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**VISITOR ACCESS PATTERNS
ON THE THAMES BASIN HEATHS**

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Summary

Few studies of access patterns address levels and patterns of access within a particular landscape or across a number of sites in a particular area. Yet such an approach is usually required to provide the necessary understanding for strategic access management. Here we present information on patterns of access and the behaviour of visitors to the Thames Basin Heaths SPA. By looking across a range of access sites it is possible to understand the types of visitors, how frequently they visit, why they visit, the routes they take within the SPA and distance they travel to reach sites. Data such as these can help inform site management and be used to predict the changes in visitor numbers caused by future developments.

The SPA covers some 8,000 hectares of heathland and forestry, and includes 13 individual SSSIs. The SPA is surrounded by a high density of housing (there are some 288,000 houses within 5km of the SPA boundary) and there is a strong pressure to develop remaining open space. This study was commissioned by English Nature to provide the baseline understanding in order to underpin a strategic approach to access management across the SPA.

Interviews and counts of visitors were conducted at sample of 26 access points across the SPA in August 2005. Identical methods and timings were used at each access point, facilitating direct comparison between points. A total of 1144 interviews were conducted. As only one person was interviewed per group of people, the interviews provide data on the access patterns of 2062 people, 16% of whom were children.

More visitors were recorded at weekends than weekdays. There was little variation in the numbers of visitors in each time period, but early morning (0700 – 0900) at the weekend tended to be the time with the fewest visitors. Totals varied between sites, with the Lookout (a large car park, with a café, visitor centre, adventure playground and other attractions, located to the south of Bracknell) by far the busiest site, with 15% of all interviews being conducted at this site.

Although groups of up to 15 people were recorded, most people were visiting either on their own (29% of all interviews) or two people (36% of interviews). The majority of people visiting the heaths arrived by car (83% of people), and only 13% arrived on foot. Those sites with large car parks had the highest number of visitors arriving by car. The median distance people had driven to reach an access point was 3.1km and 70% of car drivers had come from within a radius of 5km from the access point. For those people travelling by foot, 90% came from within 1.5km.

A variety of reasons were given for visiting the heaths, representing a broad range of recreational activities, such as cycling, fishing, picking mushrooms, flying model aircraft, wildlife watching or simply taking the children out. Dog walking was by far the most common reason (59% of groups) given for visiting the heaths. Only 28% of groups interviewed were without a dog and the total number of dogs accompanying the people interviewed was 1271, equating to 0.6 dogs for every person visiting the heath. A significantly higher proportion of those who visited the heaths daily were dog walkers, compared to less frequent visitors

The distance travelled on the heath and the actual distance penetrated (the linear distance from the access point to the centre of a visitor's route) are summarised for each activity. Dog walkers walked an average of 2.5km, penetrating a mean of 760m onto the heath.

The questionnaire also addressed the use of alternative sites. Three-quarters of all heathland visitors said they visited alternative sites. People that travelled to sites by car were more likely (than those that walked to sites) to visit alternative locations. Dog walkers tended to travel shorter distances to reach alternative sites than other users.

A variety of different variables are explored as potential predictors of total visitor numbers at each access point. The number of houses surrounding each point was a significant predictor using a radius of 5km, but not further. The proportion of residents at different distance bands from each access point is calculated and is suggested as the most reliable method to model visitor levels. The proportion of residents recorded visiting the heath declined with increasing distance from the access point, this was irrespective of whether they travelled by foot or by car.

Across all sites, the average number of people leaving each access point, per hour, was 7 people. This figure is used to extrapolate an estimate of the total number of visits to the SPA per annum. This figure, of over 5 million visits per annum, is a crude estimate, and is calculated using the assumption that the 26 access points used in the study are representative of all access points within the SPA. Accepting the limitations, the figure of 5 million visits per year, if reasonable, is equivalent to many National Parks.

This report provides a valuable baseline assessment of access levels and patterns of access across the Thames Basin SPA. Additional work is required to look at some issues in more detail and provide data for building robust predictive models of access levels. Future potential applications of the work are discussed and include the possibility of mapping visitor densities within sites and relating these maps to bird data.

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Introduction

Lowland heathland is recognised as a priority habitat by conservationists, as it supports a range of rare and threatened species. Despite a considerable decline in the area of heathland over the past century, the UK still holds about 20% of the European resource. The most significant areas for heathland include the counties of Hampshire, Dorset and Surrey, where it is often found alongside areas with high human populations.

Human pressure, largely from recreation, can impact upon the conservation interest of heathland sites (for reviews see Underhill-Day 2005; Haskins 2000, De Molinaar 1998). Some of the problems include an increased incidence of fires (Kirby & Tantram 1999), disturbance to key bird species (Mallord 2005, Liley & Clarke 2003, Murison 2002) and predation from domestic pets such as cats (Underhill-Day 2005). Work on the heathland bird species of bird listed in Annex 1 of the EU Birds Directive (Mallord 2005, Liley & Clarke 2003, Liley & Clarke 2001) has shown a negative correlation between certain species and the amount of housing in the vicinity of the site.

The Thames Basin Heaths are designated as internationally important (the Thames Basin Heaths SPA) due to the presence of three Annex 1 bird species, the woodlark, nightjar and Dartford warbler. The SPA supports the second largest concentration of Dartford warblers in Great Britain, the third largest number of woodlarks, and the fourth largest population of breeding nightjars. The SPA consists of dry and wet heathland, mire, oak and birch woodland, gorse scrub and acid grassland, plus areas of rotational conifer plantation. It covers an area of some 8400ha, consisting of 13 Sites of Special Scientific Interest (SSSI) from Hampshire in the west, to Berkshire in the north through to Surrey. This location, to the south west of London on the M3 corridor, has led to high development pressures, which, from the mid 20th century continue to the present day. The loss of heathland in the area over the past 100 years has been estimated at 53% (Land Use Consultants 2005). The Land Use Consultant study (2005) calculates that at least 35,170 houses will need to be built around the Thames Basin Heaths based on the current housing allocation to 2016. This number of houses will require a land area of 12km², assuming a density of 30 houses per hectare.

At present there are an estimated 288,000 residential properties within 5km of the SPA boundary. Given the current and potential human pressure on the Thames Basin Heaths, there is a clear need for a better understanding of patterns of human recreational use of the heaths. With such an understanding, policy, planning and site management can all be targeted to reduce the pressure and avoid conflict between human needs for green space and wildlife conservation.

Most visitor studies of heathland sites have been undertaken in response to a proposed development or issues relating to a single site (see Underhill-Day (2005) for a review). As these studies are usually focussed on a single site, and have been conducted using different methods, it is difficult to draw conclusions across a range of sites, or develop a strategic understanding. Despite these problems a number of general conclusions can be drawn:

- A range of recreational uses typically occurs, including walking, jogging, cycling, dog walking and horse riding.
- At all sites examined, there is a majority of dog walkers over other users.
- The spatial pattern of use by visitors is largely determined by the location, type and size of access points and the network of paths and tracks on site.
- There are differences in the reasons for visiting, frequency of visit and length of stay between residents and tourists visiting heaths
- There are many similarities between the visiting patterns at heaths of similar character, even when these are in different areas.

The only study which has addressed a range of heathland sites, surveyed using a standard methodology, was carried out on the Dorset Heaths (Clarke *et al.* 2005). This study involved counts and questionnaires at twenty different access points, including a range of different car-park sizes on both rural and urban heaths. The Clarke *et al.* study was entirely focused on the Dorset Heaths, and it is not known how much the access patterns found might apply to other areas. Given the undoubted effect that public access has on the internationally recognised heathland habitat and its wildlife, further work on access patterns in the Thames Basin Heaths area was required. This study follows methods similar to those used by Clarke *et al.* to examine access patterns across the Thames Basin Heaths SPA, by investigating visitor behaviour through systematic sampling in a way which would:

1. allow conclusions to be drawn on the type of visitor and the patterns of visiting across the Thames Basin Heaths SPA
2. determine the catchment areas from which visitors travel to particular types of access point
3. measure the distances travelled to the heaths
4. quantify the routes taken by people on the heaths

Methods

Selection of sample survey heathland access points

Twenty six access points onto the Thames Basin Heaths SPA were selected. These points were chosen by English Nature staff familiar with the SPA as to include a variety of access points, ranging from a car-park with 200 spaces and accompanying visitor centre and café to tracks leading off housing estates with little or no parking provision. The access points selected are given in Table 1 and their locations shown in Figure 1.

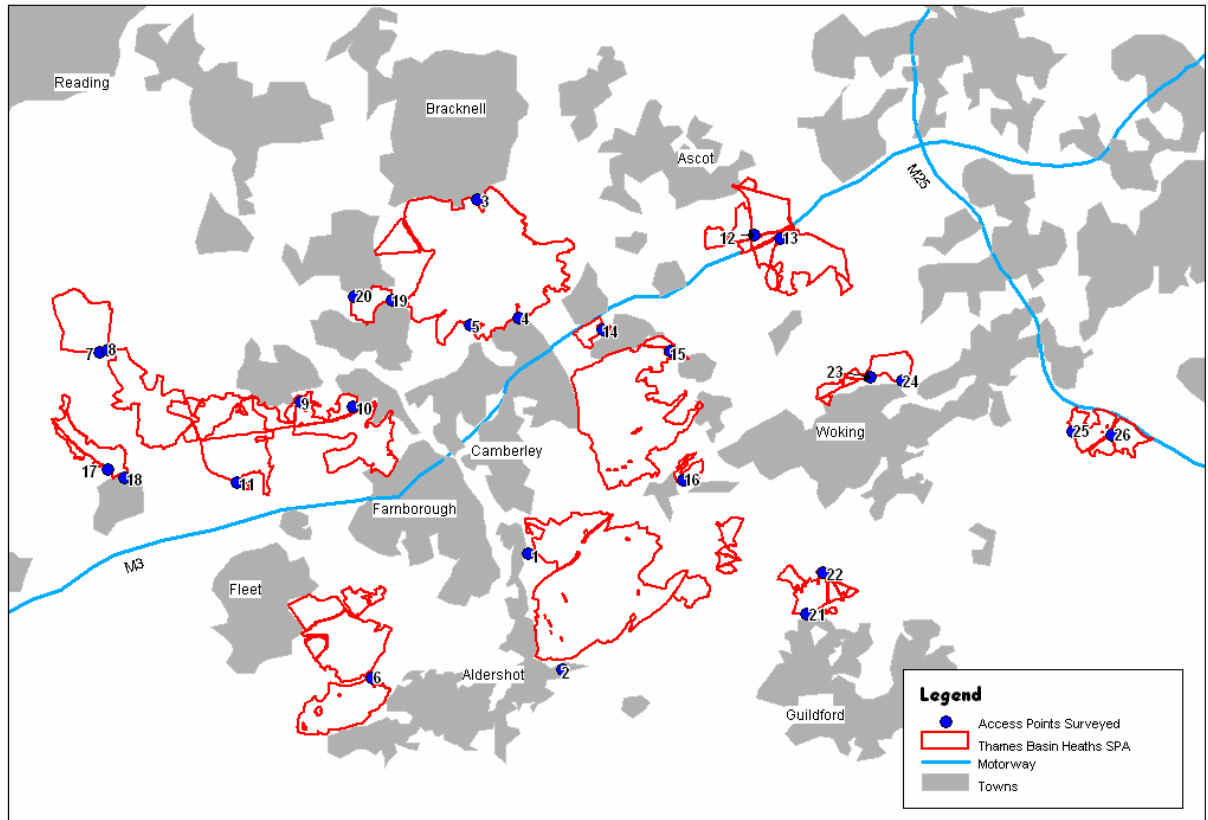


Figure 1: Location of access points surveyed. The numbers against each access point cross reference to Table 1.

Table 1: Access points used in the survey. Ticks in brackets indicate a facility not directly associated with the car-park but present in the immediate proximity.

Map Ref (Fig 1)	Site	SSSI	No. off-road parking spaces	Type of access point			Facilities			Other Attractions / Notes
				car park	lay-by or pull in	track entrance	Café / food	Sign-posted routes	toilets	
17	B3011 opposite Arrow Lane	Hazeley Heath	4	✓						Unsurfaced lay-by adjacent to road
11	Black Bushes Road	Castle Bottom to Yateley & Hawley Common	3	✓						Lay-by (unsurfaced and bumpy) adjacent to track into forestry plantation
6	Bourley Road	Bourley & Long Valley	36	✓						Some MOD access restrictions. Car parks either side of road, off-road parking for an additional 15 cars to south.
22	Burdenshott Road	Whitmoor Common	25	✓			(✓)	(✓)		Adjacent to pub, virtually extension of pub car park. Car park recently gravelled
9	Car Park off Cricket Hill Lane	Castle Bottom to Yateley & Hawley Common	8	✓						Very bumpy track, difficult turn quite hidden and discrete. Car park adjacent to pond.
10	Car Park off the A30	Castle Bottom to Yateley & Hawley Common	22	✓						Two separate car parks down a track, also access to housing. A pond adjacent to car-park
12	Chobham Road	Chobham Common	35	✓				✓		An additional 30 car parking spaces blocked off.
23	Chobham Road	Horsell Common	18	✓						Very secluded car park, with difficult turning and down a very bumpy track
26	Currie's Clump (Boldermere CP)	Ockham & Wisley Commons	65	✓			✓	✓	✓	Semaphore Tower may attract visitors. Very close to M25
25	E of Aberconway House (Wrens Nest CP)	Ockham & Wisley Commons	12	✓			(✓)	(✓)		Very close to RHS gardens at Wisley, where café etc.
14	Lightwater Country Park	Colony Bog & Bagshot Heaths	120	✓			✓	✓	✓	A variety of interlinked car parks and bays. Playground, heathland visitor centre (open 9 – 5), leisure centre etc.
1	Mytchett Place Road	Ash to Brookwood Heaths	10		✓		(✓)		(✓)	Simple lay by (unsurfaced) alongside road. Adjacent to Basingstoke canal visitor centre, camp site and "Potters"
8	N entrance to Warren Heath	Bramshill	1			✓				Trackway into Forestry, very close to designated car park. Track entrance surfaced, but kerb stones make parking difficult
2	Nightingale Road / A325	Ash to Brookwood Heaths	5	✓						Next to pub (with car park with a further 10 spaces). Well hidden access point, with very narrow gateway into car park.
20	Off Crowthorn Road	Sandhurst to Owlsmoor Bogs and Heaths	12	✓						Open and spacious car park just outside Crowthorn, parking bays, recently surfaced and safe exit onto road.
18	Play area, Springfield Avenue	Hazeley Heath	0							Small playground with swings etc and path alongside onto SPA. Within housing estate. No off-road parking, but parking available on residential streets nearby.
16	Queens Road, Cowshot Common	Colony Bog & Bagshot Heaths	3		✓					Difficult to find, tiny lay by, no real access facilities
7	S entrance to Bramshill Plantation	Bramshill	7	✓						FC car park with tracks leading off either side of road

Map Ref (Fig 1)	Site	SSSI	No. off-road parking spaces	Type of access point			Facilities			Other Attractions / Notes
				car park	lay-by or pull in	track entrance	Café / food	Sign-posted routes	toilets	
21	Salt Box Road	Whitmoor Common	18	✓						
15	Sandpit Hill	Colony Bog & Bagshot Heaths	8	✓						Small car park in front of houses
24	Shore's Road	Horsell Common	40	✓						
19	South Road	Sandhurst to Owlsmoor Bogs and Heaths	1			✓				Gateway to electricity sub station and a gateway (close to vehicles) onto SPA.
13	Staple Hill	Chobham Common	15	✓						Small car park with very good views
3	The Lookout	Broadmoor to Bagshot Woods & Heaths SSSI	200	✓			✓	✓	✓	"Go Ape", playground, designated mountain bike routes, heritage centre, café, shop and well-lit, large car park.
4	Top of Bracknell Road	Broadmoor to Bagshot Woods & Heaths SSSI	3		✓					Dead end of road within housing estate. Lay by / turning space adjacent to block of flats
5	Top of Kings Ride	Broadmoor to Bagshot Woods & Heaths SSSI	0			✓				Track starting from bend in road within housing estate. Parking available on residential streets surrounding access point.

Timing of surveys

The time of the day and point in the week are likely to influence both the rate and type of heathland usage by visitors. Great care was therefore taken to ensure that the usage of each heath access point was assessed in a statistically balanced manner. Each access point was surveyed for a total of eight two-hour periods, split into four periods during the weekend (Saturday-Sunday) and four periods during weekdays (Monday-Friday). Within both weekend and weekday visits, each access point was surveyed during each of the following periods within a day:

0700-0900, 1000-1200, 1300-1500 1700-1900.

The questionnaire sample survey was carried out on 34 person-days within the period from 1st August to 31st August 2005.

Counts of People

During each two-hour period, a tally was kept of all people (i.e. not the number of groups but the total number of people, including children) entering and leaving the site.

Weather

As weather may influence the number of people visiting a site at a given time, the weather during each survey period was also recorded. Cloud cover was estimated, as a single value representing the average cloud cover during the period. Rainfall was recorded as either no rain within survey period; rain for less than 30 minutes; rain for between 30 and 60 minutes; rain for between 60 and 90 minutes or rain for more than 90 minutes. Where possible, wet weather was avoided.

Field questionnaire

During a two-hour survey period, as many visitors as possible, leaving the access point, were asked to fill in a brief questionnaire (Appendix 3). The questionnaire was designed to be simple and brief so as to maximise participation and cooperation. When interviewing a visitor, the total number of people with them in the group/party was recorded, but only one person was interviewed per group. As a consequence, the total number of interviews differs from the total number of people. Both totals are used within the analysis.

The questionnaire was designed to provide the following information:

- Size of group (adults & children)
- Number of dogs (if present)
- Frequency of visits to the site
- Distance travelled to reach the site (retrospectively calculated from postcode)
- Mode of transport to reach the site
- Time of day of visit
- Entry point onto heath (whether or not the same as the location where interview was taking place)
- Route taken during visit
- Purpose of visit
- Whether other sites were visited for the same purpose
- Distance typically travelled to reach alternative sites
- Mode of transport to reach alternative sites

Use of postcode data & GIS

A national postcode database containing the geographic location (as a point) and the number of residential dwellings (i.e. houses) within each postcode area was used within a GIS system to determine the number of houses within each of a range of distances from each access point (see Liley & Clarke 2003 for further details). These figures were then used to calculate the

number of potential visitors around each site. The actual number of people was estimated by multiplying the number of houses by 2.36 (the mean number of people per household in the UK, from the Office of National Statistics 2005).

In order to determine the distance that the people interviewed had travelled to reach the access point, they were asked which postcode they had travelled from. The distance travelled was then expressed as the linear distance from the postcode to the access point.

All people interviewed were asked to indicate the route they had taken on the heath, with the aid of aerial photographs, a copy of the OS map and with reference to landmarks (such as hills, ponds or viewpoints) that they had passed. The route was then drawn on a map (Ordnance Survey 1:10,000 scale), and subsequently transferred to GIS as a polyline, using the same OS base map. Where people entered and left the heath from different access points, the route was drawn simply as the route taken between the two points. Some routes would leave the site, for example detouring through housing estates to then return to the heath. In such cases, the entire route was drawn and not simply the route within the heath, ensuring that the actual distance walked or travelled was measured.

It was not always possible to accurately map the routes taken, due either to the maze of small paths that criss-cross some of the heaths, or because some people were uncertain. On heavily wooded sites the aerial photographs were of limited help as the tree canopy obscured paths.. Where the interviewee could not describe their route at all, no route was mapped, however, in most cases interviewers were able to map the route at least roughly.

All routes, once mapped, were summarised using two numbers: the distance covered (the total length of the route, mapped as a polyline) and the penetration distance (the linear distance from the mid-point of the route to the access point).

The area of the heath within which people could walk / visit was estimated, also using GIS. The boundary of this “visitable area” was, in most instances, the SPA boundary, but where open countryside, with access, occurred alongside, this was also included. This “visitable area” therefore encompassed the amount of land with public access and directly accessible from the given access point.

Analysis

All errors are standard errors unless otherwise indicated.

Box plots are commonly used within the analysis. The box boundary closest to zero indicates the 25th percentile, a line within the box marks the median, and the boundary of the box farthest from zero indicates the 75th percentile. Whiskers (error bars) above and below the box indicate the 90th and 10th percentiles, and outlying points are marked with dots. These percentiles simply divide the distribution of the data into percentages, allowing the distribution of the data to be visualised.

Results

Structure of results

The results section summarises the answers to each question, following the same order as the questionnaire. Much of the raw data, presented by site, is given in tables in the appendices. Both the total number of people and the total number of groups (i.e. number of interviews) have been used. As most analyses use the total number of people, this should be assumed unless the text states otherwise.

The total number of visitors recorded and variation between sites

A total number of 1144 interviews were conducted, involving 2062 people, 72% of all the people recorded leaving the access points. The totals per site are given in Appendix 1 (Table 17). Across all sites, the number of people interviewed significantly correlated ($p < 0.001$) with the number of people leaving, indicating that the proportion of refusals and people missed was even across all sites. In total, 267 people (9% of those leaving) declined to be interviewed and 180 people (6% of those leaving) had already been interviewed on a previous visit. A total of 347 (12% of those leaving) were not interviewed. These were either people who passed at the same time as other people were being interviewed, or alternatively came past too quickly (for example by bicycle) for the interviewer to be able to stop them.

The Lookout was by far the busiest site, with 317 people (15% of all interviews) interviewed (Figure 2). The average number of people leaving, per access point, was 109.8 (+ 21.9) in 16 hours of survey time, equating to 7 people per hour.

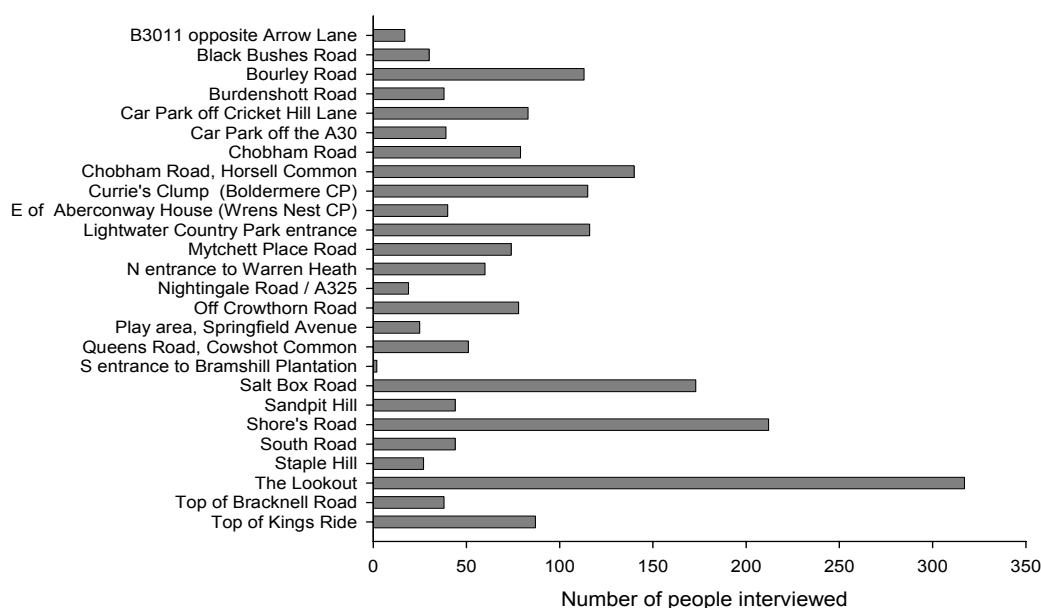


Figure 2: Total number of people interviewed per site

Group size

Group size ranged from 1 to 15 people. The most frequently encountered group size was 2 people (36% of all interviews) and, with 29% of all interviews conducted with lone people, 65% of all interviews involved groups of 2 or less (Appendix 1, Table 18).

Adults or children

Although the age or age class of people was not recorded, the number of children (under 16 years old) in each group was recorded. Overall, children comprised 16% of the 2062 people

recorded visiting the heaths; the percentage of children was highest at the Lookout (34% of people were children).

Number of dogs

The total number of dogs accompanying the people interviewed was 1271, equating to 0.6 dogs per person. Only 28% of groups interviewed were without a dog (Table 2). The number of groups interviewed that had dogs with them was 821, giving a mean of 1.5 dogs per group with a dog .

Table 2: Number of dogs recorded and group size (number of people in each group).

	<i>No of dogs per group</i>									Total
	0	1	2	3	4	5	6	7	8	
No of groups	323	504	242	42	19	8	2	3	1	1144
% of groups	28	44	21	4	2	1	0	0	0	
Total No people	792	749	389	75	31	13	5	4	4	2062
Total No dogs	0	504	484	126	76	40	12	21	8	1271

Frequency of visit

All people interviewed were asked how frequently they visited the site, and were given the choice of answering ‘daily’, ‘weekly’, ‘monthly’, ‘varies through the year’ or ‘don’t know’. Those who were visiting for their first time were included within the ‘don’t know’ category. Most people interviewed clearly frequently visited the sites, with daily being the most common answer (52% of interviews, 41% of all people). At 22 of the 26 sites, daily was the answer given in the most interviews (see Appendix 1, Table 19 for the data for each site).

As might be expected, significantly more of those people visiting regularly were visiting the heath to walk their dogs (Table 3).

Table 3: Numbers of visitors coming daily, weekly or less frequently than weekly that visit to walk their dogs. Significantly more visitors coming daily are walking their dog ($\chi^2_2 = 184, p < 0.01$).

<i>Frequency of visit</i>	<i>Total number of people</i>	<i>Total number of people walking their dog</i>	<i>% of visitors walking dogs</i>
Those that visit daily	852	710	83
Those that visit weekly	525	361	69
Those that visit less frequently than weekly	685	199	29

Weekend vs weekday

Survey effort at each site was split equally between weekdays and weekends. Therefore, if visitor usage was the same at weekends and weekdays, one would expect half the observed people to be recorded on weekends. In fact, comparing the totals of visitors recording leaving the access points, 59% of people leaving were recorded on weekends. A Chi-square test of the null hypothesis of equal daily rates of usage at the weekend as on week-days was significant ($p < 0.01$) for all sites combined (omitting the south entrance to Bramshill Plantation where the sample size was too small). In fact only one site (Lightwater) had more people visiting, per day, during the week (33% of people leaving Lightwater were recorded at the weekend). The individual sites where significantly more people ($p < 0.01$) visited during the weekend were the Lookout, Stable Hill and Chobham Road (Chobham Common). These sites all have large car parks.

Time of day

People were asked whether they tended to visit more frequently at a certain time of day. Half of all people interviewed (49%) did not visit at a particular time (Table 4).

Table 4: Time of day interviewed in relation to the time of day when the interviewee tended to visit the heath. The percentages are calculated for each row.

Time period interviewed	Total (no groups)	Time of day most frequently visit (% of total)					
		before 9am	0900 - 1200	1200 - 1400	1400 - 1600	after 1600	don't know / no particular time
0700 – 0900	218	51	2	0	0	0	47
1000 – 1200	355	7	41	1	2	2	46
1300 – 1500	288	4	7	18	13	6	52
1700 – 1900	283	1	4	1	4	39	51
Total	1144	13	16	5	5	12	49

The actual totals of people leaving the site within each time period were used to determine when most people visit the heaths. On weekdays there was little difference in the number of people leaving the site in each of the two-hour time periods (Table 21, Figure 3). On weekdays the time period 1300 – 1500 was the time when the highest counts were recorded, but only 31% of people were recorded during this time period. On weekends, the early morning (0700 – 0900) had fewer visitors than the other time periods, and, as with weekdays, the highest counts of people were from the 1300 – 1500 time period (34% of weekend visitors leaving the site). The data for each site for weekdays and weekend days with visitors per time period are given in Appendix 1, Table 21.

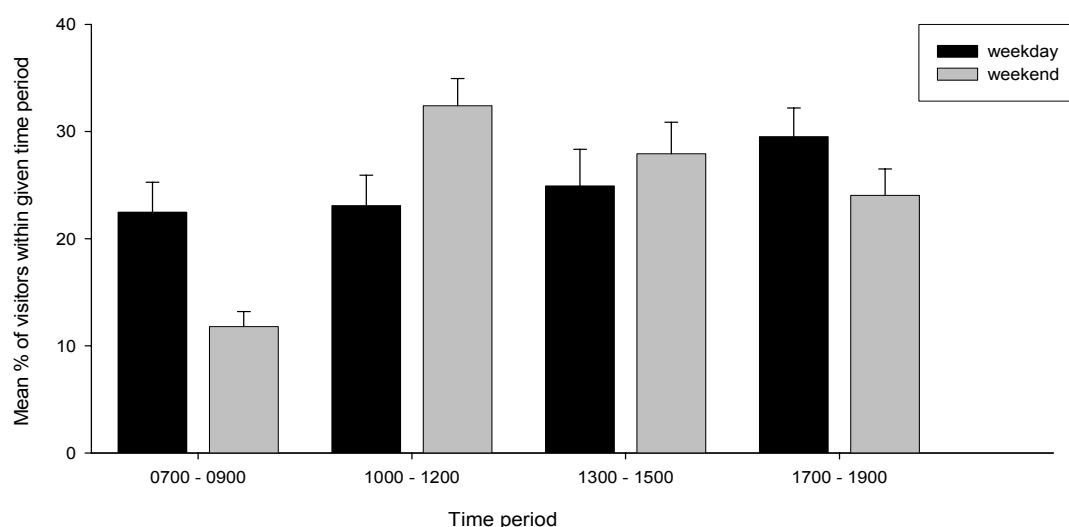


Figure 3: Mean percentage of visitors within a given time period for weekends and weekdays. The percentage figures give the proportion of the total count for a weekday or a weekend day recorded leaving the site within the given time period.

Reason for visiting the heath

All of the people interviewed were asked the purpose of their visit on that day, and were given a choice of eight possible answers. These eight included an “other” category, and when this was used the other purpose was recorded. As people were able to give up to two reasons (for example some people may exercise their dog and jog during the same visit), the total number of reasons given was greater than the number of people interviewed. The number of people who gave two reasons for visiting the heath was 347, meaning that 2409 reasons were given for visiting the heath (see Appendix 1, Table 20 for totals).

Dog walking was the most common reason given as the purpose of the visit that day, with 59% of people walking dogs (Figure 4). The total number of dog walkers arriving by car significantly correlated with the total count of people leaving the site (Pearson correlation coefficient = 0.628, p = 0.001).

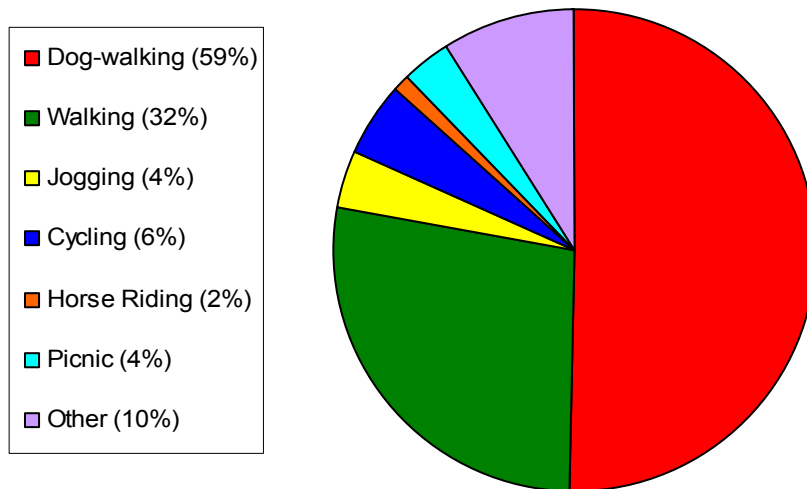


Figure 4: The purposes for visiting the sites. Proportions are calculated from the total number of answers given (some people were visiting for more than one reason).

Taking only those access points with car-parks, there was no significant relationship between the number of dog walkers interviewed at each site (taking only those dog walkers that arrived by car) and the number of houses within either 5km or 10km (Figure 5). This would suggest that factors other than distance to the heath may be influencing the number of dog walkers visiting a given site by car. Sites such as Nightingale Road and the car park at Cricket Hill Lane had particularly low numbers of dog walkers arriving by car. The Nightingale Road car park is very small, and parking is difficult, and the car park of Cricket Hill Lane is reached down an unmarked, very bumpy and difficult to negotiate track. Such factors may be influencing the lack of any relationship.

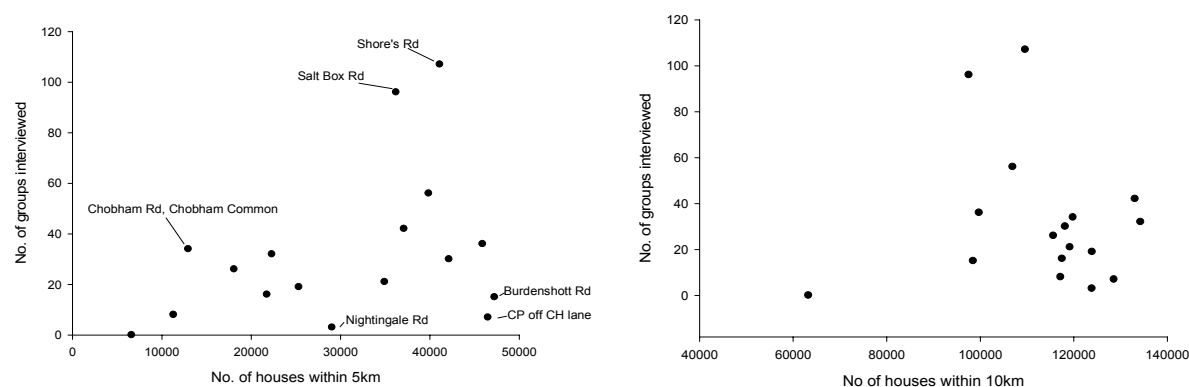


Figure 5: No of groups of dog walkers, arriving by car and number of people living within 5km and 10km radius of each access point. Only sites with car parks are included.

The “other” category included a wide range of reasons for the visit, these included:

- Taking the children out 70 people
- Flying model aircraft 19 people
- Fishing 14 people
- Short cut to work 14 people
- Exercise / keeping fit 9 people
- Mushroom picking 9 people
- Orienteering 5 people
- Nature watching 4 people

In addition, the interviewers noted on one occasion a group of people involved in battle re-enactment and also two instances of people walking on the heath with their cat. None of these people were subsequently interviewed (they either left by a different access point or left outside the interview periods).

The Lookout clearly attracts a wide range of visitors and it was here that a particularly high number of people gave “other” as the reason for visiting. The presence of an adventure playground, discovery centre and specific child-orientated events clearly attracted people with children. The “Go-Ape” theme park also attracted a number of people, and while those solely visiting “Go Ape” were ignored, “Go Ape” was still given as a reason for a number of visitors. For example, not all of a group would visit “Go Ape”, and those not involved would walk or picnic while waiting. The high numbers of people recorded at the Lookout were therefore clearly related to the range of attractions present at the site.

Mode of transport to heath access point

For all 26 access points together, the majority of people arrived by car or van (83% of people). The proportion of people who arrived on foot was 13% (Figure 6). However, relative use of cars compared to arriving on foot varied enormously between access points. No one came by car, and practically all people walked, to the access point next to the play area on Springfield Avenue. Over 95% of people came by car to access points on Chobham Road (Chobham Common), Currie’s Clump, S entrance to Bramshill Plantation, Shore’s Road, Staple Hill and The Lookout. The data for each site is given in Appendix 1, Table 22.

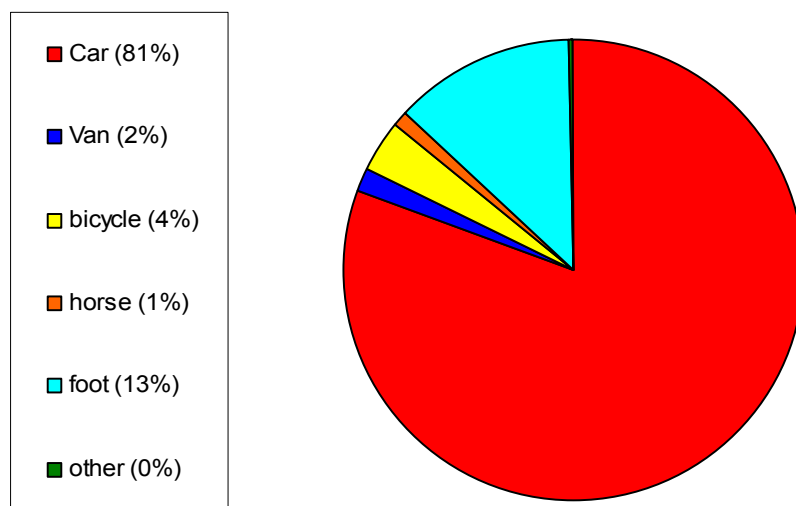


Figure 6: Mode of transport. Percentages are based on the total number of people rather than the number of groups interviewed.

The role of parking

Car parking provision varied between the access points surveyed. Sample sizes for each type of parking provision varied, with only four sites with no parking or very limited parking (for example on a grass verge). As might be expected, the sites with large car-parks had the highest hourly rate of visitors arriving by motor vehicle (Table 5). Some of the sites with large car parks also had additional facilities, such as cafes, toilets, and adventure playgrounds etc, which could serve as additional attractions and hence account for the wide variation in the number of visitors to sites with large car parks.

Table 5: Number of people per hour, according to car-parking facilities and mode of transport. Total people is the number of people in groups that were interviewed. Small car-parks are those that hold less than 20 cars.

Mode of transport	<i>large car park (n=8)</i>		<i>small car-park (n=9)</i>		<i>lay-by or pull in (n=5)</i>		<i>V. limited parking (n=4)</i>	
	Total people	No. per hour per site	Total people	No. per hour per site	Total people	No. per hour per site	Total people	No. per hour per site
foot	54	0.4	68	0.5	78	1.0	65	1.0
vehicle	947	7.4	564	3.9	124	1.6	59	0.9
other	29	0.2	32	0.2	8	0.1	34	0.5
	1030		664		210		158	

Across all sites, the number of people counted leaving each site significantly correlated with the number of car-parking spaces (both including the Lookout: Pearson’s correlation coefficient = 0.77, p = <0.001, and excluding the Lookout: Pearson’s correlation coefficient = 0.42, p = 0.04).

Distances travelled to each heath access point

Each interviewed visitor was asked for the postcode from which they had travelled that day. A GIS (MapInfo Professional 7.5, 2003) was then used to calculate the straight-line distance from the postcode and the access point. This approach provided a good approximation of the distribution and range of distances people travel to each access point. Distances greater than 10 km were classed as '>10km'. A map of postcodes

In total 723 (63%) of the people interviewed gave full valid postcodes from which the distance to the access point could be calculated. Of the remaining people 381 (33%) gave only the first half of their postcode, referred to as the postcode stem. Where the range of recorded distances for all visitors to a particular access point from places with the same post code stem was relatively small, the missing distances from the same stem postcode to the same heath were set to the median of the observed distances. However, this infilling of numerous missing values made little difference to the distribution of distances travelled to any of the access points. Therefore all subsequent analyses and statistics are based solely on the full postcodes only.

Some of the people travelling by car had travelled considerable distances, with the maximum distance for one group interviewed of 568 km ! However, the majority of people travelling by car came from within a radius of 15km (Figure 7 and Table 6). Those travelling by foot travelled the shortest distances.

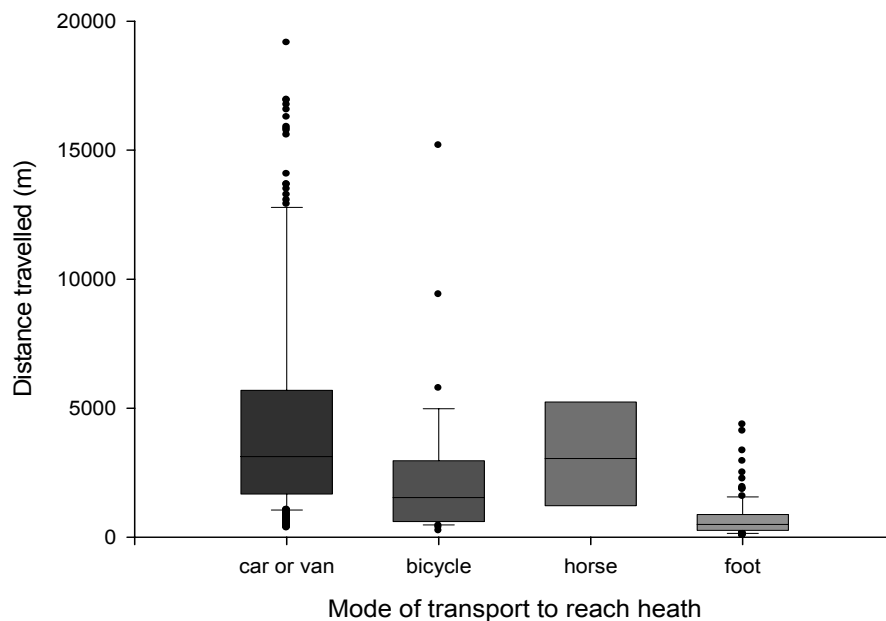


Figure 7: Distances people travelled to sites, grouped according to mode of transport used to reach the site

Table 6: Summary of distances people travelled to sites (data shown graphically in Figure 7). Data from all sites combined

	Distance (km) of postcode to access point			
	car or van	bicycle	horse	foot
Median	3.1	1.5	3.1	0.5
Standard deviation	35.9	2.9	2.0	0.8
count (n)	568	34	8	112
Max	555.4	15.2	5.7	4.4
Min	0.4	0.2	0.6	0.1

The cumulative frequency of the distance travelled to reach the site, for each mode of transport, gives an indication of the catchment for each site. It can be seen that 40% of people travelling by foot come from within the 400m distance band; that the 1500m distance band includes 20% of car drivers and 90% of those arriving by foot, and that no walkers and only 30% of car drivers came from beyond 5km (Table 7, Figure 8)

Table 7: The percentage of people travelling within a given distance to reach the access points

Distance (m)	car / van	foot	bicycle
100	0	4	0
200	0	18	0
300	0	30	4
400	1	40	7
500	2	51	11
1000	9	79	35
1500	20	90	50
5000	70	100	93

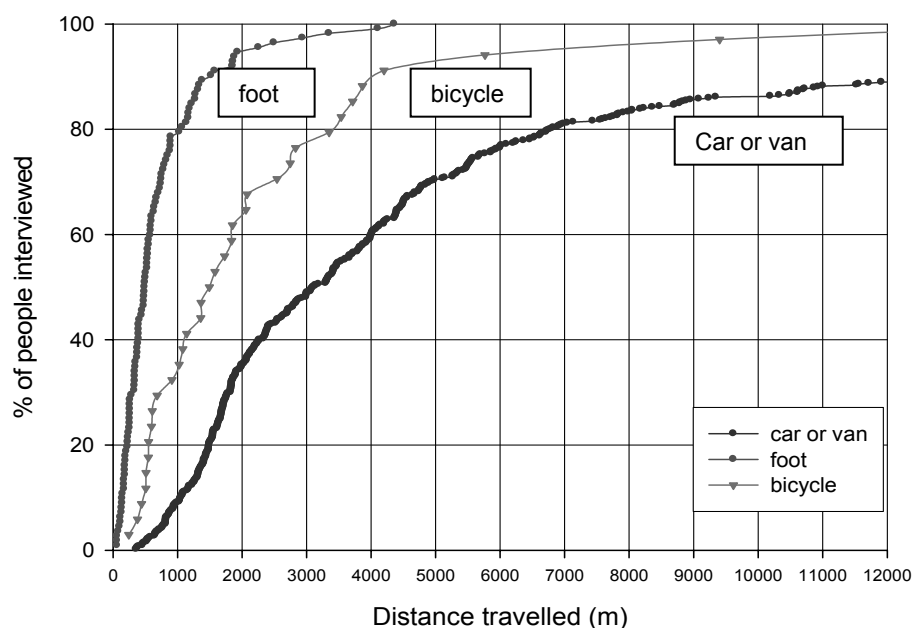


Figure 8: Cumulative frequency distribution of the distances travelled to heath access points

Distances and route travelled on each heath access point

Each person interviewed (as they were leaving the heath) was asked to indicate on a map of the site which route and where they had just walked. These routes are mapped for all sites in Appendix 2. These maps show that circular routes were commonly followed. The length of route was compared for each of the main activities (Figure 9, Table 8).

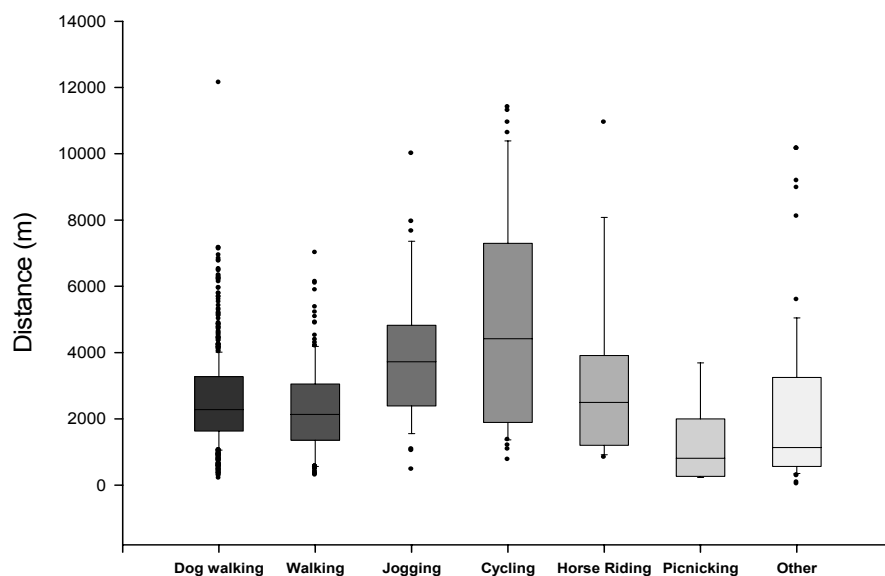


Figure 9 Length of route for each user group.

Table 8: Length (km) of route for each user group (data matches Figure 9 above).

	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Count(n)</i>
Dog Walking	2.5	2.3	1.3	0.2	12.1	772
Walking	2.3	2.1	1.4	0.3	7.0	143
Jogging	3.9	3.7	2.1	0.5	10.0	39
Cycling	4.9	4.4	3.3	0.8	11.4	44
Horse Riding	3.2	2.5	2.6	0.8	10.92	16
Picnicking	1.2	0.8	1.2	0.2	3.7	9
Other	2.3	1.1	2.5	0.03	10.2	76

The penetration distance measurement provides a useful measure of how far onto the heath visitors will go from the access point. Despite the average dog-walk route being 2.5km, 78% of dog walkers do not penetrate further than 1km onto the heath (Figure 10, Table 9, Figure 11).

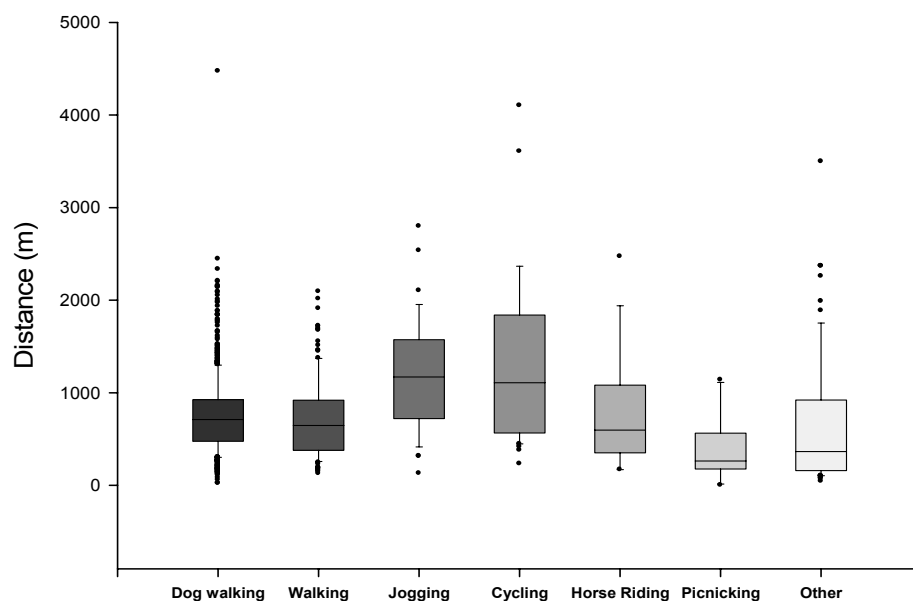


Figure 10: Penetration distance for each user group. The penetration distance is the linear distance from the mid point of the route to the access point.

Table 9: Penetration distances (m) for each user group (data matches that in Figure 10)

	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Count (n)</i>
Dog walking	760	712	419	20	4471	772
Walking	722	646	431	126	2091	143
Jogging	1174	1170	617	128	2796	39
Cycling	1336	11099	858	232	4101	44
Horse Riding	807	596	621	168	2470	16
Picnicking	388	263	358	0	1137	10
Other	676	364	685	43	3495	76

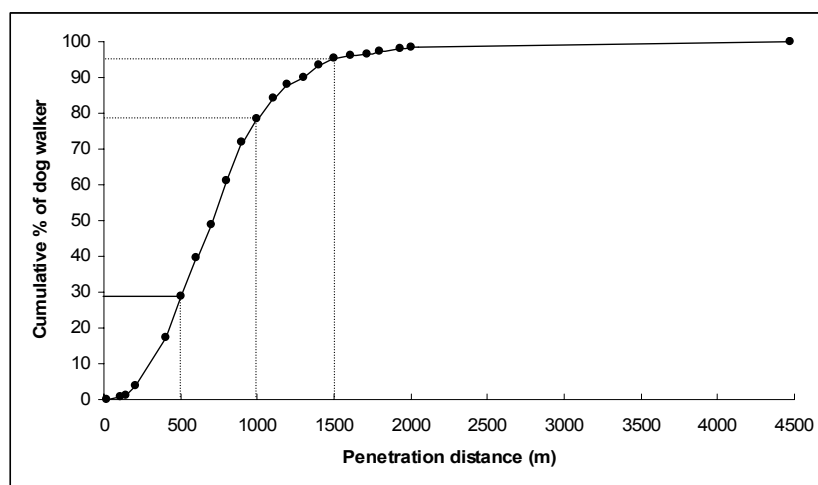


Figure 11: Cumulative frequency of the penetration distance onto heath, dog walkers only

For all users, neither the mean distance travelled on the heath, nor the mean penetration distance significantly correlated with the ‘visitable’ area (non-parametric rank Spearman correlations of 0.21 and 0.11 respectively, $p > 0.05$ for both) (Table 23).

Alternative sites

People were asked whether they visited alternative sites for the same primary purpose as their visit when interviewed. Three-quarters (1553 people) of all people interviewed did visit alternative sites, but there was some variation depending on the purpose of the visit (

Table 10).

Table 10: Responses (in percent) from people when asked whether they visit alternative sites for the same purpose as their visit when interviewed.

<i>Purpose</i>	<i>Yes</i>	<i>No</i>
Dog walking	78	22
Walking	80	21
Jogging	54	41
Cycling	67	33
Horse Riding	62	34
Picnic	85	15
Other	62	38
Total (all groups)	75	24

A binary logistic regression was used to determine whether those people arriving by car were more likely to use alternative sites than visitors who arrive on foot. Significant differences were found for dog walkers (80% of those arriving by car visit alternative sites and 57% of those arriving on foot visit alternative sites, $z = 5.00$, $p = <0.01$) and walkers, (80% of those arriving by car visit alternative sites and 63% of those arriving on foot visit alternative sites, $z = 1.99$, $p = <0.05$). For joggers, sample sizes were small and no significant difference ($z = -0.52$, $p > 0.05$) was found between those arriving by car (43% visit alternative sites) and those arriving on foot (52% visit alternative sites).

Distance travelled to alternative sites

Those people interviewed who did visit alternative sites were asked how far they travelled to reach these alternatives, being given a choice of less than a mile, 1 – 5 miles and greater than 5 miles. A small proportion (12%) said that they visited a number of sites that fell within more than one category. Relatively few people (16%) travelled less than a mile and the majority (44%) travelled between 1 and 5 miles to reach alternative sites. There was some evidence that dog walkers tended to travel shorter distances to alternative locations as dog walkers were the group with the smallest proportion of people (20%) travelling more than 5 miles.

Table 11: Distance travelled to alternative sites. The table takes only those interviews where the person / group did visit alternate sites and the table gives the number of groups and then the percentage of those who travel within a given distance category.

Purpose	No groups	% of groups			
		< 1 mile 1.6km	1 - 5 miles 1.6 – 8km	> 5 miles >8km	more than 2 categories
Dog walking	610	17	51	20	11
Walking	112	13	20	47	21
Jogging	19	21	26	42	11
Cycling	32	9	22	50	19
Horse Riding	10	0	50	40	10
Picnic	9	22	11	56	11
Other	44	9	32	52	7
Total (all visitors)	836	16	44	28	12

Those who visited alternative sites were also asked how they travelled to these other locations. These data are summarised in (Table 12), which gives the % of groups, split according to purpose and mode of transport. Most dog walkers who travel to alternative sites on foot (82%) go less than a mile, but where they travel by car, most (59%) will travel between 1 and 5 miles. Most walkers (67%) also travel less than a mile on foot to reach alternative sites, whereas 57% of walkers who travel by car to the sites where they walk will travel more than 5 miles.

People were asked both the mode of transport they had used to visit the site on the day interviewed and also the mode of transport used to visit alternative sites. There was a clear difference between those who travelled to the site by vehicle and those who walked. Of those who came by car and also visited other sites, 82% would also visit other sites by car. By contrast, for those who arrived by foot, approximately half (52%) would visit alternative sites by car. This suggests that there are a number of people who tend always to travel to sites by car, and also a set alternate between car and foot.

Table 12: Percentage of visitors who travel a given distance to reach alternative sites, split by purpose of visit and by type of access.

<i>Mode of transport</i>	<i>Total</i>	% of groups who travel given distance to alternative sites			
		less than 1mile	1 - 5 miles	>5 miles	more than 1 distance category
Dog walkers					
car	479	8	59	25	8
foot	68	82	16	1	0
other	4	0	25	25	50
both foot and car	56	18	32	4	46
Walkers					
car	88	7	23	57	14
foot	12	67	8	0	25
other	1	0	0	100	0
both foot and car	10	0	10	20	70
Joggers					
car	9	0	22	78	0
foot	7	57	43	0	0
other	1	0	0	0	100
both foot and car	2	0	0	50	50
Cyclists					
car	18	0	11	78	11
by bike	1	0	100	0	0
other	13	23	31	15	31
Horse Riders					
car	2	0	0	100	0
other	7	0	71	29	0
both foot and car	1	0	0	0	100
Picnickers					
car	5	0	0	100	0
other	1	100	0	0	0
both foot and car	3	33	33	0	33
“Others”					
car	40	5	33	58	5
foot	3	67	0	0	33
both foot and car	1	0	100	0	0

Table 13: Mode of transport used to reach the site on the day interviewed cross referenced with mode of transport used to visit alternative site. Table gives the number of groups in each category and the percentage (% in brackets). The percentage is calculated from the row totals.

<i>Method used to visit the site when interviewed</i>	<i>Method used to visit other sites</i>				<i>Total</i>
	car, van or other motor vehicle	On foot	Other method	Both vehicle and on foot	
car, van or other motor vehicle	581 (82)	56 (8)	4 (1)	62 (9)	703
foot	49 (52)	34 (36)	2 (2)	10 (11)	95
total	630	90	6	72	798

Predicting total visitor numbers

The total number of people varied between sites. There are a number of possible factors which are likely to influence the total numbers of visitors, these include:

- 1) The size of the human population living near the access point (the size of this catchment will vary depending on mode of transport)
- 2) The ease of reach, barriers such as rivers, or motorways may mean that the actual distance to travel to a given access point is considerably larger than the linear distance from the house to the access point
- 3) The number of parking spaces
- 4) The number of other visitors – this may influence whether parking is available and also it is possible that other people could both attract or deter other users.
- 5) Access restrictions - for example no cycling or a requirement to keep dogs on leads (the presence of livestock will usually necessitate the latter).
- 6) Provision of certain access features, such as nature trails or mountain bike circuits
- 7) The quality of the site – whether it be views, shade to walk under or attractiveness of the location
- 8) Facilities, the presence of toilets, cafes etc
- 9) The size of the site and the actual area open to visitors
- 10) The presence and number of alternative sites nearby
- 11) Cost – whether there are parking or other charges

Many of the above are difficult attributes to quantify. However, certain variables can be easily quantified and were used to test whether the total number of visitors leaving an access point (the tally counts) could be predicted. The following variables were used:

- Total no of houses within 5km (taken from the postcode data)
- Total no of houses within 10km (taken from the postcode data)
- The number of off-road parking spaces at each access point
- The ‘visitable’ area at each site, calculated largely from the SPA boundary, modified to include additional undesignated areas of countryside where access was permitted. Main roads, railway lines and built up areas were used to delimit the area ‘visitable’.

Each of these will be explored in turn

Housing density around sites

The actual number of people living in around each access point varied between points: the maximum was Lightwater Country Park, which has 112,000 properties lying within a 10km radius of the access point and the smallest number of properties within this radius was found with the Burdeshott Road access point (51,000 properties). The mean number of properties within a short distance (eg less than 1km) of the access points was relatively small, reflecting the small area within the given radii (Figure 12).

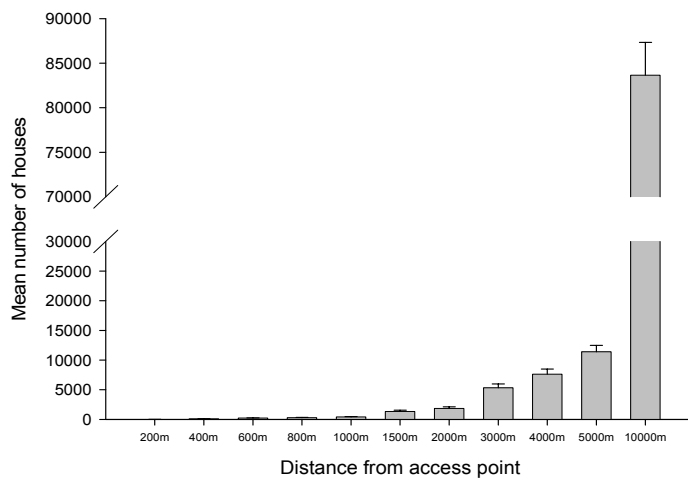


Figure 12: Mean number of houses per access point at different distance bands. Note the break in the y axis.

The number of houses with 5km and within 10km of access points significantly correlated with each other (Pearson correlation co-efficient = 0.543, $p=0.004$). The Lookout was a clear outlier, attracting more people than might be expected given the number of people in the surrounding area (Figure 13). There was a significant relationship between the number of houses and total visitors leaving the site, using the housing figures for all distance bands between 1km and 5km. At distances above 5km, there was no significant relationship between the number of houses surrounding the access point and the numbers of visitors (Figure 13,).

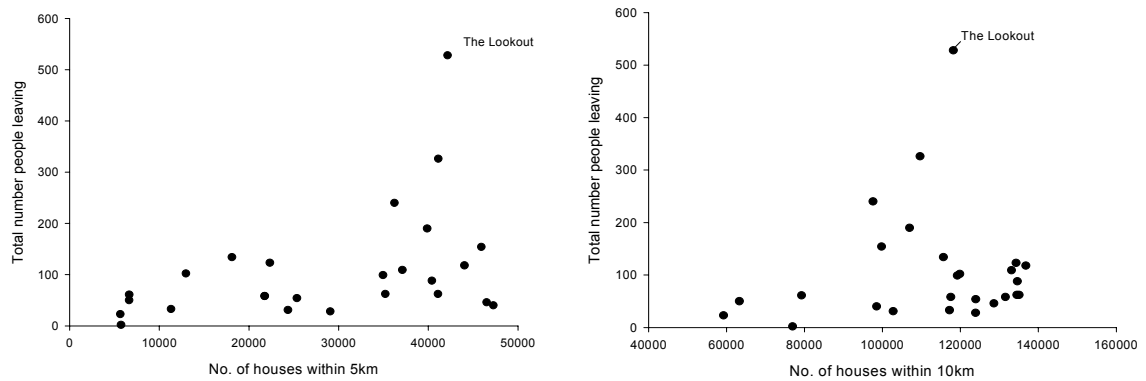


Figure 13: Plots of the number of houses at 5km and 10km and the number of people leaving each site. The relationship with the number of houses within 5km is significant ($r^2 = 14\%$, $F = 5.10$, $p=0.04$), with similar values both including and excluding the Lookout. The relationship is not significant (either with or without the Lookout) with the number of houses within 10km ($F = 0.32$, $p >0.05$).

Table 14: Significance and R² values (indicating the percentage of variance explained) for regression analyses testing the relationship between the number of houses within a given distance band and the total number of people counted leaving the site. The analyses were repeated both including and excluding the Lookout.

Distance band	Including the Lookout		Excluding the Lookout	
	p	R ²	p	R ²
200m	0.24	1.8	0.25	1.6
400m	0.94	0	0.87	0
600m	0.35	0	0.67	0
800m	0.23	2.1	0.65	0
1000m	0.04	12.8	0.25	1.7
1500m	0.004	26.6	0.02	17.5
2000m	0.003	29.3	0.008	23.3
3000m	0.003	27.6	0.005	26.7
4000m	0.03	15.1	0.007	24.3
5000m	0.03	13.8	0.036	14.1
7500m	0.12	5.8	0.17	3.8
10,000m	0.57	0	0.58	0

‘Visitable area’

There was no clear relationship between the number of people counted leaving the site and the ‘visitable area’ (Figure 14). The ‘visitable area’ was very large for some sites, especially the three sites on Broadmoor to Bagshot Woods and Heaths SSSI (where the area is 1800 ha). It is perhaps possible that many of the sites are too large for site size to influence the number of visitors. It is likely to be user groups such as cyclists and joggers, who cover longer distances on their visits, who will be influenced by the size of the site.

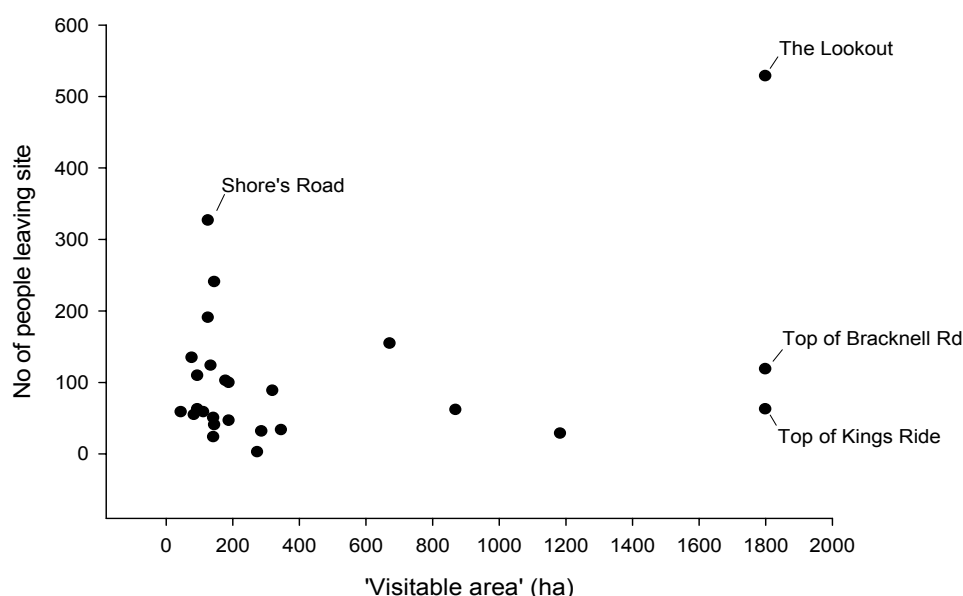


Figure 14: Numbers of people leaving each site in relation to the ‘visitable ares’ at each site.

In order to attempt to predict the total number of people leaving the site, a multiple regression was carried out, using the number of people leaving the site as the response variable and the number of houses within 5km and the number of parking spaces at each site as the regressors. The Lookout was excluded from the analysis. There was a rather poor fit, with only 25% of the variance in the number of people explained. The overall relationship was significant ($F_2 = 5.09$, $p = 0.015$) and both regressors were significant ($p < 0.05$). The multiple regression was repeated with the inclusion of the visitable area, but the overall fit was not improved.

The above multiple regression was repeated, but only using those 16 sites with a car park (again excluding the Lookout). With this, smaller sample size, none of the variables individually, or in combination, was significant in predicting the number of people.

The proportion of residents visiting each site

As might be expected, the proportion of residents, living around each site and that visit that heath decreases with increasing distance away from each site. This decreasing proportion of residents can be described using fitted curves, which can then be used to predict the numbers of people visiting a given site.

Figures shows such curves, for all visitors across all sites and then for visitors arriving by foot and by car separately. The data presents the percentage of people who were interviewed.

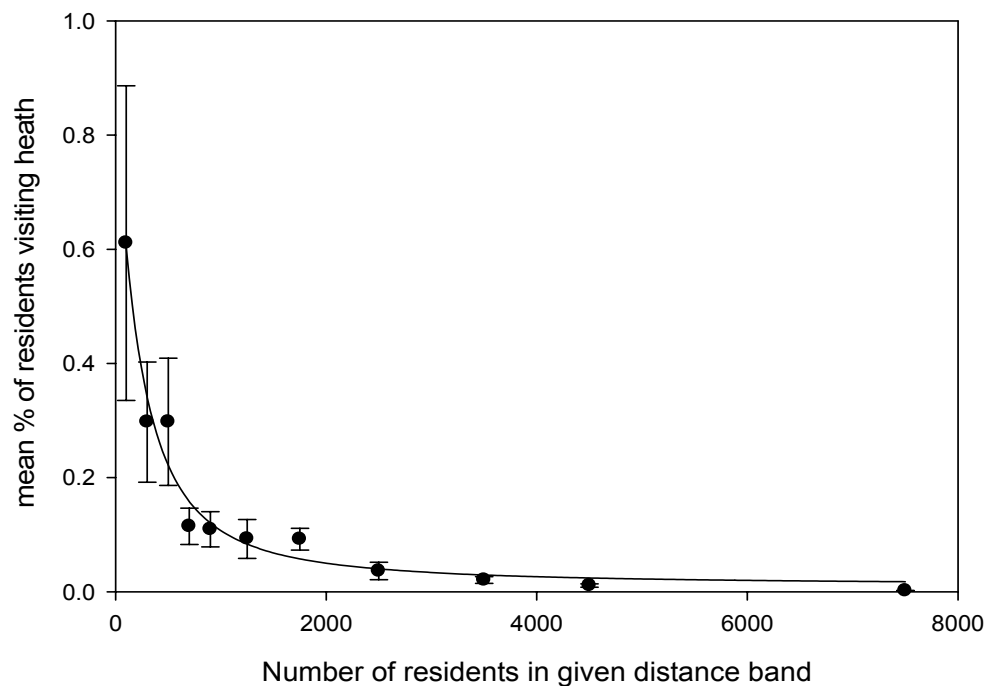


Figure 15: All visitors: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: $y = ae^{(b/x+c)}$. Where $a = 0.010 (\pm 0.011)$; $b = 5130.163 (\pm 3672.72)$ and $c = 1145.581 (\pm 555.843)$. $R^2 = 97\%$.

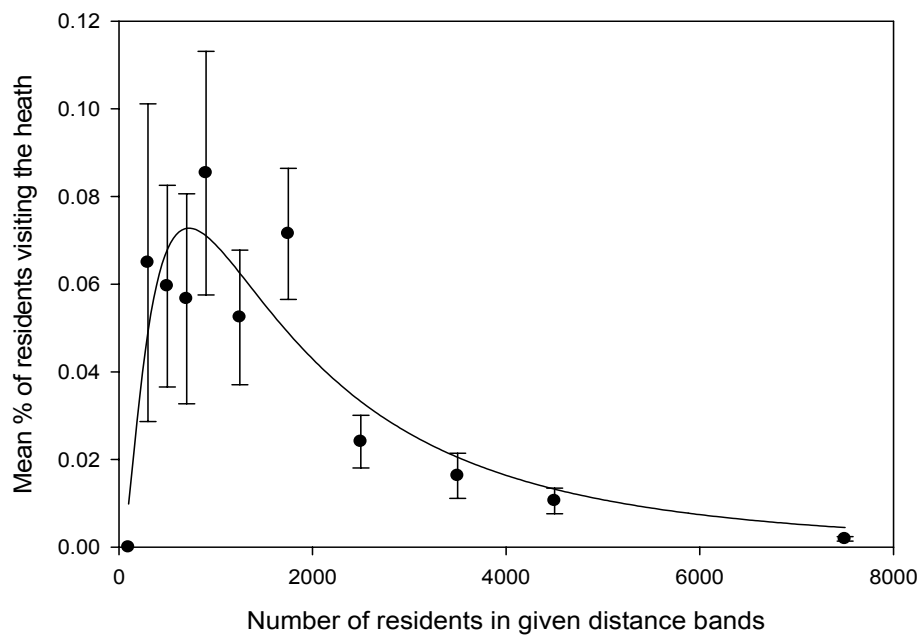


Figure 16: Car drivers only: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: .

$$y = ae^{-\left[\frac{-0.5 \left(\ln \left(\frac{x}{x_0} \right) \right)^2}{b} \right]}$$

Where $a = 0.073 (\pm 0.008)$; $b = 0.99 (\pm 0.16)$ and $x_0 = 723.65 (\pm 114.16)$. $R^2 = 85\%$.

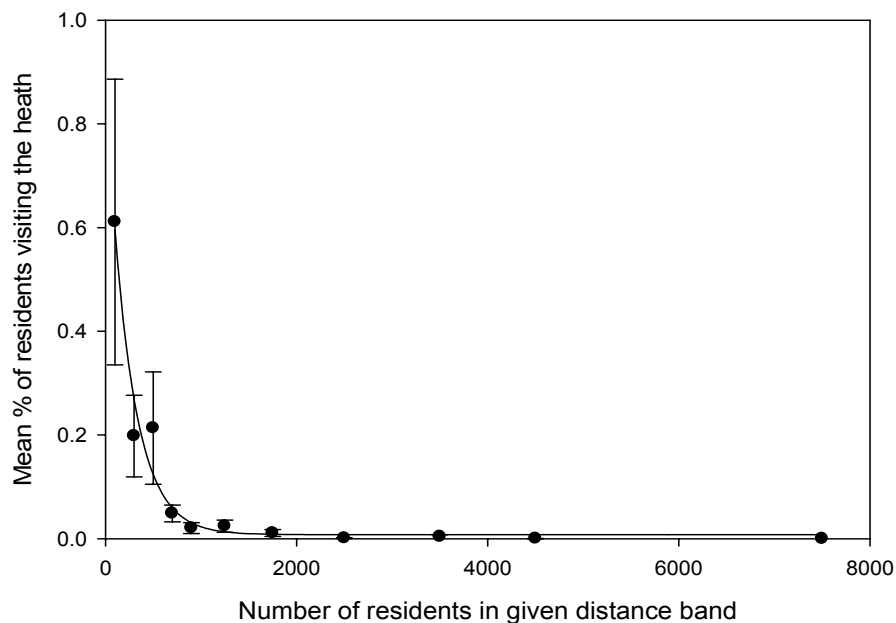


Figure 17: People travelling by foot: proportion of residents visiting the heath in relation to the total number of people living around each heath. Each point represents the mean (per site) number of people interviewed coming from a given distance. Error bars give 1 standard error. Curve is described by the following equation: $y = y_0 + ae^{(-bx)}$. Where $y_0 = 0.08 (\pm 0.02)$; $a = 0.88 (\pm 0.09)$; $b = 0.004 (\pm 0.0001)$. $R^2 = 95\%$.

Extrapolating visitor numbers to give annual totals

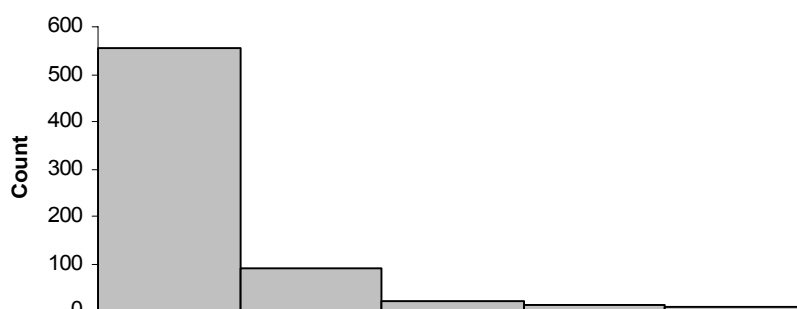
Most studies of visitor numbers express visitor levels in terms of an annual figure, representing the number of visits to the site. Such a figure is calculated here to facilitate a comparison between visitor pressure on the SPA as a whole and other sites within the UK. There are a number of different ways in which such the total could be estimated, and only one, simple approach, is given here. A total of over 5 million visits per annum to the SPA is estimated as follows:

Total number of visitors recorded leaving during this survey	2856
Number of sites	26
Mean number of visitors leaving per site	110
No. of hours of surveying per site	16
Mean no. of people leaving per site per hour	7
Total hours in day (0600 – 2000)	14
Total people leaving site per day per access point	98
Mean number of people leaving per access point per yr.	35,770
Total number of access points within the SPA	150
Estimate of the total number of visits per year to the SPA	5,365,500

The above calculation uses an estimate of 150 access points within the SPA. This total is estimated using a survey of access points, conducted for English Nature (Exergesis 2004). All access points within the SPA were identified, apart from Bourley, which was not surveyed. The survey found a total of 685 access points, 130 of which had space for at least one car. The figure of 150 is therefore considered a reasonable estimate (allowing for Bourley) of the total number of access points equivalent to the ones in this survey.

Without a comprehensive survey of all access points it is not possible to check that the 26 access points used in the survey is representative of the SPA as a whole. The audit of access points (Exergesis 2004) does give the number of car-park spaces at each access point, the frequency distribution of which is compared with the current survey in (Figure 18). It can be seen that the 26 points covered in this survey do not represent the real distribution, as a lower proportion of access points with foot access only were covered in this survey. Hence the estimate of the total number of visitors to the SPA, while being as accurate as possible with the current data available, is likely to be an over estimate of the total number of visits.

All access points with SPA (apart from Bourley)



Access points included in this survey

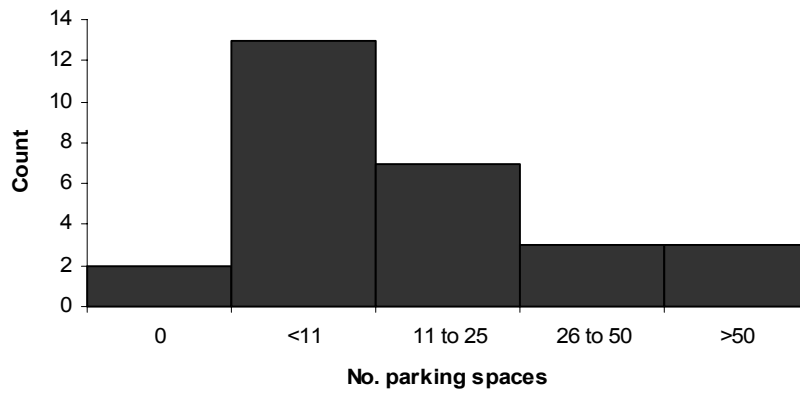


Figure 18: A comparison of the range of access points (categorised according to car park capacity) within the SPA as a whole (top graph) and within this report.

Discussion

This study looks across a range of access points within the SPA and clearly identifies broad patterns in the types of access, frequency of visits, visitor behaviour and reasons for visiting. This understanding will help develop a strategic approach to access management, for example facilitating the creation of alternative sites which will be attractive to visitors, and hence reducing visitor pressure within the SPA. An understanding of the catchments of individual access points will also help to identify when changes in the number of houses surrounding the heath, perhaps through new development, will influence actual visitor numbers to the SPA.

A number of clear patterns have emerged:

- The number of visitors to sites is related to the number of houses surrounding each site and the type of access point (amount of parking etc.)
- The majority of visitors travel by car and drive relatively short distances (less than 5km)
- The main reason for visiting sites is for dog walking.
- Dog walkers visit sites very frequently and will typically walk around 2.5km along circular routes which take them approximately 760m from the access point
- Besides dog walking there are a wide range of other reasons why people visit heaths
- A high proportion of visitors will visit alternative sites – those that travel by car especially so

As Figure 19 clearly illustrates, the routes taken by the visitors interviewed have covered a considerable proportion of the SPA. The routes taken create a web like network spreading out from each access point. Were all access points to be mapped, and a similar mapping exercise conducted for each, it is clear that few areas would remain undisturbed. Even on some of the larger heaths, it can clearly be seen from Figure 19 that the routes from different access points overlap, suggesting that the centre of some heaths will be visited by people who have entered from different access points. Depending on the shape and size of site, and also the distribution of access points, it is possible that visitor numbers could be highest away from car-parks.

Figure 20 shows the postcodes from which people travelled from. Only the area around the SPA is shown. The map shows the “catchment” of the SPA, and it is clear that people from a number of different settlements visit the SPA. Each access point is surrounded by a cluster of coloured dots representing people who have travelled from that postcode to the access point. It is interesting to see that people do not necessarily visit the nearest part of the SPA to their postcode, and also that the catchments for different access points clearly overlap. The map therefore supports the approach of looking at the proportion of residents that visit at different distance bands. People who live close to a given access point would be expected to visit that access point more frequently as it is the closest. Sites that are further away might still be visited. The approach of using the proportion of residents quantifies this choice, and the increased number of alternative sites which are likely to be available at greater distances. This approach is recommended as a future avenue for predicting visitor pressure at unsurveyed sites.

It is apparent that the SPA receives a high number of visitors from the local area who visit sites regularly. We extrapolate these data to give an estimate of total visits per annum to the SPA. This figure, of over 5 million, is higher than figures for some national parks (Table 15). However, the estimate should be treated with caution. There are a number of different ways by which this could be calculated, only one is used here. A full audit of all access points to the SPA has not been conducted and a simple comparison with our current knowledge of access points does suggest that the points included in this survey tend to be

those with more parking. The 5 million figure may therefore be an over estimate, but does serve to illustrate the order of magnitude that may be involved.

Table 15: Visitor numbers to English National Parks (from Defra 2002).

National Park	Total Visits (millions of people p.a.)
Broads	5.4
Dartmoor	3.8
Exmoor	1.4
Lake District	22
Northumberland	1.5
North York Moors	8
Peak District	19
Yorkshire Dales	9

Understanding the context

The interviews were conducted in August. This month is the peak holiday period, and visitor access patterns may, as a consequence, be different when compared to the rest of the year. The results here demonstrate that most visitors are local residents, and the SPA is unlikely to attract many tourists. As some residents may well be away on holiday at this time of year, net visitor numbers could be lower than at other times of the year. The numbers of children and number of families visiting sites would also be expected to be different outside of the school holiday period.

Dog walkers are clearly the main user group. The data show that dog walkers visit more frequently than other users, many of them walking daily on the same site. As dogs need exercising on a daily basis, the dog walkers interviewed are therefore likely to represent relatively constant sample of visitors, and usage would be likely to be similar throughout the year. During the winter, the proportion of dog walkers to other users may well be higher as the numbers of people cycling, taking the children out, picnicking etc. would be likely to be less.

Another feature of August is that there are more day-light hours. Assuming that those people who visit daily visit throughout the year (and visit during day-light hours), then the number of these people visiting per hour will be likely to be higher during the winter. Expressing visitor numbers as a daily rate rather than an hourly rate is therefore likely to provide the best means of comparing visitor pressure at different times of the year.

Towards an access management toolkit for lowland heathlands ?

This study was conducted in a similar fashion to the Dorset study (Clarke *et al.* 2005), with identical time periods used and many of the same questions asked in the interviews. Given the similarities between the two studies, it is interesting to compare the results. While much of the data are broadly similar, it does appear that there are differences between the two areas (Table 16), and it would be interesting to determine whether these are significant.

Table 16: Comparison between visitor access pattern data from the Dorset Heaths (Clarke *et al.* 2005) and this study.

	<i>Dorset</i>	Thames Basin
Proportion of people visiting on their own	41%	29%
Proportion of visitors arriving by car	59%	83%
Proportion of visitors arriving on foot	36%	13%
Proportion of car drivers coming from within 2km	31%	36%
Proportion of car drivers coming from within 3km	43%	47%
Proportion of people walking coming from within 1km	89%	79%
Average distance walked by dog walkers	2181m	2508m
Average penetration distance (dog walkers) only	698m	760m
Proportion of people interviewed walking their dog	80%	59%
Proportion of people interviewed joggers	2%	4%

Combining the two datasets would, in fact, provide the potential to develop a generic model of lowland heathland visitor use in southern England. In particular, by combining all the sites (the total number of sites would be 46), it would be possible to identify particular features of access points (such as parking provision, way-marked routes etc) which were present on sites that attracted particularly high numbers of people. It would also be of interest to combine the data of catchment and proportion of residents visiting the heaths. With these data combined it would be possible to develop a predictive model of visitor numbers and their subsequent distribution (once on the heath) for any access point. Such a model, once developed, could be applied to all access points within a given area, using GIS, allowing a hotspot model of people density across each site to be mapped. Such maps could then be used to develop access management plans; as a tool for exploring the distribution of key bird species and as a means of predicting the effect of manipulating access (for example through closing access points) in strategic locations.

Further steps towards understanding access issues to the SPA

This survey presents an overview of access patterns, and the data have considerable potential for furthering our understanding. The following are beyond the scope of this report, but represent logical next steps for building on the work here:

- 1) Repeat counts at one or two of the access points at a different time of year in order to determine how visitor levels in August compare with other months.
- 2) Combine the Dorset and Thames Basin Heaths data sets to build a model which will predict total visitor numbers to sites based on the number of houses surrounding each site. This model will also allow the number of visitors likely to visit a site that will result from new development.
- 3) Use the process of developing the above model to pull out which sites attract more people than expected and which sites attract fewer. By looking at these residual values it will be possible to further highlight particular features of sites which attract people.
- 4) Map and categorise all access points within the Thames Basin Heaths SPA
- 5) Calculate (using the model identified in 1) the total visitor numbers to each access point within the SPA. Use this figure to show the total visitor numbers per annum to the SPA.
- 6) Use the cumulative curves representing the penetration distances of different user groups to map visitor density within sites.
- 7) Overlay bird data to compare settlement pattern of Annex 1 species with the number of visitors to each site.

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Abbreviations

GIS	Geographical Information System
SPA	Special Protection Area

Appendix 1

Additional tables, giving breakdowns of totals per site.

Table 17: Totals of people entering, leaving and interviewed by site

Site	No. of people					
	entering	leaving	Declined to answer	already interviewed	interviewed	% people leaving interviewed
B3011 opposite Arrow Lane	33	23	2	2	17	74
Black Bushes Road	32	31	1	0	30	97
Bourley Road	143	154	14	11	113	73
Burdenshott Road	61	43	0	5	39	91
Car Park off Cricket Hill Lane	85	99	5	5	83	84
Car Park off the A30	62	46	0	5	39	85
Chobham Road	124	102	3	4	79	77
Chobham Road, Horsell Common	255	190	3	3	140	74
Currie's Clump (Boldermere CP)	137	134	5	3	115	86
E of Aberconway House (Wrens Nest CP)	70	58	3	4	40	67
Lightwater Country Park entrance	242	134	12	6	116	87
Mytchett Place Road	112	99	21	4	74	75
N entrance to Warren Heath	61	73	7	6	60	82
Nightingale Road / A325	39	28	1	1	19	68
Off Crowthorn Road	121	109	5	18	78	72
Play area, Springfield Avenue	47	50	1	10	25	50
Queens Road, Cowshot Common	68	58	1	3	51	88
S entrance to Bramshill Plantation	4	2	0	0	2	100
Salt Box Road	299	240	10	28	173	72
Sandpit Hill	100	54	1	5	44	81
Shore's Road	400	326	13	15	212	65
South Road	60	62	7	5	44	71
Staple Hill	38	33	0	1	27	82
The Lookout	538	528	141	11	317	60
Top of Bracknell Road	84	62	8	14	38	61
Top of Kings Ride	116	118	3	11	87	74
Total	3331	2856	267	180	2062	72

Table 18: Number of groups encountered of a given size (group size includes adults and childrens).

Site	Group size					Total people
	1	2	3-5	6-9	<10	
Top of Kings Ride	30	17	6			87
B3011 opposite Arrow Lane	9	4				17
Black Bushes Road	11	8	1			30
Bourley Road	30	26	4	3		113
Burdenshott Road	12	6	4			39
Car Park off Cricket Hill Lane	27	17	7			83
Car Park off the A30	15	6	4			39
Chobham Road, chobham common	21	19	4	1		79
Chobham Road, Horsell	48	30	5	2		140
Currie's Clump (Boldermere CP)	13	26	12	1		115
E of Aberconway House (Wrens Nest CP)	9	12	2			40
Lightwater Country Park entrance	26	14	9	3		116
Mytchett Place Road	30	14	5			74
N entrance to Warren Heath	21	15	3			60
Nightingale Road / A325	5	4	2			19
Off Crowthorn Road	33	17	3			78
Play area, Springfield Avenue	7	4	3			25
Queens Road, Cowshot Common	15	10	3	1		51
S entrance to Bramshill Plantation	2					2
Salt Box Road	64	36	10	1		173
Sandpit Hill	22	9	1			44
Shore's Road	72	38	13	3		212
South Road	29	3	3			44
Staple Hill	12	5	1			27
The Lookout	19	31	30	13	2	317
Top of Bracknell Road	19	5	2			38
Total no. of people	601	752	484	196	29	2062
% of all visitors in given group size	29	36	23	9	1	

Table 19: Frequency of visit for each site. The table gives the total number of groups interviewed at each site, and then the percentage of that total according to the answers given. Numbers in bold refer to the most frequently given answer (highest percentage) at each site.

Site	Total interviewed at each site (no of people)	% of groups interviewed				
		Daily	Once a week	Once a month	Varies through the year	Don't know
B3011 opposite Arrow Lane	13	54	38	0	0	8
Black Bushes Road	20	55	30	5	5	5
Bourley Road	63	51	29	14	3	3
Burdenshott Road	22	50	18	5	23	5
Car Park off Cricket Hill Lane	51	57	16	10	10	8
Car Park off the A30	25	56	16	4	16	8
Chobham Road, chobham common	45	31	33	11	7	18
Chobham Road, Horsell	85	53	33	7	6	1
Currie's Clump (Boldermere CP)	52	10	25	13	29	23
E of Aberconway House (Wrens Nest CP)	23	39	22	9	9	22
Lightwater Country Park entrance	52	60	33	2	4	2
Mytchett Place Road	49	59	33	2	6	0
N entrance to Warren Heath	39	54	33	8	3	3
Nightingale Road / A325	11	91	9	0	0	0
Off Crowthorn Road	53	68	21	4	4	4
Play area, Springfield Avenue	14	79	14	0	7	0
Queens Road, Cowshot Common	29	83	7	3	0	7
S entrance to Bramshill Plantation	2	0	50	0	0	50
Salt Box Road	111	64	23	6	4	4
Sandpit Hill	32	66	25	3	3	3
Shore's Road	126	49	34	7	8	2
South Road	35	63	17	11	9	0
Staple Hill	18	17	22	22	22	17
The Lookout	95	25	17	22	20	16
Top of Bracknell Road	26	85	12	0	4	0
Top of Kings Ride	53	64	23	6	4	4
Total	1144	52	25	8	8	6

Table 20: Total number of people interviewed at each heath access point, classified by their principle reason for visiting the heath. The percentages are expressed as a proportion of the number of people interviewed (2062), not the number of reasons given for visiting the heath (2409).

	Total number of people at each site						
	Dog-walking	Walking	Jogging	Cycling	Horse Riding	Picnic	Other
Top of Kings Ride	43	25	12	5	0	0	16
B3011 opposite Arrow Lane	13	3	1	0	0	0	0
Black Bushes Road	27	16	2	1	0	0	0
Bourley Road	70	54	14	13	1	0	0
Burdenshott Road	27	11	0	2	0	0	0
Car Park off Cricket Hill Lane	38	27	1	2	8	0	14
Car Park off the A30	20	9	1	6	5	0	1
Chobham Road, chobham common	59	37	4	0	0	0	4
Chobham Road, Horsell	91	41	3	8	6	0	16
Currie's Clump (Boldermere CP)	52	68	1	3	0	11	5
E of Aberconway House (Wrens Nest CP)	30	23	0	0	0	2	0
Lightwater Country Park entrance	56	41	2	0	0	39	0
Mytchett Place Road	58	21	5	2	0	0	0
N entrance to Warren Heath	47	7	3	3	6	0	3
Nightingale Road / A325	9	11	4	0	0	0	0
Off Crowthorn Road	65	15	1	1	0	0	2
Play area, Springfield Avenue	10	7	2	3	0	0	6
Queens Road, Cowshot Common	32	13	2	0	3	0	4
S entrance to Bramshill Plantation	1	0	0	0	0	0	1
Salt Box Road	154	30	1	0	3	0	5
Sandpit Hill	37	18	0	1	0	0	2
Shore's Road	168	78	2	2	0	12	2
South Road	17	5	5	11	0	0	9
Staple Hill	8	16	0	0	0	0	4
The Lookout	55	73	19	51	0	15	119
Top of Bracknell Road	23	17	5	5	0	0	0
TOTAL	1210	666	90	119	32	79	213
%	59	32	4	6	2	4	10

Table 21: Proportion of people visiting each site according to time period, for weekdays and weekend. The time period with the highest percentage for each day is highlighted in bold.

Site	Weekday					Weekend				
	No people leaving	% of people within time period				No people leaving	% of people within time period			
		0700 - 0900	1000 - 1200	1300 - 1500	1700 - 1900		0700 - 0900	1000 - 1200	1300 - 1500	1700 - 1900
B3011 opposite Arrow Lane	6	0	33	33	33	17	24	35	24	18
Black Bushes Road	9	11	11	67	11	22	9	36	55	0
Bourley Road	55	13	27	24	36	99	12	25	30	32
Burdenshott Road	14	43	7	14	36	26	4	54	27	15
Car Park off Cricket Hill Lane	42	12	17	33	38	57	14	49	16	21
Car Park off the A30	14	29	14	29	29	32	25	31	9	34
Chobham Road	16	44	19	0	38	86	5	35	24	36
Chobham Road, Horsell Common	77	12	49	21	18	113	12	27	42	19
Currie's Clump (Boldermere CP)	46	9	37	39	15	88	6	30	34	31
E of Aberconway House (Wrens Nest CP)	11	27	27	18	27	47	13	21	47	19
Lightwater Country Park entrance	83	6	6	64	24	40	13	38	45	5
Mytchett Place Road	39	15	18	18	49	49	12	24	27	37
N entrance to Warren Heath	25	24	32	20	24	36	19	44	19	17
Nightingale Road / A325	8	25	63	0	13	20	0	55	10	35
Off Crowthorn Road	43	16	28	23	33	66	5	47	20	29
Play area, Springfield Avenue	21	29	14	10	48	29	7	34	28	31
Queens Road, Cowshot Common	22	36	27	9	27	36	11	8	53	28
S entrance to Bramshill Plantation	2	50	0	50	0	0	0	0	0	0
Salt Box Road	118	30	25	25	20	122	18	28	19	35
Sandpit Hill	18	6	6	28	61	36	25	44	17	14
Shore's Road	119	19	34	29	17	207	11	21	30	38
South Road	33	52	6	3	39	29	10	31	10	48
Staple Hill	6	33	17	17	33	27	7	41	33	19
The Lookout	251	6	29	47	18	277	6	32	57	5
Top of Bracknell Road	35	17	37	11	34	27	22	33	15	30
Top of Kings Ride	50	22	16	16	46	68	18	18	35	29
Total	1163	17	26	31	26	1656	11	31	34	25

Table 22: Mode of transport given by people interviewed when asked how they travelled to the heath. The 3 “others” were all horse riders who had travelled to the sites using a horse box.

Site	<i>No of people visiting</i>						% of visitors arriving	
	Car	Van	bicycle	horse	foot	other	by car or van	on foot
B3011 opposite Arrow Lane	11	1			5		71	29
Black Bushes Road	27	2			1		97	3
Bourley Road	90	10	12		1		88	1
Burdenshott Road	35	1			3		92	8
Car Park off Cricket Hill Lane	60		3	6	14		72	17
Car Park off the A30	10		6	5	18		26	46
Chobham Road, chobham common	77				2		97	3
Chobham Road, Horsell	122		5	4	9		87	6
Currie’s Clump (Boldermere CP)	106	6	1		2		97	2
E of Aberconway House (Wrens Nest CP)	36				4		90	10
Lightwater Country Park entrance	91	1			24		79	21
Mytchett Place Road	62				12		84	16
N entrance to Warren Heath	49		3	3	2	3	86	4
Nightingale Road / A325	4				15		21	79
Off Crowthorn Road	69	1	1		7		90	9
Play area, Springfield Avenue			3		22		0	88
Queens Road, Cowshot Common	19			3	29		37	57
S entrance to Bramshill Plantation	1	1					100	0
Salt Box Road	162	5		3	3		97	2
Sandpit Hill	29		1		14		66	32
Shore’s Road	206	5			1		100	0
South Road	4		22		18		9	41
Staple Hill	27						100	0
The Lookout	309		5		3		97	1
Top of Bracknell Road	2		5		31		5	82
Top of Kings Ride	52	1	9		25		61	29
Total	1660	34	76	24	265	3		
%	81	2	4	1	13	0	83	13

Table 23: Mean and range of distances (m) travelled on the heaths and the penetration distance (m) from each access point (sorted by visitable area).

	<i>visitable area (ha)</i>	<i>No. of groups</i>	<i>Distance walked</i>			Penetration distance		
			mean	max	min	mean	max	min
Play area, Springfield Avenue	46	35	2001	7655	280	661	2796	108
Chobham Road, Horsell	78	28	2469	7008	706	781	1465	256
Salt Box Road	85	12	2449	6516	527	723	1337	141
Nightingale Road / A325	95	34	1650	4776	554	552	1571	208
Shore's Road	95	11	2443	4508	589	667	1372	245
Currie's Clump (Boldermere CP)	113	49	1736	4631	205	568	1211	81
Sandpit Hill	127	49	2188	4475	474	629	1136	125
Chobham Road, chobham common	127	34	2910	4083	1155	1039	1332	398
E of Aberconway House (Wrens Nest CP)	135	2	2689	6466	421	804	1841	177
Off Crowthorn Road	143	23	1729	3815	305	541	999	20
Top of Kings Ride	143	90	3981	10004	1431	1229	3495	334
S entrance to Bramshill Plantation	146	63	1760	2233	1288	453	828	78
Bourley Road	146	26	4083	10942	995	1249	2133	462
Car Park off the A30	180	20	1567	4812	348	438	1542	23
Car Park off Cricket Hill Lane	190	13	1278	3258	32	391	1242	0
Burdenshott Road	190	110	2757	5674	321	869	1522	157
Queens Road, Cowshot Common	275	23	1626	3236	569	590	1107	142
B3011 opposite Arrow Lane	288	50	1699	3206	910	514	1032	263
Lightwater Country Park entrance	321	84	2014	4456	233	557	1514	188
South Road	347	22	1589	3664	348	485	1334	57
Black Bushes Road	672	18	3658	5949	2212	1072	1455	667
Mytchett Place Road	870	50	2484	4811	1502	706	1470	409
N entrance to Warren Heath	1185	47	4562	7154	2007	1443	2470	482
Staple Hill	1800	52	2025	5075	366	616	1692	179
Top of Bracknell Road	1800	32	3069	11301	354	1004	3603	126
The Lookout	1800	122	3772	12143	293	1028	4472	0

Appendix 2

A review of methods used, timings of interviews and weather

Rainfall

Interviews and counts were conducted at each site for 8 two hour sessions (208 sessions). Attempts were made to avoid any sessions with rain, and 79% of all sessions were conducted in dry weather. There was certainly no decrease in the numbers of visitors when there was rain for a short duration, but there was evidence that longer periods of rain may have deterred visitors (Table 24).

Table 24: Mean number of people recorded leaving each site per session and amount of rainfall during session

Amount of rain	Mean number of people leaving per 2 hour session	Standard error	Number of sessions
No rain	14	1.3	165
Less than 30 minutes	17	7.3	21
Between 30 minutes & 1 hour	7	2.0	7
Between 1 hour & 1 hour 30 minutes	5	1.2	10
Rainfall for more than 1 hour & 30 minutes	1	0.5	5

The sample sizes for days with rain were too small to develop any kind of adjustment factor by which to modify site totals. For reference, sites and time periods where rain was fell for more than 30 minutes of the two hour time period are given in Table 25.

Table 25: Survey periods with more than 30 minutes of rain

	Time period	Day	No. of people leaving
Rainfall for between 30 minutes & 1 hour			
Black Bushes Road	1300 - 1500	Weekday	6
Chobham Road	1700 - 1900	Weekday	6
Lightwater Country Park entrance	1300 - 1500	Weekend	18
Mytchett Place Road	1300 - 1500	Weekday	7
Queens Road, Cowshot Common	1300 - 1500	Weekday	2
Sandpit Hill	1700 - 1900	Weekend	5
Staple Hill	1700 - 1900	Weekday	2
Rainfall for between 1 hour & 1 hour 30 minutes			
Lightwater Country Park entrance	1700 - 1900	Weekend	2
Mytchett Place Road	0700 - 0900	Weekday	6
Mytchett Place Road	1000 - 1200	Weekday	7
N entrance to Warren Heath	1300 - 1500	Weekend	7
N entrance to Warren Heath	1700 - 1900	Weekend	6
Queens Road, Cowshot Common	1000 - 1200	Weekday	6
Queens Road, Cowshot Common	1700 - 1900	Weekday	6
S entrance to Bramshill Plantation	1300 - 1500	Weekend	0
S entrance to Bramshill Plantation	1700 - 1900	Weekend	0
The Lookout	1700 - 1900	Weekend	13
Rainfall for more than 1 hour & 30 minutes			
Black Bushes Road	1000 - 1200	Weekday	1
Chobham Road	1000 - 1200	Weekday	3
Chobham Road	1300 - 1500	Weekday	0
Staple Hill	1000 - 1200	Weekday	1
Staple Hill	1300 - 1500	Weekday	1

Timing

Visitor numbers were sampled at each site using 8 two hour periods. During each period, the number of people entering and leaving the site was recorded. By comparing the number of people entering and leaving during each session it is possible to check whether the periods not sampled were not different to those tested. For all time periods, across all sites, there were slightly higher numbers of visitors entering than leaving during the survey sessions (median number entering = 9, median leaving = 8). The difference between the two is not significant (Mann-Whitney $W = 45159$, $p > 0.05$).

In total, more people were recorded entering than leaving for 3 of the four time periods, with the 1700 – 1900 time period, as would be expected with the approaching darkness, being the one period where more people were recording leaving. For none of these time periods, however, was the difference significant.

Table 26: Totals of people entering and leaving each site by time period. Significance column gives the Mann Whitney W score and p value.

<i>Time period</i>	<i>Total no. people entering</i>	<i>Total no. people leaving</i>	significance
0700 - 0900	514	379	(2984, p>0.05)
1000 - 1200	1011	811	(2866, p>0.05)
1300 - 1500	1164	915	(2926, p>0.05)
1700 - 1900	642	714	(2646, p>0.05)

Appendix 3 Questionnaire

INSTRUCTIONS TO INTERVIEWERS:

Use this sheet to read out the questions (IN BLACK INK, BOLD & BLOCK CAPITALS) and enter the answers on the summary sheet. Questions should be read out exactly as written. The red text shows the answers that people may give, and these answers should be read out after the question.

HELLO, COULD YOU SPARE ME A COUPLE OF MINUTES TO ANSWER SOME BRIEF QUESTIONS REGARDING YOUR VISIT TO THIS HEATH TODAY. THIS IS PART OF A STUDY OF VISITOR ACCESS PATTERNS COMMISSIONED BY ENGLISH NATURE.

- 1) HOW MANY ADULTS IN TOTAL, INCLUDING YOURSELF, ARE THERE WITH YOU HERE TODAY FOR THIS VISIT ?** if more than one: **HOW MANY ADULTS AND HOW MANY CHILDREN (UNDER 16) ?**
-

- 2) CAN I JUST CHECK, HOW MANY DOGS DO YOU HAVE WITH YOU TODAY?**
-

- 3) HOW FREQUENTLY DO YOU TEND TO VISIT THIS SITE ?**
 DAILY,
 ONCE A WEEK,
 ONCE A MONTH,
 SPORADICALLY (VARIES THROUGH THE YEAR)
 DON'T KNOW / FIRST VISIT
-

- 4) DO YOU TEND TO VISIT THIS SITE AT A CERTAIN TIME OF DAY ?**
 BEFORE 9AM
 BETWEEN 9AM AND 12
 BETWEEN 12 AND 2
 BETWEEN 2 AND 4
 AFTER 4PM
 DON'T KNOW / FIRST VISIT
-

- 5) FROM WHICH POSTCODE DID YOU TRAVEL TO REACH THIS SITE ?**
-

- 6) HOW DID YOU GET HERE ?** single answer only. Add if necessary: **WHAT FORM OF TRANSPORT DID YOU USE ?**
 CAR
 VAN
 BUS / COACH
 MOTORCYCLE
 BICYCLE
 HORSE
 ON FOOT
 OTHER (WRITE IN)
-

- 7) DID YOU ENTER THE HEATH FROM HERE OR FROM SOMEWHERE ELSE ?**
 ENTERED FROM THIS ACCESS POINT
 ENTERED FROM A DIFFERENT ACCESS POINT

DON'T KNOW

- 8) WHERE HAVE YOU WALKED DURING YOUR VISIT TO THIS AREA TODAY?**
show visitor aerial photograph and annotate copy. if necessary ask for landmarks.
-

- 9) WHAT WAS THE MAIN PURPOSE OF YOUR VISIT TODAY ?** multiple answers ok.
DOG WALKING
WALKING
JOGGING / RUNNING
MOTOR-CYCLING
BICYCLING
HORSE-RIDING
PICNIC
OTHER (WRITE IN)
-

- 10) DO YOU VISIT ANY OTHER PLACES, EITHER HEATHLAND OR NON-HEATHLAND, FOR THIS SAME PURPOSE ?**
YES: GO TO QUESTION 10
NO: END OF QUESTIONNAIRE
DON'T KNOW: END OF QUESTIONNAIRE
-

- 11) HOW FAR DO YOU TYPICALLY TRAVEL FROM YOUR HOME TO REACH THESE ALTERNATE SITES ?**
<1 MILE
1 – 5 MILES
>5 MILES
-

- 12) AND HOW DO YOU TRAVEL FROM YOUR HOME TO REACH THESE OTHER SITES?**
BY CAR OR OTHER MOTOR VEHICLE
ON FOOT
OTHER
-

THANK YOU VERY MUCH FOR YOUR TIME

Figure 19: Routes taken by visitors on each site

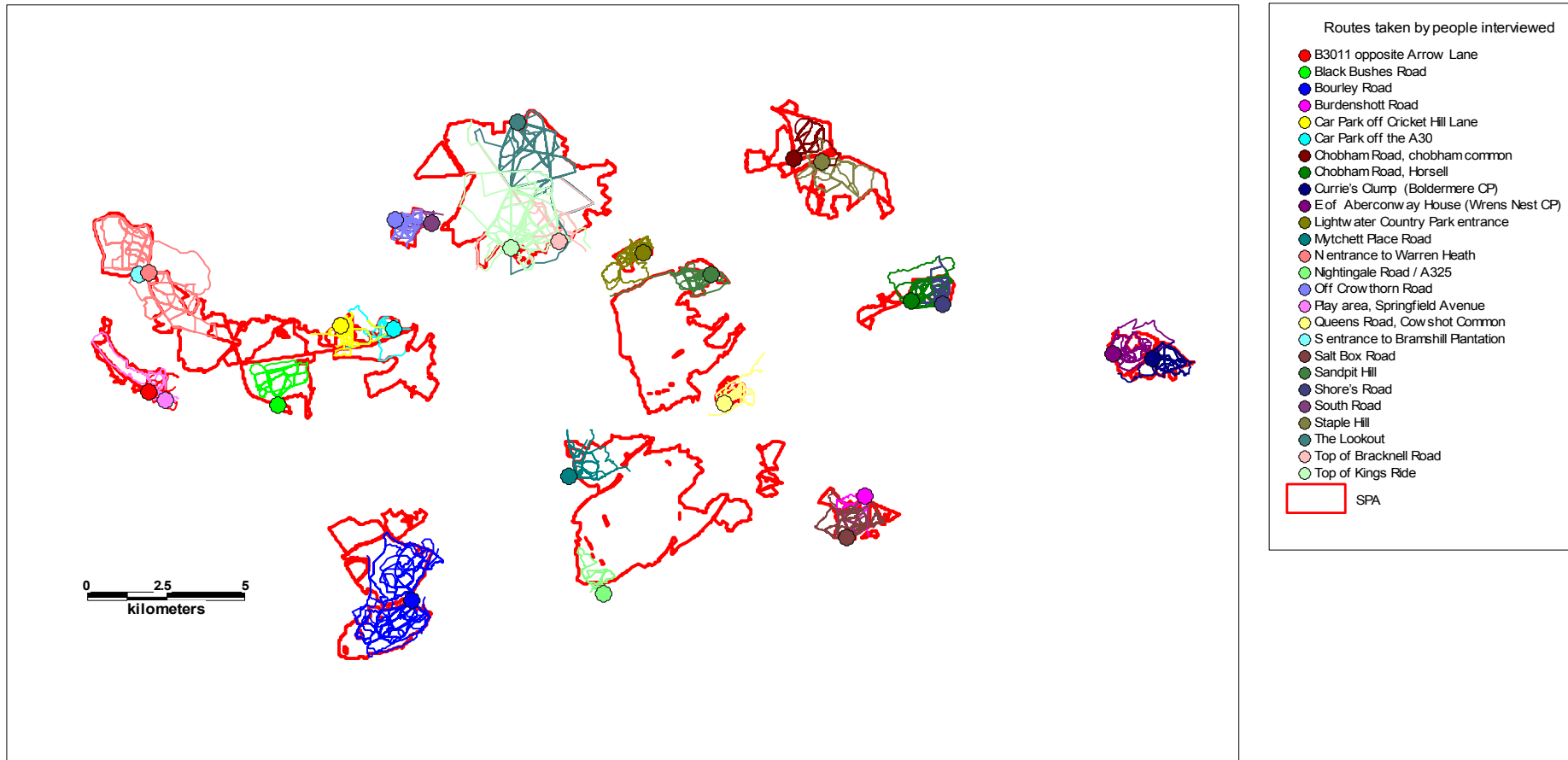


Figure 20: Locations of different postcodes given by people interviewed. Only the immediate area to the SPA is shown.

