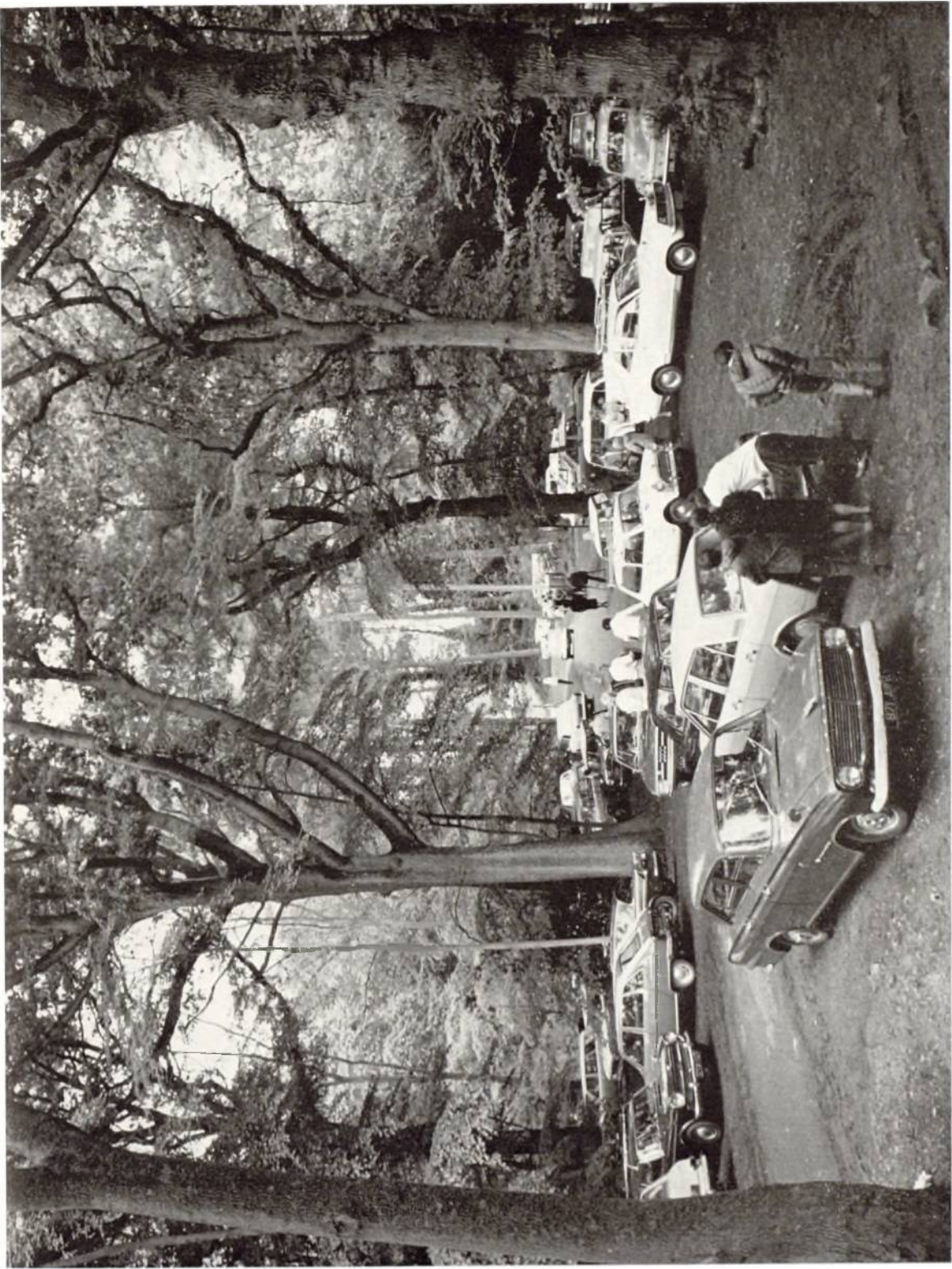


Plate III. The car park at Symonds Yat Rock looking towards the entrance. The traffic counter was sited across the road in the distance just in front of the entering car.

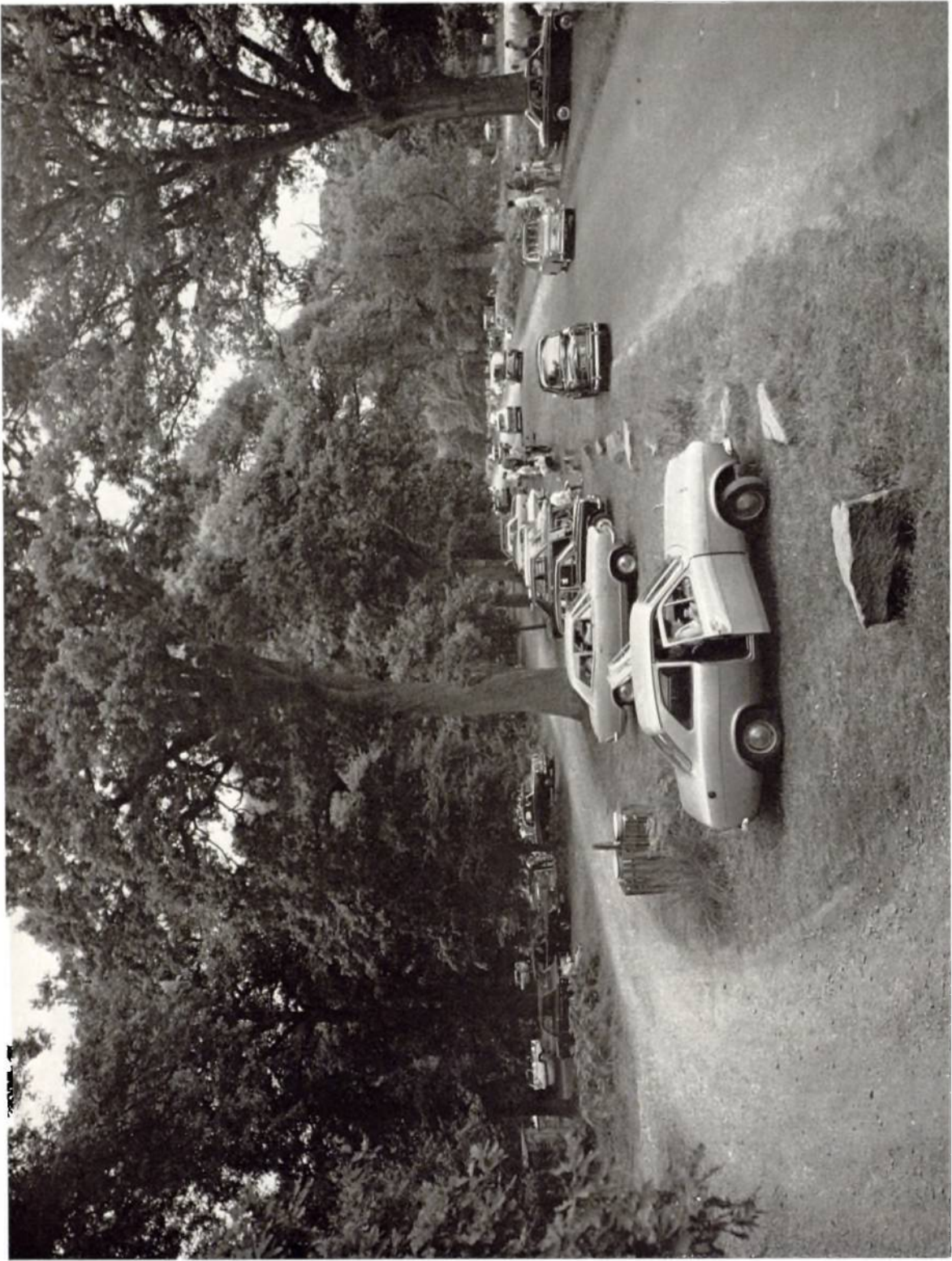
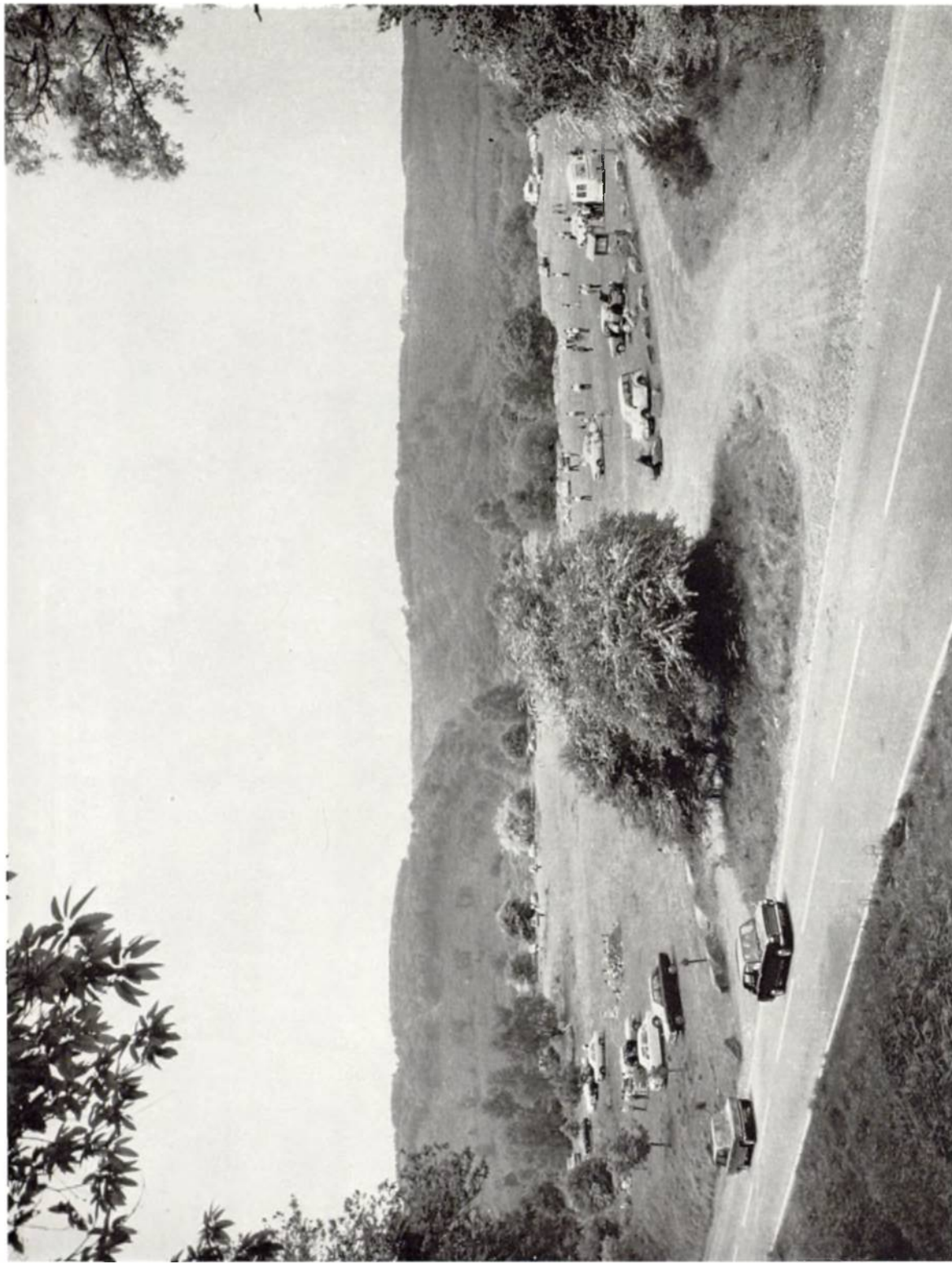


Plate IV. A general view of the Speech House picnic place looking from the hotel. Visitors tend to park facing the cricket field to the right of the picture, hence the straight line of cars. As well as the slip road in the foreground there are many other access points in about half a mile of road frontage. During the 1968 survey a traffic counter was placed across the slip road level with the fenced litter bins.



Plate V. Another view of the Speech House picnic place showing conditions on a busy day.



Platc VI. A view of the Beechenthurst Picnic place formed by levelling the site of the former Speech House colliery. Cars are typically parked around the perimeter of the site. In 1968 a traffic counter was positioned across the right-hand fork of the entrance.

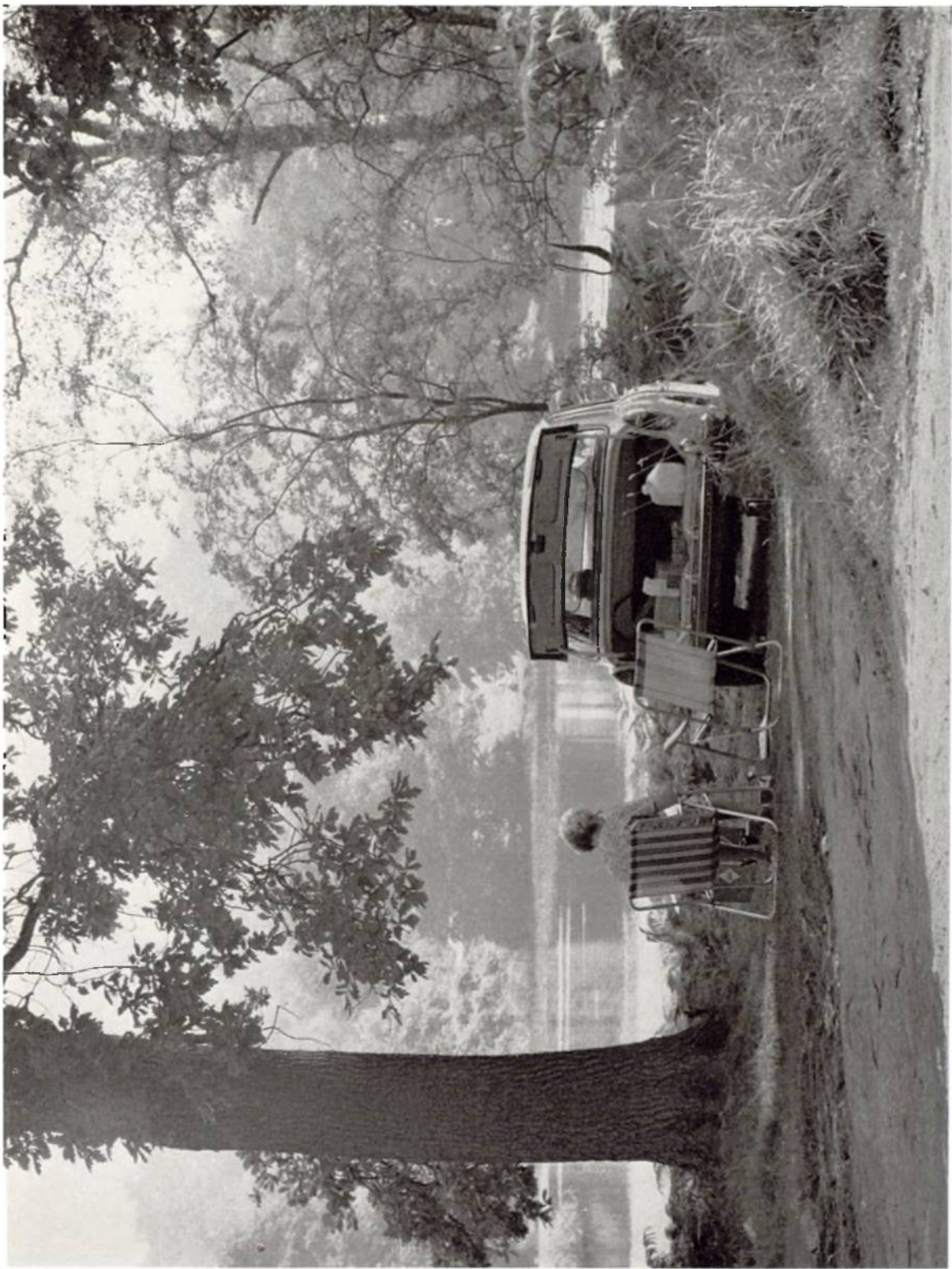


Plate VII. Water is always a source of attraction in the forest. Parking space for one car at Cannop Ponds in the centre of the forest. Individual groups like this were included in the Dispersed Site sample.

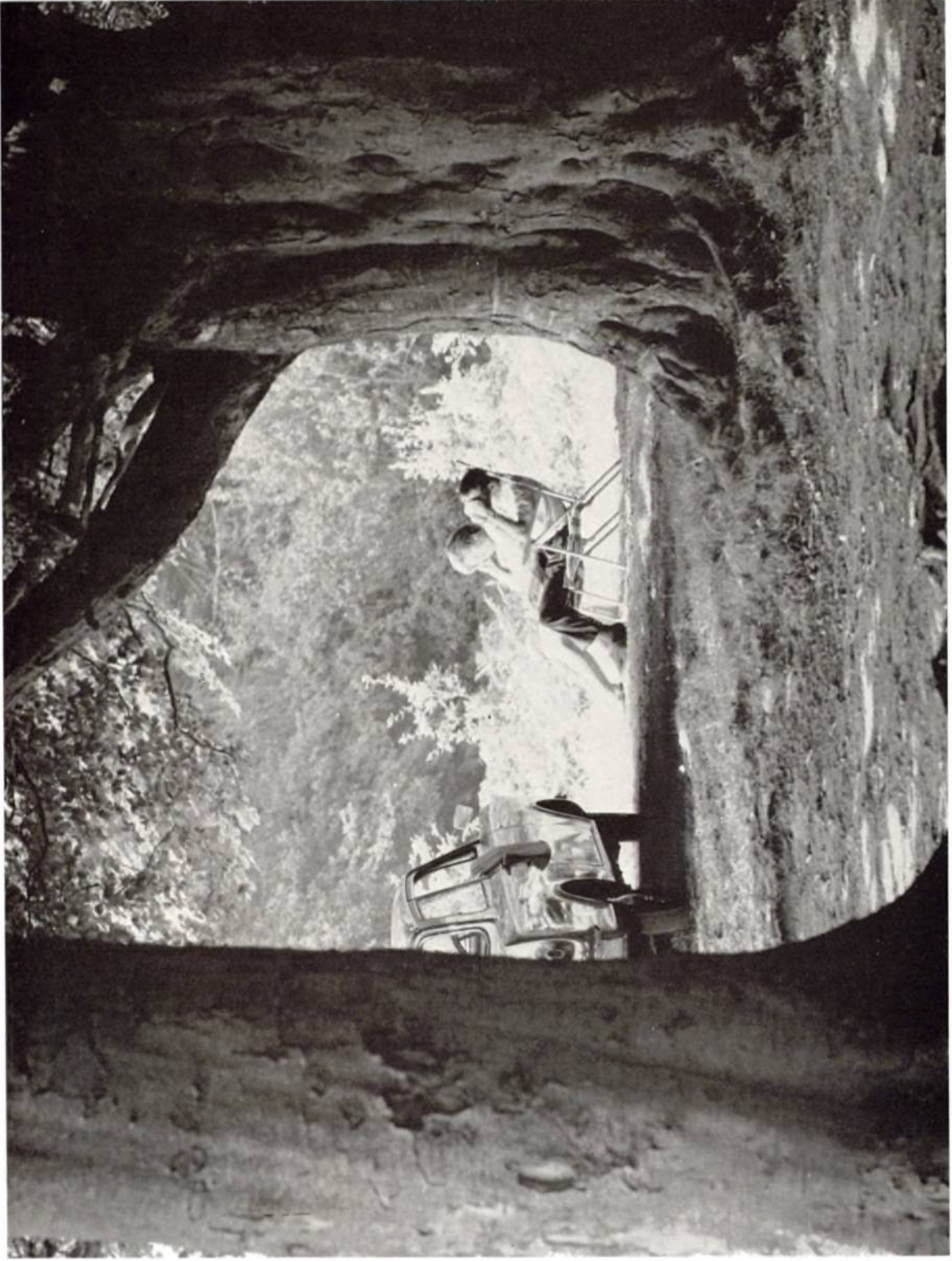


Plate VIII. A view taken at Edge End picnic place where cars park alongside the avenue of elderly beech trees. As at many other areas in the forest, most people tend to stay close to their car.

A MODEL FOR PREDICTING DAY VISITS

Introduction

It is generally a slightly easier task to describe the state of a system, such as the use of the Forest of Dean by day visitors, than to forecast the future state or performance of that system. One reason for this is that the variables used to describe the existing pattern may not be appropriate for predicting *change* over time. These variables may wane in their importance while new influences emerge. This is the danger common to most forecasting situations where we are trying to predict changes from cross sectional data. This should become apparent in the discussion below when we are forced to make the switch from a descriptive model to a forecasting model which is much more speculative.

The Descriptive Model

The typical exponential curve of trip attraction rates from the 20 towns to the Dean was described fairly accurately by the equation:

$$\text{Log}_e Y = 7.64 - .090 (\text{distance in miles}) \quad (3)$$

which has an R² of .95. With such a high proportion of the variance in Y explained by distance this does not leave much room for the operation of other variables.

Thus, it is not surprising that inspection of the distribution of residuals from the regression line of the equation did not reveal any systematic pattern. Also, when the residuals for each town were individually examined, there was no evidence that any general variable had been omitted.¹ The largest differences between the observed and expected trip generation rates occurred in the local towns of

Chepstow, Lydney and Mitcheldean. Trips from these towns were under-predicted by the regression, but this could have been due to any number of factors including errors in measuring variables, particularly distance. There is the possibility that local trippers consider or perceive that the Dean is more accessible than the distance measure allows.

These differences are evident again when the data are broken down into sub-groups based on distance travelled and place of interview. It is clear from low R² values for the less than 15 mile categories shown in Table 15 that distance is a poor predictor for short trips, but very effective for long trips (especially to Symonds Yat) and combined long and short trips. The slightly better performance of the model for long trips to Symonds Yat may arise from the fact that these visitors, travelling a mean distance of 37 miles, are more sensitive to travel costs than any other sub-group.

But these relationships were not used directly in a model because the forecast would assume that an increase in trips would be simply a function of the increase in population (since trip rates are expressed in trips per 100,000 population). The model must be restructured for forecasting purposes.

Forecasts of Day Visits to the Forest of Dean

Four different methods were employed in the Forest of Dean visitor forecasts for 1981. By using these methods, the separate effects of the independent variables on the estimates could be ascertained.² The results are summarised in Table 16 while fuller details are given in Appendix C.

TABLE 15
PROPORTION OF VARIATION EXPLAINED BY REGRESSIONS FOR VARIOUS TRIP TYPES USING EQUATION (3)

	Symonds Yat		Speech House		All Forest	
	b	R ²	b	R ²	b	R ²
All Trips	-.027	(.86)	-.040	(.94)	-.041	(.94)
>15 miles	-.032	(.96)	-.035	(.91)	-.033	(.85)
<15 miles	—	—	-.029	(.49)	-.029	(.61)

Note:

The values above have been calculated in a computer package using common rather than natural logarithms hence the differences from the value in Equation (3) for all trips to the forest.

¹ Residual values for the 20 towns were examined using a method developed by R. R. White, Assistant Professor of Geography, North Western University, Evanston, Illinois. He has used a Poisson probability model to test the significance of observations from several sets of mapped data.

² These forecasts like many others make generous assumptions of reliability for forecasts of car ownership, population, and travel times, made by other agencies. Often these forecasts are not made for the same areas which means that some improvisation is necessary to make the data compatible.

TABLE 16
FORECASTS OF DAY VISITS TO THE FOREST OF DEAN
1968-81
(Includes transit and tourist visitors)

SUMMARY OF FORECAST METHODS		
Basis	Variables included	Compound rate of growth per year
Method A Trip attraction function	Population	1.5%
Method B "	Population, car ownership	7.5%
Method C Forecast equation	Population, car ownership, travel time	10.25%
Method D As C but by sites and distance zones	"	10.00%

FORECAST FOR SEASONAL TOTAL (JUNE TO SEPTEMBER, ALL FOREST)

	Cars	Visits
1968	99,000	320,000
1981 Method A	120,000	384,000
B	254,000	825,000
C	351,000	1,120,000
D	346,000	1,110,000

FORECAST FOR AVERAGE SUMMER WEEKEND (ALL FOREST)

	Cars	Visits
1968	2,500	9,200
1981 Method A	3,000	11,000
B	6,500	24,000
C	8,800	32,000
D	8,700	32,000

FORECASTS FOR AVERAGE SUMMER SUNDAY

	1968 Cars	1981 Cars
Whole Forest	1,600	2,000-5,700
Symonds Yat	700	900-2,500
Speech House	600	700-2,000

Notes:

(a) The number of persons per car is higher at weekends than on weekdays. A value of 3.7 persons per car based on 1968 interview data has been used to calculate visits at weekends. For seasonal totals a value of 3.2 persons per car has been used based on 1970 observational data.

(b) The method of applying the forecast equations to the 1968 data is modified in Part II of this report. Modified forecasts of future use are given in Table 18 and the accompanying text explains their basis.

(1) *Method A*. In this forecast, demand for day trips was assumed to increase at the same rate as the growth of population with all other factors held constant. In this method the 1968 visit attraction rates for each of the 20 towns, expressed as visits per 100,000 population, are multiplied by the pre-

dicted 1981 populations for those towns. A total percentage increase in visits over all 20 towns for the period 1968-81 is then calculated. This percentage is then applied to the 1968 total of visits from all origins for the appropriate period. This calculation assumes that any increases in visits from the Dean catchment area will be the same as those from the 20 towns and that visits by tourist and transit visitors will increase at the same rate as those by day visitors from home. The overall growth rate produced is 1.5% per annum over the period 1968-81. This is higher than the predicted national increase in population over the same period because several towns in the catchment area are due to receive planned overspill from major conurbations.

(2) *Method B*. The method here is similar to *A* except that the 1968 rates are expressed as visits per 10,000 cars and they are multiplied by the forecast numbers of cars at each town in 1981. While assuming that the attraction rate from each town will be constant the method takes growth in population and car ownership into account. The result is to forecast more than double the 1968 number of visits by 1981, implying a growth rate of 7.6% per annum.

(3) *Method C*. This method introduces the effects of population, car ownership, and travel time into a forecast equation. A forecast model was constructed using the modified geographical areas for which forecast data were available.

$$\text{Log}_{10} (\text{Trips per } 10,000 \text{ cars}) = 3.2092 - 0.0264 (\text{travel time in minutes}) \quad (5)$$

$$(0.0054) \quad R^2 = .88$$

Inserting 1981 estimated car ownership and travel times into this equation, the model yielded a growth rate over the period 1968-81 of 10.3% per annum.

The model assumes that distance and travel time are interchangeable (in spite of the argument earlier in this report), so that some idea of the independent effects of changes in travel time can be gained.

This forecast suggests a threefold increase in visits but there are doubts about the reliability of the method. Firstly, the method uses values from the regression line to forecast visits from each of the 20 towns. This means that forecasts from individual towns may be under- or overestimates. If the discrepancies are large for towns which produce large numbers of visits because of sampling error, errors in forecasting are likely. The large increases in rates predicted for Bristol and the Dean towns have a greater effect on the total volume of 1981 visits than the decrease forecast for Chepstow, for example. It must be stressed that applying a model based on predicting trip rates to forecasting absolute flows can be hazardous; a small error in predicting rates can lead to a large error in predicting volumes of visits.

A second interesting feature of this model is that

travel time has a strong effect on the results. Cardiff, Pontypool and Cwmbran respond to road improvements and Swindon is expected to generate a fairly dramatic increase in trips owing to a reduction in travel time of 16 minutes. This high travel time elasticity may well be an overestimate since other factors such as competing opportunities are omitted, but it is consistent with the notion expressed earlier that long distance trippers are more responsive to travel time changes than short distance trippers.

(4) *Method D.* The purpose of this forecast is to test the effect of disaggregating the day tripper population in the manner suggested in Chapter 3. Three groups were identified:

- (i) Local visitors living within 15 miles of the centre of the Dean.
- (ii) Visitors to Speech House living more than 15 miles from the Dean.
- (iii) Visitors to Symonds Yat living more than 15 miles from the Dean.

Forecasts for the first group were made with population and car ownership variables alone, but equations were developed for the other two groups:

$$\text{Log}_{10} Y_1 = 3.024 - .0264 (\text{travel time to Speech House}) \quad (6)$$

$$\text{Log}_{10} Y_2 = 2.938 - .0288 (\text{travel time to Symonds Yat}) \quad (7)$$

where Y_1 equals trips per 10,000 cars to Speech House, Y_2 equals trips per 10,000 cars to Symonds Yat, and R_2 values were .87 and .98 respectively.

Although the local trip sub-group produces 20% fewer visits over 13 years than Method C, because the Dean overprediction is reduced, the forecasts for the other towns are still very high with an increase of 10% per annum or a total increase of 255% over 13 years.

The Assumptions Underlying the Forecasts

Even if the higher forecasts are discounted, it still seems very likely that the numbers of day visits to the Dean will increase rapidly. The real test of the plausibility of the estimates is the confidence we have in the assumptions underlying the forecasts.

In a linear extrapolation of the kind undertaken here in which a cross-sectional model has been used for forecasting change, the list of underlying assumptions is formidable. But it is essential to spell the assumptions out so that the gap between what has been produced and what we need to know is completely clear.

The first assumption is that the Forest of Dean

and its constituent parts will retain their attraction relative to other day trip destinations. This implies that the character of the Dean will not change, nor the nature of its competition. Thus, the projection does not specifically allow for internal changes in the Dean such as the construction of new picnic areas, the effect of the recently opened scenic route, charging at sites, or improved publicity for the Dean as a whole. Nor does the forecast allow for the effects of crowding on future demand. It assumes that there will be sufficient spare capacity to accommodate demand or that no one will object to any rapid increase in crowding at the main sites. This problem of the "feedback" effects of both crowding and new developments is an area of research about which we currently know almost nothing. Yet for Forestry Commission planners it is essential to know whether new developments will generate new demand or whether halting all developments and improvements will act as a control on demand for day visits to the Dean.

The other implication of this is that external competition will not change. But it is known already that the Wye Valley is to be designated an Area of Outstanding Natural Beauty and this may increase the attraction of the area, by giving it more publicity. On the other hand, competition may increase; proposed developments include the Cotswold Water Park which may draw off some of the demand for trips to the Dean from the urban areas on the eastern side of the Severn Estuary. It may be fair to suggest from the point of view of the forecast that the new developments—the A.O.N.B. and the new parks—will cancel each other out.

It is more difficult to assess the second assumption, that there will be no substitutions in leisure time activities over the forecast period. That is there will not be a tendency to switch to other recreation activities such as playing golf or watching colour television rather than going on day trips to the countryside. Again, this is a topic that requires a good deal of research. The dramatic shifts in leisure patterns recorded by the Bureau of Outdoor Recreation in the USA indicate that our assumption may be hazardous.³

The third assumption is that the forecasts of population, car ownership and road developments are reliable. The major uncertainties are associated with the car ownership projections and the decisions to build major town developments at Worcester and Swindon. There is also the possibility, which is perhaps more remote, that a completely new urban centre will be established somewhere on Severnside over the next 15 years.

³ Bureau of Outdoor Recreation (1967), *1965 Survey of Outdoor Recreation Activities*. Washington, D.C.: US Government Printing Office, p. 9.

The fourth, and most important assumption, for Methods C and D is that the growth in day visits to the Forest of Dean will follow a growth path similar to or greater than the predicted growth in car ownership.⁴ The Road Research Laboratory predictions are for a 4.7% per annum compound increase in car ownership in Great Britain and a similar increase in car travel over the period 1970–1980. The assumption being made in the Dean forecasts is that those people who do not own a car at present will, when they acquire one, abandon their current weekend pastimes on several days of the year in favour of day trips by car to the countryside. It is being implicitly assumed that all social groups, when they reach certain levels of affluence, adopt the life style of the more affluent groups. This as a broad generalisation is by no means certain.

Comparison with other day trip forecasts suggests that the predictions of Methods C and D at least may well be overestimates of future growth in day visits to

the Forest of Dean. The main difficulty, however, in these comparisons is to ensure we are comparing like with like. While “pleasure driving” in the United States, experienced a 1% per annum *decrease* in participation between 1958–1965,⁵ North American conditions may not be relevant to those in Britain and the activity of pleasure driving may not be directly analogous to day trips to the Dean. Comparison with the projection of “day trips to the country” made in the Northern Leisure Survey⁶ is more likely to be valid. This suggests an increase of 2.5% per annum in persons participating in this activity between 1967–1980. However this comparison is between overall participation rates over a region and trips attracted to a recreation area in another part of the country, and cannot be exact. But even if the Methods C and D prove to be overestimates, the Forest of Dean still appears to be faced with urgent management and planning problems and these are examined in the next part of the report.

⁴ Car ownership forecasts were taken from P. G. Herriman (1968) *Forecasts of Vehicle Ownership in Counties and County Boroughs in Great Britain*. Road Research Laboratory Report RRL LR 200. London: Ministry of Transport.

⁵ Bureau of Outdoor Recreation, *ibid.*

⁶ National Opinion Polls, *ibid.*

Part II

**THE SIGNIFICANCE OF THE DEAN SURVEY
FOR RECREATION PLANNING**

By Roger M. Sidaway

Chapter 5

IMPLICATIONS FOR LOCAL RECREATION PLANNING

Relative Levels of Use

The first set of important data produced by the 1968 Survey were the estimates of use of the forest and of individual sites by day visitors. These are set out in Tables 2 and 17. They show the relative usage of the main sites and to some extent confirm the subjective impressions of local managers. But it had not been realised before that the levels of use of Beechenhurst and Edge End were much lower than those at the other main sites. Indeed the figure for the dispersed sites may include individual areas whose use approaches the level at Beechenhurst. The Ready-penny picnic place is probably one such area. However, most of the total for the dispersed sites

TABLE 17
ESTIMATES OF USE OF INDIVIDUAL AREAS IN THE FOREST OF DEAN BY DAY VISITORS DURING THE SUMMER OF 1968

	<i>Cars</i>	<i>Visits to sites</i>
1 Summer period (June 1-September 30)		
Symonds Yat car park	44,500	142,500
Speech House picnic place	36,500	117,000
Beechenhurst	8,000	25,500
Edge End	10,000	32,000
Dispersed sites	42,000	134,500
2 Average Summer Weekend		
Symonds Yat	1,090	4,000
Speech House	860	3,200
3 Peak Summer Weekend		
Symonds Yat (1/2 June)	1,780	6,600
Speech House (24/25 August)	1,440	5,300
4 Average Summer Sunday		
Symonds Yat	710	2,600
Speech House	560	2,100
5 Peak Summer Sunday		
Symonds Yat (2 June)	1,200	4,300
Speech House (25 August)	900	3,300

Notes:

(a) The total visits made to all sites during the summer period (451,500) does not equal total visits to the forest in Table 2 (320,000) as many visitors went to more than one site on the same day.

(b) Car occupancy rates vary by days of the week, a mean value of 3.2 (based on 1970 observational survey) was used to calculate seasonal estimates of visits. The value of 3.7 based on response to question 17 of the 1968 questionnaire was used in converting the numbers of cars at weekends to numbers of visits.

comprises parking on verges or in gateways along some 20 miles of public road within the forest. As this was not a complete inventory of all possible parking places and included only visitors arriving by car, and as it covers only the June to September summer season, the estimate of 320,000 visits to the forest given in Table 2 may well be an underestimate of total use.

The Predictions for the Dean Forest Park

Probably the results of the survey analysis with the most significant implications for local planning are the predictions for future use of the forest park. But before possible courses of action are considered some thought must be given to their credibility. Is it likely that demand for day visits to the Dean will increase at the predicted rate?

This question can only be answered by further examination of the assumptions. One assumption which was not considered in Chapter 4 concerns the relationship between the sample of visitors from the 20 towns and the total population of visitors to the Dean.

The sample used for prediction and the population differ in three ways. The sample was taken at weekends only, it includes only day visitors from home and it represents urban areas only. Is it reasonable to generalise the predictions to cover the weekday population and other types of day visitors including those from rural areas?

It appears on the basis of the traffic counter readings that the proportion of weekday visits to the Dean measured by car numbers is 55% of total seasonal use. Weekday visitors will include day visitors from home and holiday makers, with probably a higher proportion of the latter than at weekends. It would seem unlikely that weekday day visiting will increase rapidly unless there is a major change in the availability of leisure time by, say, staggering working hours. Forecasting likely changes in holiday making in the Dean catchment area is even more uncertain. Perhaps this area will attract a growing number of second holidays in future but there is no direct evidence to suggest likely changes in holidaymaking habits in the locality.¹ Thus the predictions for day visitors from home cannot strictly be applied to the 23% of weekend visitors who were either tourist or transit visitors.

An impression of how well the 20-town sample represents all other weekend day visitors from home

¹ Trend data in 1970 *British National Travel Survey* (British Tourist Authority) suggest that while main holidays in Great Britain are likely to remain at about the same level, second holiday making will increase during the next few years.

may be gained by examining the forecast growth rates of population and car ownership of the two groups. Method A suggests a population growth rate of 1.5% p.a. over the 20 towns, which is more than twice the predicted national increase over the same period. Within the remainder of the inner catchment area, i.e. contributing towns in Gloucestershire, Worcestershire, Herefordshire and Monmouthshire, population growth will probably be nearer the national rate of 0.6% p.a.

Rural car ownership levels are higher than in urban areas and may be nearer saturation. The predicted increases in car ownership reflect this. Since the 20 town sample contains several large towns the predicted increase in day trips due to car ownership may be an overestimate for the rural areas of the catchment. Examination of the remainder of the catchment suggests that a growth rate of 5.3% p.a. would be more appropriate for these areas. This examination of the total population of visitors suggests that not all the assumptions made in Part I are reasonable and that the forecasts should be modified. The major weak-

ness of the earlier forecasts concerns the assumption that weekend and weekday visiting will rise at an equal rate. Altering this assumption has most effect on the forecast of seasonal use. However, it is the volume of weekend visitors which is most significant for planning purposes.

The method of calculation of the modified forecasts which are presented in Table 18 is as follows. Of the 1968 seasonal estimate of approximately 100,000 cars, about 55% visited on weekdays and 45% on weekends. Among the weekend visitors approximately 77% were day visitors from home, the remainder were tourist and transit visitors. About 82% of the day visitors from home came from the 20 towns and adjoining districts.² The assumptions used are:

- (a) That weekday attendance rises at 0.6% per annum compound over the period 1968-81.
- (b) That the numbers of transit and tourist visitors remain constant or that they rise at 5% per annum compound during the period.
- (c) That car ownership in the catchment area

TABLE 18
MODIFIED FORECASTS OF DAY VISITS TO THE FOREST OF DEAN 1968-81

ESTIMATE OF SEASONAL USE	Numbers of cars		
	1968	1981 (i)	1981 (ii)
1 Weekdays	55,000	59,000	59,000
2 Weekend transit and tourist visitors	10,000	10,000	19,000
3 Weekend day visitors from home			
(a) from the 20 towns	29,000	76,000	102,000
(b) from remainder of catchment	6,000	14,000	14,000
Total	100,000	159,000	194,000
Compound rate of growth per year	—	3.7% to 5.3%	
ESTIMATES OF WEEKEND USE (Calculated for the average summer weekend)			
	1968	1981	
1 Tourist and transit visitors	580	580	1,100
2 Day visitors from home			
(a) from the 20 towns	1,570	4,080	5,500
(b) from remainder of catchment	350	820	820
Total	2,500	5,480	7,420
Compound rate of growth per year	—	6.2% to 8.7%	

Notes:

Forecast 1981 (i) assumes:

No increase in tourist and transit visitors.

7.5% p.a. increase in visitors from the 20 towns (Method B).

6.8% p.a. increase in visitors from the remainder of the catchment.

1981 (ii) assumes:

5% p.a. increase in tourist and transit visitors.

10.25% p.a. increase in visitors from the 20 towns (Method C).

6.8% p.a. increase in visitors from the remainder of the catchment.

² See Appendix C for an exact definition of the areas used in these forecasts.

outside the 20 towns rises at 5.3% per annum compound.

The predicted rates of increase of Methods B and C were then applied to the 1968 population of weekend day visitors from home from the 20 towns to give a range of forecasts. The seasonal forecasts show a more modest rate of growth than those given in Part I.

Forecasts of weekend use are calculated by a similar method but as the modifications in assumptions influence smaller proportions of the sample the predicted rates of increase are closer to those given in Part I.

These modified forecasts suggest that seasonal use may rise $1\frac{1}{2}$ to 2 times and weekend use may double or treble over the thirteen years between 1968 and 1981. If applied to the number of visits at the average summer weekend they suggest the 1968 level of 9,200 would rise to between 16,000 and 20,000 while peak weekend use might rise from 23,500 to between 42,000 and 57,000 visits.

In Chapter 4 several of the assumptions underlying the predictive models were examined. One of these was that the forest will retain its relative attraction as a recreation area which in turn depends on internal and external factors. The maintenance of the internal attractiveness of the forest park depends on a continuing investment in recreation facilities in the Dean and no general deterioration in the appearance of the forest. The steady pace of development of facilities in the forest since 1968 suggests that this assumption is likely to hold true.

External factors are more difficult to judge. While the provision of alternative recreation opportunities may have a marked effect on the attraction of the Dean particularly in the more distant parts of its catchment area, little further comment can be made on the remarks made in Part I. Country Park facilities are likely to be developed in the Cotswolds and at Chepstow. Of these the Chepstow park is likely to have the greater impact on use of the Dean. The designation of the lower Wye Valley as an Area of Outstanding Natural Beauty should at least maintain the general popularity of the whole area.

On balance it seems likely that the assumption about relative attraction is more reliable than those underlying the major assumptions of increases in car ownership and population. Changes in policy on the movements of population to expanding towns could have a marked effect. But perhaps the major weakness is the inability to predict changes in taste or fashion in countryside recreation activities.

Historic trends are no certain guide to the future but they may give some indication of the plausibility

of our predictions. Unfortunately, there are no historic data for day visits or trips to the countryside. The only available information is on paying visits to National Trust properties and Department of Environment ancient monuments. Over the ten years 1959–69, national attendance increased by 11 and 5% compound per annum respectively. Local properties such as Tintern Abbey, Chepstow, Goodrich and Raglan Castles showed rates of increase of 6, 8, 9, and 8% respectively. If similar factors affect day trips to the Dean over the next ten years as influenced visits to paying properties, then the predicted growth rates of 6 to 9% per annum are by no means implausible.

With so many caveats outstanding there is some uncertainty about the accuracy of the Forest of Dean forecasts. They must be considered exploratory and have the additional value that some of the problems of forecasting have been more clearly identified. A doubling of visits to the Dean appears probable over the next ten years but the increase is unlikely to be spread evenly over the week. The pattern of marked peaking at weekends is likely to continue and could become more marked. One or two of the most popular areas in the forest are likely to come under severe strain.

Possible Courses of Action³

Assuming that the predictions prove substantially right, what are the implications of a doubling of use in the Dean over the next ten years and what possible courses of action should be considered in a local plan?

The first option is to do nothing at all in terms of new provision. The supply of sites would remain unchanged. Some areas could probably accept twice the level of use. Physically constricted sites such as Symonds Yat are already severely congested on peak occasions, so that doubling the levels of use on these days would be ill advised to say the least. In most areas increased wear and tear would call for more maintenance. But the supply of sites is not fixed as more and more access points would develop over the grass verges of public roads through the forest. In other words use of the dispersed sites would both increase and become more dispersed. This is the historic pattern of development through the forest. At best it provides pleasant secluded picnic glades on the edge of the forest, at worst verges become worn down, sward becomes cut up and muddy by uncontrolled use by cars in wet weather. The forest becomes "frayed at the edges". In addition such development may increase traffic hazards. The ten-

³ The following paragraphs are based on information from the survey and observations of the writers. They are not intended to be a substitute for a comprehensive recreation plan for the Forest of Dean area. Such a plan would take into account other recreation activities in the forest and be based on a thorough assessment of the supply and capacity of recreation areas in the forest park.

dency for visitors to congregate at large sites also makes it unlikely that a "natural equilibrium" solution would work satisfactorily. In fact, since 1968 new sites have been developed and a scenic route has been signposted. This route aims to disperse visitors around the forest and away from the most congested points. The remaining question becomes, therefore, the appropriate level and type of investment that is required to cater for increasing demand in the Dean. Should there be many more small facilities or some major concentrated investment? If a major scheme were chosen, what evidence is there in the survey to suggest an optimum location?

If present use was spread evenly around the forest, the second option of many small, recreational developments might seem attractive. But there is already a concentration of use at several popular points and before development is dispersed any further in the forest some thought should be given to the overall recreation carrying capacity of the forest. It may be necessary to limit the spread of development to ensure the forest environment is maintained. While this is a matter of local policy further research might be directed towards determining the desirable limits of recreation development in the Dean.

The third option is to favour a limited major development and this view is strengthened by the present attraction of the major concentration point at Symonds Yat. This area already attracts 30% of existing day use and is severely congested at peak weekends. Its appeal to long distance visitors has already been noted. The Speech House-Beechenhurst complex also attracts about 30% of day use in the Forest and while there are possibilities for large-scale development around Cannop Ponds it is debatable if the central area of the Forest could take the predicted doubling *and* draw visitors from Symonds Yat without drastic alteration of the character of that part of the Forest.

If Symonds Yat is to retain its appeal, its use should be contained if not curtailed and this may require the

positive planning of a counter-attraction. To be effective this would need to be a similarly spectacular viewpoint elsewhere in the valley, carefully designed to have a minimum impact on the valley itself. Such a viewpoint would need to be designed with a higher capacity than Symonds Yat.

On the basis of the origin towns shown in Table 22, half the visiting traffic from outside the Dean comes from the south or south west (i.e. over the Severn Bridge or along the M4 from South Wales). This proportion will have increased slightly by 1981. It would therefore seem logical to site any major counter-attraction at the southern end of the lower Wye Valley. This proposal would intercept as much traffic as possible before it enters the congested parts of the valley.

In summary, analysis of the survey material suggests that strategic location of a counter-attraction to Symonds Yat will be required before 1981 to cope with the predicted increase in day visits. Meanwhile management of the Symonds Yat Rock area should be geared to containing use and, possibly, reducing facilities at the Rock itself.

One further implication from the study which should be made explicit concerns the appropriate scale of planning. For many people a visit to the Dean forms only part of a day's outing to the Dean and Wye Valley area. It follows that the planning horizon for the Dean should be extended to include the lower Wye Valley and co-operation between landowners and agencies is essential to achieve effective planning. Co-operation is equally important within the Dean, for example the survey shows that pleasure driving in the forest is an important recreational activity. Planning should not concentrate entirely on provision of parking and picnicking facilities but should also consider catering for pleasure driving by both car and coach. Even greater co-operation will be required between the Highway and Planning Authorities and the land managers, the Forestry Commission, in the future.

Chapter 6

IMPLICATIONS FOR LOCAL RECREATION MANAGEMENT

The overall levels of use of the forest by day visitors and the use of individual areas are of direct interest to local recreation managers. Changes in levels of use over time and the effect on use of management actions, such as the opening of the scenic drive, would also be of interest. The 1968 survey can give no assistance here beyond forming a baseline for further work.

Examination of Table 19 shows that there is a large, perhaps surprisingly large, number of regular visitors to the forest, most of whom are locals. These data have been used to relate visits to people and

calculate the proportion of the resident population who visit the forest.

The number of day visits made during the summer season was calculated for five-mile distance bands up to 40 miles from the forest. Then the number of visitors was calculated by dividing the number of visits by an average frequency of visit for each distance class. The population within each local authority area was allocated to the distance zones and the total number of visitors is presented as a percentage of the resident population in Table 20. Some anomalies arise probably due to the crudity of

TABLE 19
FREQUENCY OF VISIT TO THE FOREST AND DISTANCE TRAVELLED BY DAY VISITORS FROM HOME

Distance travelled	First visit	Once a year	2-3 times a year	4-8 times a year	9-12 times a year	more than 12 times a year	Sample size = 811
0-10	8	4	7	10	7	64	100
11-20	9	3	14	21	8	45	100
21-30	13	4	27	30	7	19	100
31-40	18	12	31	22	4	13	100
41-50	27	9	17	26	7	14	100
51-60	20	15	32	22	0	11	100
61-70	28	23	15	18	5	11	100
Over 70 miles	35	14	30	6	2	13	100
All distances	18	9	21	20	5	26	100

TABLE 20
PERCENTAGE OF RESIDENT POPULATION WHO MAKE A DAY VISIT TO THE FOREST OF DEAN

Distance from the forest (miles) (1)	% Total Day Visits from home (2)	No. of Visits (thousands) (3)	Average frequency of visit (a) (per year) (4)	No. of Visitors (thousands) (5)	Resident Population (thousands) (6)	Percentage of Resident Population who visit the forest. (Col. 5 as a percentage of Col. 6)	
						within each 5-mile distance band (7)	in cumulative band (b) (8)
0-5	17	53	9	6	16	38	38
6-10	4	12	14	1	34	3	14
11-15	6	19	10	2	42	5	10
16-20	6	19	9	2	139	2	5
21-25	6	19	7	3	200	1	3
26-30	11	34	6	6	447	1	2
31-35	10	31	6	5	632	1	2
36-40	7	22	4	6	420	1	2
Total	67	209			1,930		

(a) weighted average calculated from Table 19.

(b) i.e. within 5 miles, within 10 miles, etc.

the population allocation. However, when presented in cumulative terms the fall-off in the visiting population with distance is consistent and rapid.

About 40% of the population living within five miles of the Forest appear to visit the park at least once during the year. By 10 miles the percentage has fallen to 15% and when the population living within 25 miles is considered the percentage has fallen to 3%.

The regular clientele living close to the forest might be persuaded by publicity and information into visiting different parts of the forest. If it were intended to increase the total numbers of visitors publicity would be more effectively directed at towns more than 25 miles away. Those towns whose trip attraction rate lies significantly below the distance decay curve (Fig. 7) may represent potential opportunities. These towns are Hereford, Pontypool, Great Malvern, Bristol, Cwmbran, Worcester and Bath. This suggestion should be heavily qualified, however, as the differences from the curve will also represent sampling errors, and differences in availability of other recreation opportunities as well as any lack of information about the Forest in the origin towns.

Holidaymakers appear to respond to publicity and information and might therefore be influenced to visit other areas in the Dean. Data in Table 21a and 21b

and Appendix B suggests that they tend to congregate at Symonds Yat, probably because they know of the beauty spot. The majority intended to visit that area even though many were on their first visit. But they tour the area making several stops, staying longer on average in the Forest than other day visitors. It seems likely that they would respond to new information.

Site Management

Information on the use of individual sites in the forest might be helpful in their future management. Questions on the improvements which visitors would like to see in recreation facilities had been deliberately excluded from the questionnaire. This information if gathered is difficult to interpret, particularly if the public are unaware of the full range of options that might be available. Questions on visitors' activities were included in the questionnaire but the replies prove to be of limited value. Ignoring any problems of recollection, the activities relate to time spent in the forest and not on any particular site. There is also some doubt about the respondent's knowledge of individual facilities. For example, the Waymarked Paths referred to in the questionnaire are a network of long distance paths which cross the Forest and primarily serve the Youth Hostels at Mitcheldean and St. Briavels. Yet apparently 27% of all day visitors from home used them.

The data on activities are of interest but give no indication of the answers to problems that directly concern the recreation manager. Namely, the extent to which semi-natural areas should be developed for recreation by the introduction of hardstanding for cars, the provision of lavatories, picnic tables, cafés, nature trails and so on. The information for these decisions is probably better obtained from systematic observational surveys designed to see if and how facilities are used. Preferably there should be controlled experiments of variations in layout and design.

Data in Table 22 on distances travelled and the origins of respondents at individual sites confirm the impression given in Part I that while Symonds Yat attracts visitors from a considerable distance, Speech House and to some extent Beechenhurst are of more local appeal.

An interesting difference emerges when length of stay data from the 1968 survey and a survey conducted in 1970 are compared (see Table 23). The 1968 data are based on replies to the question 'How long did you spend in the Forest of Dean today?' Although the answers are arranged by place of interview they will only in part reflect time spent at that site. On the two sites where data were gathered by direct observation of cars in 1970, average length of stay *on site* is appreciably shorter. Data of this type may

TABLE 21a

DISTRIBUTION OF VISITOR TYPES BY LOCATIONS IN THE FOREST OF DEAN

	<i>Day visitors from home</i>	<i>Transit visitors</i>	<i>Tourist visitors</i>
Sample size =	811	143	94
Location:	%	%	%
Symonds Yat	20	21	41
Speech House	22	10	17
Beechenhurst	20	7	21
Edge End	19	48	8
Dispersed Sites	19	14	13
	100	100	100

TABLE 21b

PERCENTAGE OF VISITORS WHO SAID THEY INTENDED TO VISIT THE INTERVIEW SITE*

	<i>Day visitors from home</i>	<i>Transit visitors</i>	<i>Tourist visitors</i>
Sample size =	811	143	94
Location:	%	%	%
Symonds Yat	78	83	75
Speech House	60	63	33
Beechenhurst	51	27	29
Edge End	46	27	51
Dispersed Sites	35	26	8

* Based on the replies to Question 10 of the on-site questionnaire.

TABLE 22
DISTANCES TRAVELLED AND ORIGINS OF VISITORS TO INDIVIDUAL SITES

Base=Day visitors from home	Symonds Yat	Speech House	Beechenhurst	Edge End	Dispersed Sites	All Sites
Sample size =	145	144	138	134	141	702
CATCHMENT AREA FOR DAY VISITORS FROM HOME					(miles)	
1st quartile travel from within (miles)	20-25	5	10-15	25	15	10-15
1st and 2nd quartiles (miles)	35-40	20	25	30	25	30
1st, 2nd and 3rd quartiles (miles)	65	40-45	30	50	45-50	45-50
ORIGINS OF DAY VISITORS FROM HOME					(percentages)	
Foresters (n=106)	13	37	27	6	20	100
Wye Valley (30)	3	40	17	20	20	100
Ross on Wye (15)	20	33	27	7	13	100
Gloucester (100)	8	28	28	17	19	100
Worcester (31)	35	16	13	10	26	100
W. Midlands (32)	38	19	13	13	19	100
All day visitors from home (811)	20	22	20	19	19	100
% making more than one stop in the forest	54	57	65	49	62	57

Definition of origins: Foresters = Origins within the area enclosed by Tidenham, Newnham, Mitcheldean and Goodrich.

Wye Valley = Monmouth, Tintern, Chepstow and area.

West Midlands approximates to the West Midland conurbation.

give much clearer pointers to management than questions on activities.

The suggestion is that length of stay at Symonds Yat is not markedly different from that on other sites in the forest. Data gathered by similar observation

TABLE 23
LENGTH OF STAY

	Mean length of stay in Forest (1968) (1)	Mean length of stay on Site (1970) (2)
Symonds Yat	2 hours 23 minutes	51 minutes
Speech House	2 " 16 "	—
Beechenhurst	2 " 44 "	—
Edge End	2 " 06 "	42 minutes
Dispersed Sites	2 " 55 "	—
All Sites	2 " 26 "	—

Notes:

Column 1 is based on the replies of day visitors from home to question 3 of the postal questionnaire.

Column 2 is based on observation of cars and includes all three visitor types.

methods on other Forestry Commission recreation areas in 1970 suggests that on most picnic areas average length of stay is about an hour.¹ Symonds Yat is known to be seriously congested on peak summer weekend afternoons and on these occasions police are required to control the traffic. Yet recent management actions have been to increase car park capacity and add to the number of facilities at Symonds Yat. The result has probably been to increase numbers at the Yat at any one time and to increase their length of stay. Data gathered in the same 1970 survey at Queen's View, Tummel, Perthshire shows that this viewpoint attracts about the same number of visitors per season as Symonds Yat (130,000) but that maximum numbers at any one time are around 60 cars as opposed to 130 at Symonds Yat. Average length of stay at Queen's View is 20 minutes. In view of the peak congestion at Symonds Yat it would seem rational for management to aim at increasing turnover of visitors at Symonds Yat by *reducing* facilities and hence length of stay. This would also have the advantage of making a visit to the Rock a more pleasant experience. This view is all the more apt when the predictions for 1981 use of the Dean are considered.

¹ Source: unpublished Forestry Commission data.

GENERAL RESEARCH AND POLICY IMPLICATIONS

Further Research

Strictly speaking few, if any, results of this survey have any general application beyond the Forest of Dean but the survey can serve as a case study in which we look for general implications for future work on forecasting recreation demand. Suggestions can be made for future research in the Dean itself and where there is consistency with the results of other surveys some more general inferences can be drawn about participation in informal countryside recreation.

The first inference concerns the nature of day visitor recreation in forests. When the activities of day visitors to the Forest of Dean are studied there is no evidence to suggest that the type of recreation in forests differs markedly from that in other areas of the countryside. The activities recorded are similar to those in many other surveys. Many people stay near their car, they picnic, play games with their children, they go for a short walk. The differences between lengths of stay in the forest and those on individual sites underline the fact that it is not just time *on site* that is important to the visitor but also time spent driving around and stopping at one or more places. The activities of visitors suggest that they may not share the forester's enthusiasm for exploring the backwoods.

To most people, a day's outing in the car is a social activity; much of the enjoyment comes from the company of family and friends. Whether one stops for one's picnic in a forest is probably incidental. The edge of the forest provides an attractive setting but interest in the forest may not go any further. The implication for planning is that forest recreation areas are part of the general system of countryside recreation provision and that their planning must be integrated with that of other agencies.

There is a further planning implication concerning the creation of forest recreation areas. Provision to date has tended to be centred on areas of high scenic attraction and has ignored population distribution. Yet demand is much more influenced by high population in the surrounding area than scenic attraction. For current planning purposes, population and car ownership by time or distance zones will provide valuable measures of potential demand.

In order to predict total use with rather more

certainty than at present, it is necessary to estimate how changes in taste will influence the demand for outdoor recreation as opposed to other uses of leisure time and at what rate such changes in taste are likely to occur. It is by no means clear that the social variables that are conventionally measured are the most relevant for this purpose.

Once a level of demand is predicted, there remains the question of how people will choose between different facilities. The local manager will want to know, among other things, which facilities are complementary and which competitive. He will also be interested to know how far publicity will influence participation, both in total and in the relative use of different sites.

There is a need to monitor use of the Forest partly to establish the effects of publicity, partly to see the effects of other management actions on the pattern of use within the forest and partly to establish overall trends. Relating this need more directly to the Dean, the effect of introducing parking charges at Symonds Yat, Speech House and Beechenhurst has not been objectively assessed. Nor is the effectiveness of the scenic route in dispersing visitors from Symonds Yat known. At some stage in the near future another assessment of the total seasonal use of the Dean is required if only to test the validity of the forecasts contained in this report.

There is a generally agreed need for research into methods of determining recreation carrying capacity.¹ This need exists in the Forest of Dean where knowledge is required of the capacity of sites and of the forest as a whole. There are ecological, physical and psychological dimensions to recreation carrying capacity and a more detailed knowledge of visitor types is basic to the psychological studies. Some indications of a possible typology of day visitors emerge from the Dean survey. Three visitor types were recognised in the survey, while Table 2 in Appendix B shows that there are two main age groups. Groups with and without children are evenly divided among day visitor respondents, but the groups with children are mainly in the 31-50 age groups while those without are older, from 45 to over 60 years. The other groups that may be of significance in capacity studies are the local regular visitors referred to in the previous chapter. Such regular visitors are likely to have definite views on

¹ Countryside Recreation Research Advisory Group (1971) *Research Priorities* available from Countryside Commission, London, pp. 7-8.

TABLE 24
SOCIAL CLASS OF VISITORS TO RECREATION AREAS
(Percentages)

Social Class	Great Britain Population	Great Britain Car owners	Ragley Hall	Tatton Park	Slimbridge Wildfowl Trust	Forest of Dean
(1)	(2)	(3)	(4)	(5)	(6)	(7)
AB	13	19	30	20	36	28
C1	22	28	34	34	29	37
C2	31	35	27	36	27	25
DE	33	18	9	10	9	10
TOTAL	100	100	100	100	100	100
Sample size	—	—	489	882	1,093	995

Notes:

(a) The following definitions of social class approximate to those used by the Institute of Practitioners in Advertising.

Social Class	Social Status	Occupation
AB	Upper middle class	Managerial and professional
C1	Lower middle class	Supervisory and clerical
C2	Skilled working class	Skilled manual
DE	Working class	Semi- and unskilled manual, casual workers and pensioners

(b) Sources of information:

Columns 2 and 3. Abrams, M. (1970) *Trends in car ownership and leisure*, a paper given at "Roads and Leisure", a conference organised by British Road Federation and British Tourist Authority in association with Ministry of Transport and Ministry of Housing and Local Government at Keele University, July 1970.

Columns 4 and 5. *Historic Houses Survey*, British Tourist Authority and Countryside Commission (1970).

Column 6. Slimbridge Visitor Survey (1971), Countryside Commission, British Tourist Authority, The Wildfowl Trust.

(c) All the Dean respondents travelled by car; the other site surveys included respondents who travelled by other means.

the appearance of the Forest. Many may even regard the Forest as their own. Future management cannot ignore these views.

General Policy Considerations

Any discussion of recreation policy ultimately raises two general questions. The first is—for which groups in the population is the manager planning? The second and related question is—what balance should be established between making the forest available to as wide a public as possible and maintaining the quality and character of the environment?

The Dean data give a clear idea of which social groups in the population the forest serves at present. The social class of day visitor respondents can be compared with that of a sample of the GB population as a whole. In Table 24 the Dean occupational data (based on Question 14) have been converted to social classes as defined by the Institute of Practitioners in Advertising. Although the transformation is approximate, the resulting profile is similar to that found in other studies. These data are plotted in Fig. 15 which demonstrates that the visiting population is not a cross section of the whole population but is biased towards the middle classes. The working class is particularly under-represented. When comparison is made with the profile of car owners, the

difference is less marked suggesting that it is a lack of opportunity rather than difference in taste that is involved. Such a finding has profound implications for our social policy of provision of recreation areas. There are many people who would doubtless like to go to the countryside but cannot. For them location of recreation areas is even more crucial than suggested earlier. If as large a section of the public as possible are to have an opportunity to visit the countryside then recreation areas must be sited close to the major centres of population. Other ways of ensuring minority participation could be to encourage coaches, for example, which may be the only means of enabling the elderly and disabled to visit the Forest at all. This might have the incidental advantage of providing less of a traffic management problem than increasing numbers of cars.

The objectives of recreation planning and management require careful thought. Should we attempt, for example, to accommodate the rising demand generated by the increasing numbers of car owners? In doing so there is a risk of preferring certain sections of the community and doing little to satisfy demand among relatively deprived groups. This goal could easily be overlooked if economic objectives of say, maximising net benefits are not qualified by broader

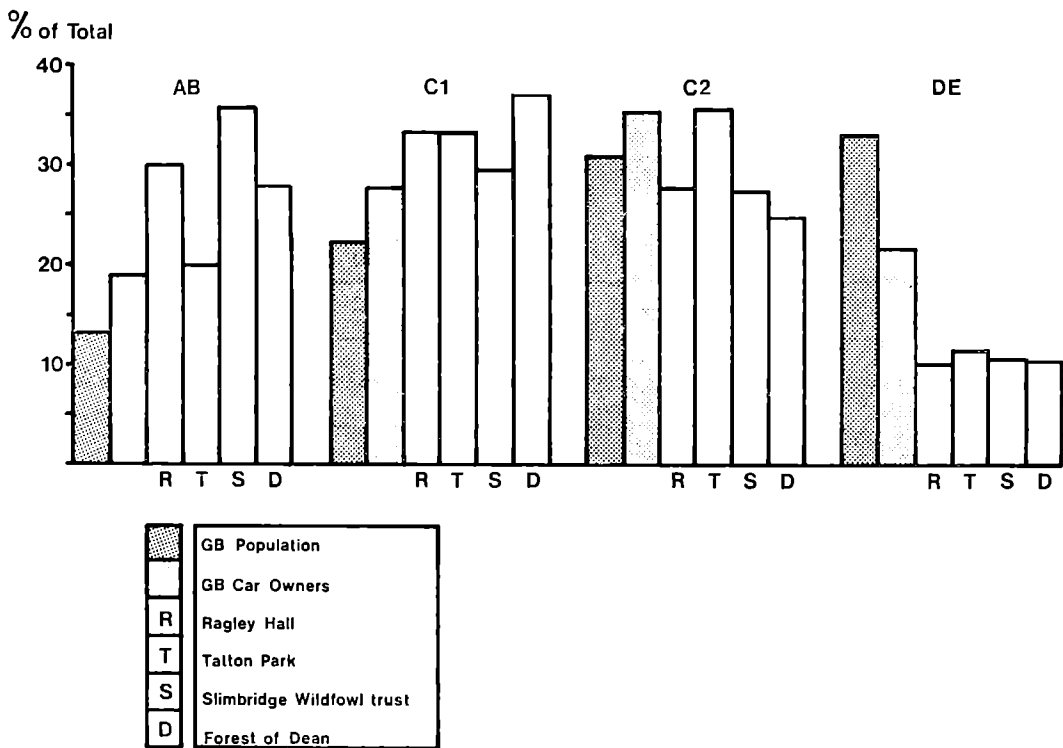


Fig. 15. Social class of visitors to recreation areas.

social objectives. These objectives have an impact on the way facilities are planned and managed and on the determination of capacity. The countryside is a finite area. Every increase in use makes its impact on the environment and reduces the quality of the experience for some recreation visitors. The point at which a conscious decision is made to limit the use of the forest, the point at which we say capacity is reached, is crucial for it affects not only the quality of the resources of the forest but also the quality of life for many people. Our reasons and motives in determining a level of capacity require critical exam-

ination to ensure that a balance between ecological, economic and social objectives is achieved.

Conclusion

The principal aim of this research has been to explain and forecast the pattern of demand for day visitor recreation in the Forest of Dean. The study suggests that a dramatic increase in demand is probable over the next decade but that further research is required to find effective ways of dealing with this increase.

Appendix A

THE QUESTIONNAIRES AND MAPS USED BY THE INTERVIEWERS

FORESTRY COMMISSION
SURVEY OF VISITORS TO THE FOREST OF DEAN 1968

	<i>Card No.</i>	<i>Columns</i>
Interview Number	1 <input type="text"/>	1 2-5
Place	<input type="text"/>	6-8
Date (day and month)	<input type="text"/>	9-11
Time	<input type="text"/>	12-15
Interviewer Response		
Yes	<input type="text"/>	1 16
No	<input type="text"/>	2 16
Weather		
<hr/>		
Ask head of Household or party:		
1. Where do you live (give exact home address)	Punch complete address	17-69
2. Where did you start your journey today? Nearest town or part of city, and County		
Code No.	<input type="text"/>	70-72
3. What time did you set out today?	<input type="text"/>	73-76
4. Do you intend to return to your starting point today? If Yes Go to Q.6 If No Go to Q.5	<input type="text"/> <input type="text"/>	1 77 2 77
5. Where are you finishing your journey today?		
Code No.	<input type="text"/>	78-80
6. When you set out today which places did you intend to visit?		
<i>Card No.</i>		
7. Could you indicate on this map all of the towns and places you passed through on the way here today?	2 <input type="text"/>	1
	<input type="text"/>	2-7
	<input type="text"/>	8-13
	<input type="text"/>	14-19
	<input type="text"/>	20-25
	<input type="text"/>	26-31
	<input type="text"/>	32-37
	<input type="text"/>	38-43
	<input type="text"/>	44-49
	<input type="text"/>	50-52

Appendix A continued

8. Did you stop at all on your journey here today?

 If YesGo to Q.9 1 53

 If NoGo to Q.10 2 53

9. Could you list the length of each stop that you made and its location?

.....			54-59
.....			61-66
Code in minutes in sequence.....			67-72
.....			73-78

10. Did you intend to visit this particular site in the Forest of Dean?

 Yes 1 79

 No 2 79

11. Do you intend to go for a drive around the Forest of Dean today?

 Yes 1 80

 No 2 80

12. How many times a year do you visit the Forest of Dean for recreational purposes?

 1st Visit 1 2

 Once 2 2

 2-3 3 2

 4-8 4 2

 9-12..... 5 2

 12+ 6 2

 Card No. 3 1

Now would you help us by giving us some information about yourself?

13. At what age did you finish your full-time education 3-4

14. What is your job and occupation?

 Occupation..... 5-10

 Industry

 Other Details

15. Are you Single..... 1 11

 Married 2 11

16. What is your age? 12-13

17. No. of persons in car 14-15

18. No. of persons in car under 17 years of age 16-17

Finally would you please help us by filling in this short POSTAL QUESTIONNAIRE when you arrive home or at your destination today. Do not fill it in until your journey has been completed. A prepaid addressed envelope is enclosed and we would appreciate it if you could post the completed questionnaire to us as soon as possible.

Appendix A continued

FORESTRY COMMISSION
SURVEY OF VISITORS TO THE FOREST OF DEAN
POSTAL QUESTIONNAIRE

Please fill this in when you have finished your journey today.

For official use only

1. Could you indicate which of the following facilities in the Forest of Dean you used today? Please place a tick in the appropriate boxes.

<input type="checkbox"/>	Refreshment shop at Symonds Yat
<input type="checkbox"/>	Refreshment or Icecream van elsewhere in the Forest of Dean
<input type="checkbox"/>	Toilets in the Forest
<input type="checkbox"/>	Nature Trails
<input type="checkbox"/>	Waymarked paths
<input type="checkbox"/>	Picnic Tables

<input type="checkbox"/>	1	18
<input type="checkbox"/>	1	19
<input type="checkbox"/>	1	20
<input type="checkbox"/>	1	21
<input type="checkbox"/>	1	22
<input type="checkbox"/>	1	23

2. Could you tell us what you did when you stopped in the Forest of Dean today. Place a tick in one or more boxes.

<input type="checkbox"/>	Went for a walk lasting more than ½ hr.
<input type="checkbox"/>	Went for a short walk lasting less than ½ hr.
<input type="checkbox"/>	Sat in or near the car most of the time
<input type="checkbox"/>	Had a picnic
<input type="checkbox"/>	Looked at the view
<input type="checkbox"/>	Watched the children play
<input type="checkbox"/>	Played a game
<input type="checkbox"/>	Took dog for a walk
<input type="checkbox"/>	Looked at trees

<input type="checkbox"/>	1	24
<input type="checkbox"/>	1	25
<input type="checkbox"/>	1	26
<input type="checkbox"/>	1	27
<input type="checkbox"/>	1	28
<input type="checkbox"/>	1	29
<input type="checkbox"/>	1	30
<input type="checkbox"/>	1	31
<input type="checkbox"/>	1	32

Any other, please specify

3. How long did you spend in the Forest of Dean today?

(See enclosed map)

<input type="checkbox"/>	33-35
--------------------------	-------

Appendix A continued

4. Did you stop at more than one place in the Forest of Dean today?			
	Yes	<input type="checkbox"/>	1 36
	No	<input type="checkbox"/>	2 36
5. If you returned to your home today, what time did you arrive?			
.....		<input type="text"/>	37-40
6. Did you return home by the same route that you took to reach the Forest of Dean?			
	Yes	<input type="checkbox"/>	1 41
	No	<input type="checkbox"/>	2 41
If not, could you list all the towns you passed through on your return journey? (from the place at which you were interviewed)			
.....		<input type="checkbox"/>	42-47
.....		<input type="checkbox"/>	48-53
.....		<input type="checkbox"/>	54-59
.....		<input type="checkbox"/>	60-65
.....		<input type="checkbox"/>	66-71
.....		<input type="checkbox"/>	72-77
7. How long did your return journey from the Forest of Dean take you? (including all stops)			
.....		<input type="text"/>	78-80

A PREPAID ADDRESSED ENVELOPE IS ENCLOSED FOR YOU TO POST THIS BACK TO US AS SOON AS YOU CAN. Thank you very much for your help.

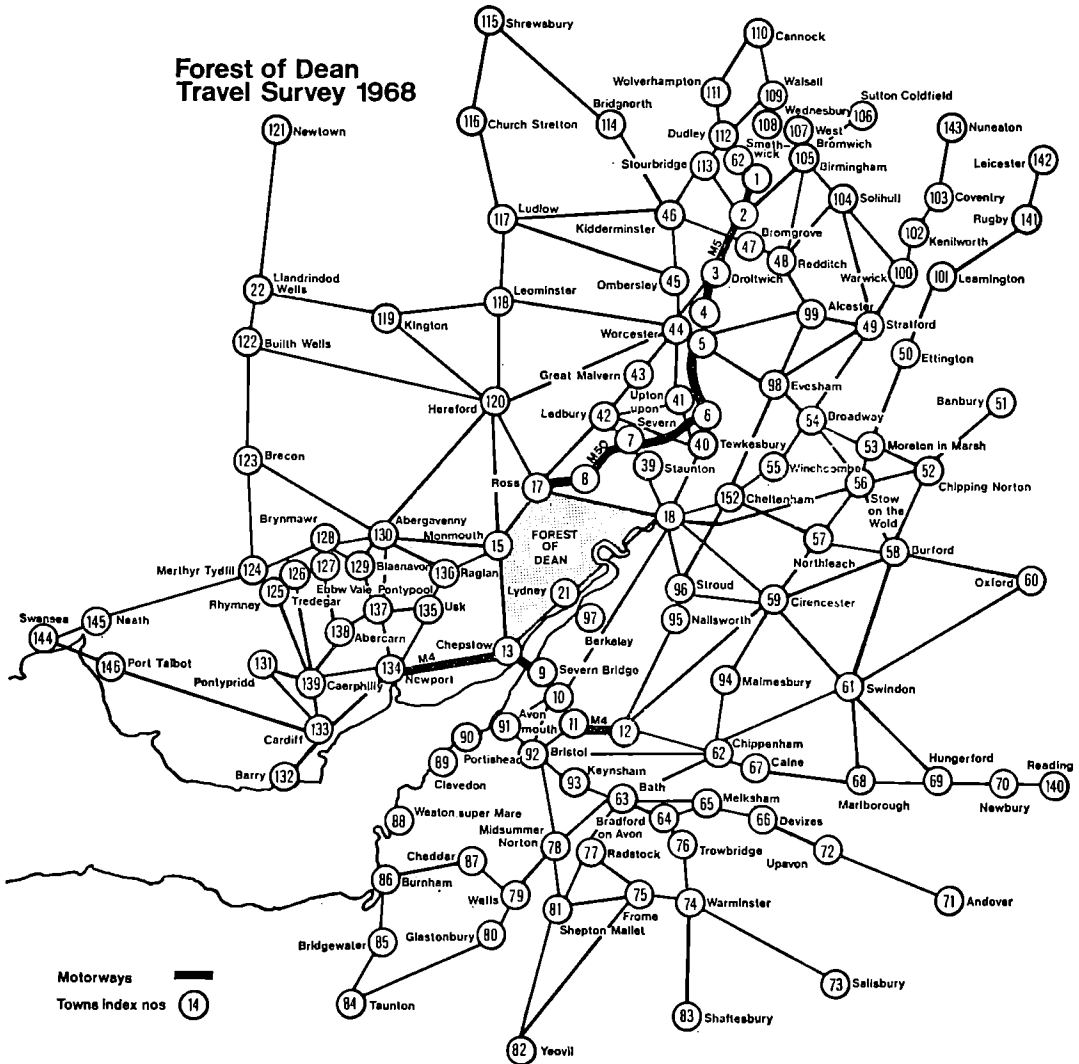


Fig. 16. Map used by interviewers for guiding respondents through the road network surrounding the Forest of Dean.

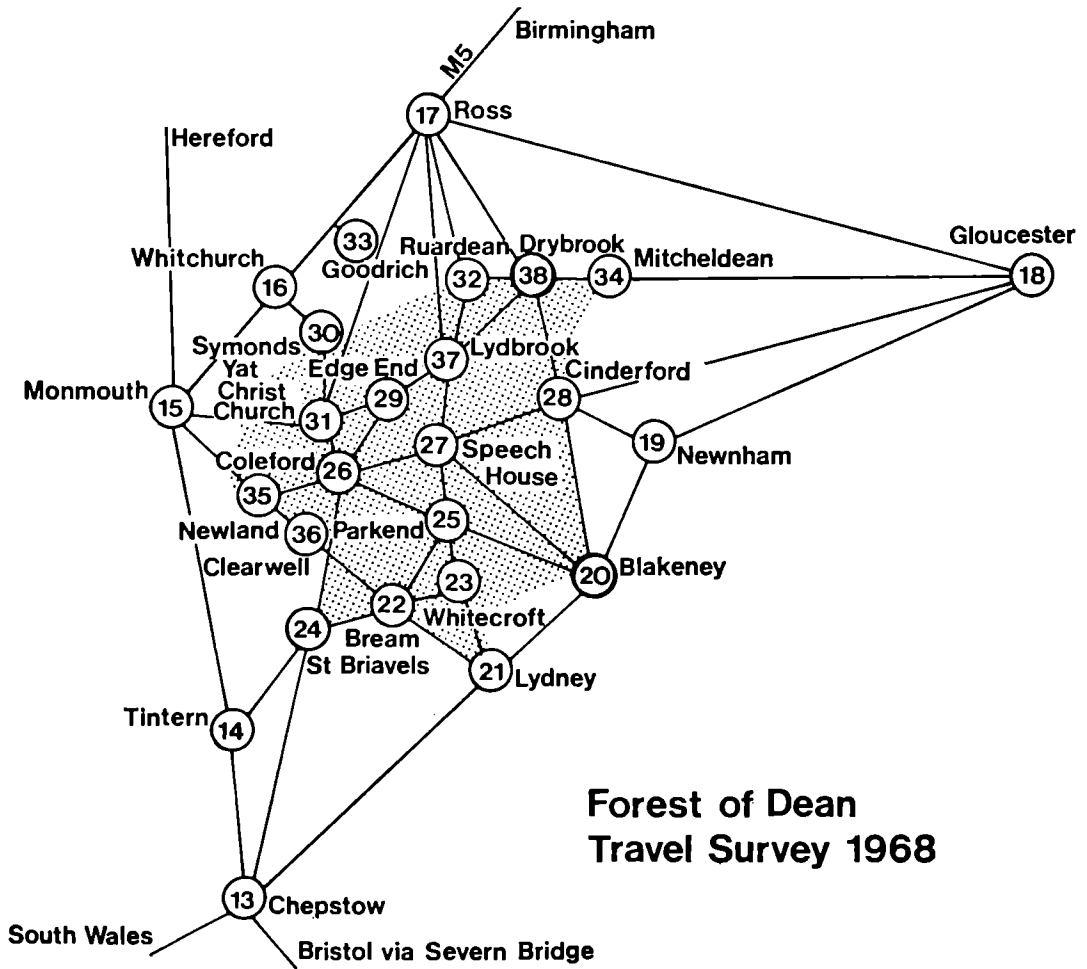


Fig. 17. Map used by interviewers for guiding respondents through the road network within the forest.

Appendix B

VISITOR PROFILE TABULATIONS

Additional tables to those in the text are appended giving profile information of the respondents. The basic data and further tables are held by the Planning and Economics Branch, Forestry Commission Research Station, Alice Holt Lodge, Wrecclesham, Farnham, Surrey, and may be seen on request.

B.1 AGE OF RESPONDENTS

	<i>Visitor Types</i>			
	<i>Day (from home)</i>	<i>Transit</i>	<i>Tourist</i>	<i>All</i>
Sample size =	811	94	143	1,048
	%	%	%	%
Under 21	2	2	1	2
21-25	7	10	8	7
26-30	9	7	8	9
31-35	8	4	7	7
36-40	13	15	13	13
41-45	13	12	9	13
46-50	13	16	13	13
51-55	11	11	15	12
56-60	10	11	14	11
Over 60	12	11	10	12
Total	100	100	100	100

Visitor types:

Day visitors from home, respondents who travelled from and returned to their home that day;

Transit visitors, respondents who stopped in the Dean en route to or from holiday accommodation;

Tourist visitors, respondents who were visiting the Dean from and returning to holiday accommodation.

B.3 MARITAL STATUS

	<i>Visitor types</i>		
	<i>Day</i>	<i>Transit</i>	<i>Tourist</i>
Sample size =	811	94	143
	%	%	%
Single	12	15	17
Married	87	83	83
Other	0	2	0
Total	100	100	100

B.4 OCCUPATIONAL GROUP

	<i>Visitor Types</i>			
	<i>Day</i>	<i>Transit</i>	<i>Tourist</i>	<i>All</i>
Sample size =	811	94	143	1,048
	%	%	%	%
Managerial	15	19	20	16
Professional	8	13	21	10
Clerical	25	31	28	26
Supervisory	8	3	4	7
Skilled	27	20	13	24
Semi-skilled	8	5	5	8
Unskilled	2	0	1	2
Self-employed	2	1	2	2
Others	4	5	6	4
Unknown	1	2	1	1
Total	100	100	100	100

Note:

Occupational groups are based on the Registrar-General's *Classification of Occupations*. Managerial = Registrar-General's 1 and 2; Professional = 3 and 4; Clerical = 5 and 6; Supervisory = 8 and 15; Skilled = 9; Semi-skilled = 7, 10 and 16; Unskilled = 11; Self-employed = 12, 13 and 19.

B.2 DAY VISITORS FROM HOME

	<i>Group</i>	
	<i>with children</i>	<i>without children</i>
Sample size =	398	413
	%	%
Age of respondent		
Under 21	2	1
21-25	5	6
26-30	9	8
31-35	12	3
36-40	23	5
41-45	20	8
46-50	15	12
51-55	6	17
56-60	4	18
Over 60	4	22
Total	100	100

B.5 EDUCATION

	<i>Day visitors from home</i>
	811
Sample size =	811
Age of completion of full-time education	%
Under 14 years	4
14 "	31
15 "	17
16 "	21
17 "	9
18 "	6
19 "	2
20 "	1
21 "	3
22 "	2
Over 22 "	3
Total	100

B.6 FAMILY PARTIES

	Day	Visitor Types		All
		Transit	Tourist	
Sample size =	811	94	143	1,048
	%	%	%	%
Groups with children	49	47	43	48
Groups without children	51	53	57	52
Total	100	100	100	100
Mean party size (car occupancy)	3.8	3.2	3.5	3.7

B.7 FREQUENCY OF VISIT

	Day	Visitor Types		All
		Transit	Tourist	
Sample size =	811	94	143	1,048
	%	%	%	%
First visit	18	49	55	26
Once a year	9	18	19	12
2-3 times a year	21	22	13	20
4-8 "	20	4	8	17
9-12 "	5	3	2	4
More than 12 times a year	26	3	3	21
Total	100	100	100	100

B.8 LENGTH OF STAY IN THE FOREST

	Day	Visitor Types		All
		Transit	Tourist	
Sample size =	702	78	121	901
	%	%	%	%
Less than 1 hour	7	45	7	11
1-2 hours	32	26	21	30
2-3 "	25	10	21	23
3-4 "	17	8	17	16
4-5 "	9	0	11	9
5-6 "	5	3	5	5
6-7 "	2	1	3	2
7-8 "	0	3	5	1
More than 8 "	1	5	10	3
Total	100	100	100	100
Mean length of stay (hours)	2.70	2.06	3.76	2.81

B.9 NUMBER OF STOPS IN THE FOREST

	Day	Visitor Types		All
		Transit	Tourist	
Sample size =	702	78	121	901
	%	%	%	%
More than one stop	57	39	69	57
One stop only	42	60	31	42
Stops not known	1	1	1	1
Total	100	100	100	100

B.10 ACTIVITIES OF VISITORS WHILE IN THE FOREST

	Day	Visitor Types		All
		Transit	Tourist	
Sample size =	702	78	121	901
	%	%	%	%
Looking at the view	74	88	88	76
Looking at trees	54	47	60	54
Using toilets	55	44	59	55
Using refreshment or ice-cream van (except Symonds Yat)	42	29	32	51
Using refreshment shop at Symonds Yat	25	28	45	28
Using Waymarked Paths	27	22	39	28
Went on Nature Trail	22	9	30	22
Used picnic tables	8	8	11	8
Had a picnic	65	65	50	63
Sat in or near car	36	42	23	35
Watched children play	27	22	17	25
Played game	20	9	12	18
Went walk with dog	16	8	15	15
Went for short walk	40	35	36	39
Went for long walk	38	24	55	39

Appendix C

BASIS OF THE FORECASTS QUOTED IN CHAPTER 4

TABLE C.1
DATA FOR FORECASTS

Origin Towns	1981 Population	1981 Cars	1981 Cars per Person	1981 Travel Time to Speech House (minutes)
Birmingham	950,000	342,000	.36	102.0
Bristol	923,065	341,534	.37	59.0
Newport	154,800	57,276	.37	55.0
Cardiff	393,000	133,620	.34	68.0
Gloucester	105,000	37,800	.36	32.0
Ross-on-Wye	6,900	2,900	.42	25.0
Chepstow	11,000	4,400	.40	31.0
Cheltenham	113,000	46,330	.41	47.0
Worcester	150,000	60,000	.40	70.0
Pontypool	38,000	15,200	.40	52.0
Stroud	63,000	25,830	.41	49.0
Bath	95,000	34,200	.36	75.0
Swindon	200,000	78,000	.39	71.0
Dean	63,000	27,030	.43	13.0
Hereford	49,000	20,060	.42	49.0
Cwmbran	55,000	22,000	.40	57.0
Gt. Malvern	37,360	15,052	.40	62.0

Definitions and Sources of Forecast Data

(1) Birmingham—Birmingham C.B. Population data were taken from Department of Economic Affairs, *West Midlands—A Regional Study* (London: HMSO, 1965). Car ownership forecasts for Birmingham and all other origin towns were taken from P. G. Herriman, *Forecasts of Vehicle Ownership in Counties and County Boroughs in Great Britain*, Road Research Laboratory Report RRL LR 200 (London: Ministry of Transport, 1968), 19 pages.

(2) Bristol—Bristol C.B., Thornbury R.D., Sodbury R.D., Mangotsfield U.D., Kingswood U.D., Warmley U.D., Keynsham U.D., Clutton R.D., Axbridge R.D., Long Ashton R.D., Clevedon U.D., Portishead U.D. Population forecasts were obtained from the County Planning Department, Gloucestershire County Council.

(3) Newport—Newport C.B., Caerleon U.D., Risca U.D. Population forecasts were provided by the Newport County Borough Planning Office and by the Monmouthshire County Planning Office (for Risca and Caerleon).

(4) Cardiff—Cardiff C.B., Penarth U.D., Cardiff R.D., St. Mellons R.D. Data taken from Colin Buchanan and Partners, *Cardiff—Development and Transportation Study, Report of the Probe Study* (London: Colin Buchanan and Partners, 1966).

(5) Gloucester—Gloucester C.B., Longford, Longlevens, Hucclecote, Barnwood, Hempstead Parishes. Data from the Gloucestershire County Planning Department.

(6) Ross-on-Wye—Ross U.D. Population forecasts based upon the expected rate of change for Hereford given in *The West Midlands—A Regional Study*, p. 73.

(7) Chepstow—Chepstow U.D. Population forecasts from the Monmouthshire County Planning Department.

(8) Cheltenham—Cheltenham C.B., Charlton Kings, Swindon, Prestbury, Leckhampton, and Uphatherley Parishes. Data from the Gloucestershire County Planning Office.

(9) Worcester—Worcester C.B. Population forecast from *The West Midlands—A Regional Study*, p. 67, based on the assumption of planned overspill from the Birmingham Conurbation.

(10) Pontypool—Pontypool U.D. Data from the Monmouthshire Planning Department.

(11) Stroud—Stroud U.D., Stroud R.D., Nailsworth U.D. Forecast data from the Gloucestershire County Planning Department.

(12) Bath—Bath C.B. Forecast data from the Bath County Planning Department.

(13) Swindon—Swindon M.B., Highworth R.D., Cricklade and Wooton Bassett R.D. Data taken from *Swindon—A Study for Further Expansion* (Swindon, Wilts: Civic Offices, October 1968), p. 58. Confirmed by the Wiltshire County Planning Department.

(14) Dean—East Dean R.D., West Dean R.D., Lydney R.D. Data for this aggregation of districts were provided

by the Gloucester County Planning Department. Forecasts for the individual districts were not available.

(15) Hereford—Hereford M.B. Forecasts from *The West Midlands Study*, p. 73.

(16) Cwmbran—Cwmbran New Town including Cwmbran U.D. Forecasts from the Monmouthshire County Planning Department.

(17) Great Malvern—Great Malvern U.D. Forecasts estimated by factoring up the Malvern population by the growth factor for Worcestershire given in *The West Midlands—A Regional Study*.

1981 Travel Time Estimates

These estimates were based upon 1981 estimated road network. The only differences between this network and the 1968 network were:

- Completion of the M4 Motorway from Swindon to Cardiff
- Completion of the M5 Motorway from Tewkesbury to Bristol
- Completion of the M50 from Ross to Newport.

Assumed speeds on these motorway extensions were 50 mph in each case.

TABLE C.2
DAY VISIT FORECAST—METHOD A

Origin Towns	1968 visits per 100,000 Population	1981 Population	1968 Visits	Forecast 1981 Visits	Per cent Change 1968-81
1	2	3	4	5	6
Dean	671·66	63,000	341	423	24·0
Ross-on-Wye	879·02	6,900	56	61	8·9
Chepstow	1199·67	11,000	73	132	80·8
Gloucester	381·45	5,000	352	401	13·9
Cheltenham	153·14	13,000	146	173	18·5
Stroud	126·20	63,000	66	80	21·2
Hereford	146·44	49,000	66	72	9·1
Pontypool	138·37	38,000	52	53	1·9
Newport	151·94	154,800	202	235	16·3
Bristol	51·09	923,065	372	472	26·9
Gt. Malvern	90·70	37,360	24	34	41·7
Cwmbran	85·00	55,000	31	48	54·8
Worcester	40·78	150,000	28	61	178·6
Bath	30·14	95,000	24	29	20·8
Swindon	20·28	200,000	31	41	32·2
Cardiff	42·26	393,000	160	166	3·8
Birmingham	6·58	950,000	70	63	-10·0
Total			2,094	2,544	21·5 or 1·5 p.a. compound

Note:

Entries in Column 5 are obtained by multiplying those in Columns 2 and 3.

TABLE C.3
DAY VISIT FORECAST—METHOD B

Origin Towns 1	1968 visits per 10,000 Cars 2	Forecast 1981 Cars 3	1968 visits 4	Forecast 1981 Visits 5	Per cent change 1968-81 6
Dean	341.00	27,030	341	922	170.4
Ross-on-Wye	476.20	2,900	56	138	146.4
Chepstow	863.91	4,400	73	380	420.5
Gloucester	233.78	37,800	352	884	151.1
Cheltenham	73.15	46,330	146	339	132.2
Stroud	57.74	25,830	66	149	125.8
Hereford	79.33	20,060	66	159	140.1
Pontypool	92.04	15,200	52	140	150.0
Newport	100.40	57,280	202	575	184.7
Bristol	26.21	341,500	372	895	140.6
Gt. Malvern	41.81	15,050	24	63	162.5
Cwmbran	47.33	22,000	31	104	235.5
Worcester	23.49	60,000	28	141	403.6
Bath	18.20	34,200	24	62	158.3
Swindon	11.91	78,000	31	93	200.0
Cardiff	19.57	133,620	160	261	63.1
Birmingham	4.60	342,000	70	157	124.3
Total			2,094	5,462	160.8 or 7.5 p.a. compound

Note: Entries in Column 5 are obtained by multiplying those in columns 2 and 3.

TABLE C.4
DAY VISIT FORECAST—METHOD C

Origin 1	1968 visits per 10,000 cars 2	Predicted visit per 10,000 cars 3	1968-81 Change in Travel Time 4	1968 visits 5	Forecast 1981 visits 6	Per cent Change 1968-81 7
Dean	341.00	734.91	0	341	1,986	482.4
Ross-on-Wye	476.20	354.52	0	56	103	83.9
Chepstow	863.91	246.24	0	73	108	47.9
Gloucester	233.78	231.72	0	352	876	148.9
Cheltenham	73.15	93.16	0	146	432	195.9
Stroud	57.74	82.50	0	66	213	122.7
Hereford	79.33	82.50	0	66	165	150.0
Pontypool	92.04	87.50	-4	52	133	155.8
Newport	100.40	57.30	0	202	328	62.4
Bristol	26.21	44.94	0	372	1,535	312.6
Gt. Malvern	41.81	37.45	0	24	56	133.3
Cwmbran	47.33	64.57	-4	31	142	358.1
Worcester	23.49	37.36	-8	28	224	392.9
Bath	18.20	17.00	0	24	58	141.7
Swindon	11.91	57.18	-16	31	446	1,338.7
Cardiff	19.57	33.08	-4	160	442	176.2
Birmingham	4.60	5.34	-8	70	183	61.4
Total				2,094	7,430	254.8 or 10.25 p.a. compound

Notes: (a) Model used for prediction of trips was

$$\text{Log}_{10} (\text{Trips per 10,000 cars}) = 3.2092 - .0264 (\text{travel time in minutes}) R^2 = .88.$$

(b) Entries in Column 6 are obtained by multiplying those in column 3 by the Forecast of 1981 cars (column 3, table C.3).

TABLE C.5
DAY VISIT FORECAST—METHOD D

(1) Visits to whole of forest from towns less than 15 miles from Dean			(3) Visits to Speech House and the rest of the Forest from towns more than 15 miles from the Dean		
	Visits per 10,000 cars	1981 visits	Predicted from: $\text{Log}_{10} Y = 3.024 - .0264$ (travel time)		
Gloucester	233.78	884	Birmingham	3.49	119
Ross	476.20	138	Bristol	29.40	1,004
Chepstow	863.91	380	Newport	37.48	215
Dean	341.00	922	Cardiff	27.60	289
			Cheltenham	60.92	283
			Pontypool	57.12	86
Total		2,324	Stroud	54.00	139
		Adjusted Total = 2,417	Swindon	37.43	292
			Hereford	54.00	108
			Total		2,535
					Adjusted Total = 3,169
(2) Visits to Symonds Yat from towns more than 15 miles from Dean			Add: Edge End Total 350		
Predicted from: $\text{Log}_{10} Y = 2.938 - .0288$ (travel time)			GRAND TOTAL (1+2+3) 7,350		
Birmingham	1.94	66			
Bristol	8.93	305			
Newport	27.57	158			
Cardiff	11.65	156			
Cheltenham	27.58	128			
Pontypool	46.89	71			
Total		884	Per cent change 1966-1981 = 255.6 per cent or 10.0% p.a. compound.		
		Adjusted Total = 1,414			

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