



Cannock Chase SAC Visitor Observation Study



Durwyn Liley & Sophie Lake



Date: 22nd June 2012

Version: FINAL

Recommended Citation: Liley, D. & Lake, S. (2012). Cannock Chase SAC Visitor Observation Study. Footprint Ecology unpublished report.



Summary

This report presents the results of observations of visitors to Cannock Chase. People visiting the area designated as a Special Area of Conservation (SAC) were observed and mapped from a series of vantage points. Surveys were undertaken during set time periods in August 2011. Nine survey locations (one of which involved a roaming surveyor) were used, and the surveys totalled 144 hours of observations. The work complements a main visitor survey (see separate report) which involved face-to-face interviews around access points. The observational work was undertaken in the heart of the SAC without people realising their behaviour was being observed. From such covert observations, it is possible to determine how visitors actually behave and move around within the middle of the site.

In total, 1291 groups were observed, equating to a visit rate of around 9 groups per hour. Dog walking was the most frequent activity recorded (44% of groups), followed by cycling (24%) and walking (22%).

The breakdown according to activity was significantly different between survey locations, with dog walkers accounting for a notably higher than expected proportion of users at survey point 8 (Brindley Heath) and fewer than expected at location 4 (Katyn Firebreak). Cyclists accounted for a notably higher proportion of users at location 1 (Sherbrook Valley).

Ninety percent of groups with dogs had the dogs off-lead and 87% of all dogs were recorded off leads. Forty-six instances of dog fouling not being picked up were observed (8% of all groups with dogs). Most dogs were recorded well away from the observer. For example, at the non-roaming vantage points, 51% of dogs were seen to stray more than 15m from their owner. The data suggest a particularly high proportion of dogs were at least 15m from their owner within the Sherbrook Valley.

Around 9% of groups included at least one person who was seen to stray from the path.

'Intensity' maps allow direct comparison between different areas of the SAC and the levels of different activities. These maps indicate that dog walkers seemed to be the most dispersed user group within the site, with most tracks and paths being used by dog walkers. Cycling and horse riding tended to be more focused along favoured routes. Both user groups also use tracks that are not bridleways/marked routes. Groups where the dog was seen to foul and no 'pick-up' was observed were mostly recorded at Tar Hill and along the Sherbrook Valley. Routes used by groups who were seen to drop litter were mostly around Tar Hill, near the Penkridge Bank Road Car Park, and near Aspens.

Contents

Summary	3
Contents	4
Acknowledgements	5
1. Introduction	6
2. Methods.....	8
Survey locations and logistics.....	8
Detailed methods.....	8
Mapping.....	8
Diary	9
Location 7	9
Analysis.....	9
3. Results	11
Overall observation results from viewpoint locations.....	11
Maps.....	14
4. Discussion	25
Our Approach.....	25
Implications and Connection to the Other Reports.....	26
5. References	27

Acknowledgements

This report was commissioned by Staffordshire County Council and we are grateful to Ali Glaisher for overseeing the work. Our thanks also to the steering group, which represents the various organisations involved in funding the work and managing Cannock Chase: Staffordshire County Council, Stafford Borough Council, Cannock Chase District Council, Lichfield District Council, South Staffordshire District Council, East Staffordshire Borough Council, Walsall Council, Wolverhampton City Council, Dudley Council, Sandwell Council, Natural England, the Forestry Commission, the AONB Partnership.

Fieldwork was conducted by Neil Gartshore, Nick Hopper, Kevin Lane and Doug Whyte.

Our thanks also to colleagues at Footprint Ecology (John Day, Helen Fearnley, Rob McGibbon and Jim White) who provided help with the logistics organising the survey work and GIS data, and for useful comment and discussion.

1. Introduction

- 1.1 A real and current issue for nature conservation in the UK is how to accommodate increasing pressure for new homes and other development without compromising the integrity of protected sites. There is now a strong body of evidence showing how increasing levels of development, even when well outside the boundary of protected sites, can have negative impacts on the sites. The issues are particularly acute in southern England, where work on heathlands (Mallord 2005; Underhill-Day 2005; Liley & Clarke 2006; Clarke, Sharp, & Liley 2008; Sharp *et al.* 2008a) and coastal sites (Saunders *et al.* 2000; Randall 2004; Liley & Sutherland 2007; Clarke *et al.* 2008; Liley 2008; Stillman *et al.* 2009) provides compelling indications of the links between housing, development and nature conservation impacts.
- 1.2 The issues are not, however, straight forward. In the past access and nature conservation have typically been viewed as opposing goals (Adams 1996; Bathe 2007) to the extent that nature reserves often restricted visitor numbers and access (e.g. through permits, fencing and restrictive routes). It is now increasingly recognised that access to the countryside is crucial to the long term success of nature conservation projects and has wider benefits such as increasing people's awareness of the natural world and health benefits (English Nature 2002; Alessa, Bennett, & Kliskey 2003; Morris 2003; Bird 2004; Pretty *et al.* 2005).
- 1.3 There is the potential for conflict where high human populations occur alongside areas of conservation importance, particularly where there are existing rights of access to those sites. It is likely that numbers of houses in an area will correlate with the number of people living there, and that the number of local residents will be closely linked to the number of visitors at a site. Increasing the amount of housing will potentially lead to an increase in population size and therefore increased access.
- 1.4 Where the site is designated as a European Protected site (SAC, SPA or Ramsar) for its nature conservation interest there are particular implications. Previous work by Footprint Ecology at Cannock Chase in 2009 produced an evidence base to inform appropriate assessments relating to Cannock Chase SAC and a visitor impact mitigation strategy. The evidence base highlighted the high number of existing houses and current high levels of visitor use. However a limitation of the work was the lack of recent information on visitor numbers and the lack of a detailed, site-specific assessment of the impacts of recreation to Cannock Chase SAC. In order to redress these gaps in our understanding, a consortium of local authorities around Cannock Chase have commissioned the following:
- An up to date visitor survey, which was commenced in 2010 and ran through to late summer 2011.
 - An observational study, recording how people behave while visiting Cannock Chase SAC

- An assessment of the recreation impacts to the interest features of the SAC, based on site visits and discussion with site managers
- A mitigation strategy

1.5 This report sets out the results of the observational study, the second element in the list above. Separate reports are also produced by Footprint Ecology for each of the other elements above.

1.6 The aim of the observational study is to record how people behave, where they go and what activities they undertake. The work complements the main visitor survey, which does not accurately record how people behave and move around within the SAC as in that survey, visitors were approached directly and interviewed, with the fieldwork concentrated around access points. The observational work was undertaken without people realising their behaviour was being observed, allowing an accurate assessment to be made of how visitors actually behave in the heart of the SAC.

2. Methods

Survey locations and logistics

2.1 Surveys involved an observer recording and mapping all recreational activity during set time periods in August 2011. A total of 9 survey locations were used (Map 1). Eight survey sessions were undertaken at each location; with each session lasting 2 hours, totalling 72 different sessions over 144 hours. The sessions were split evenly between weekdays and weekend days – i.e. at each location there were 4 weekday sessions and 4 weekend sessions. Survey periods were 07:30-09:30; 10:30-12:30; 13:30-15:30; 16:30-18:30 meaning that survey effort was spread relatively evenly across daylight hours.

Detailed methods

2.2 Each survey location (apart from location 7) provided a good vantage point from which it was possible to see a number of different paths and a clear view across part of the Chase. These vantage points were selected by County Council Staff and the viewable area at each is shown in Map 1, which also illustrates the path network¹. Surveyors remained stationary at the viewpoint and recorded all activities observed from the vantage point. Surveyors were not intended to be easily recognisable as surveyors, and pretended to be birdwatching, photographing or simply sitting with a newspaper/book open so that visitors were not aware they were being watched.

2.3 Each two-hour survey session involved:

- Mapping all visitor/recreation events observed;
- Recording a diary of all visitors to the site observed during the session, cross-referenced to the map and recording activity and other information regarding each group.

Mapping

2.4 At the first visit surveyors carefully outlined the recording area and accurately mapped and described the exact point at which they were stationed, ensuring that subsequent surveys were done from the same location and using the same recording area. Each recording area was a continuous area where all events could be recorded and accurately mapped. It did not include any extensive 'blind spots'.

2.5 During the two hour survey period all activities were observed and recorded on the map, with labels cross-referencing to the diary and arrows indicating direction. Where an individual/group was accompanied by a dog, only the route of the owner was mapped, however details of the maximum distance the dog strayed from the owner were recorded within set distance bands.

¹ Path network digitised from aerial photographs. For further details and methods see the separate report on the impacts of recreation to the SAC.

- 2.6 All routes were recorded as a line. Any places where people stopped – for example to picnic – were indicated with a cross on the line.

Diary

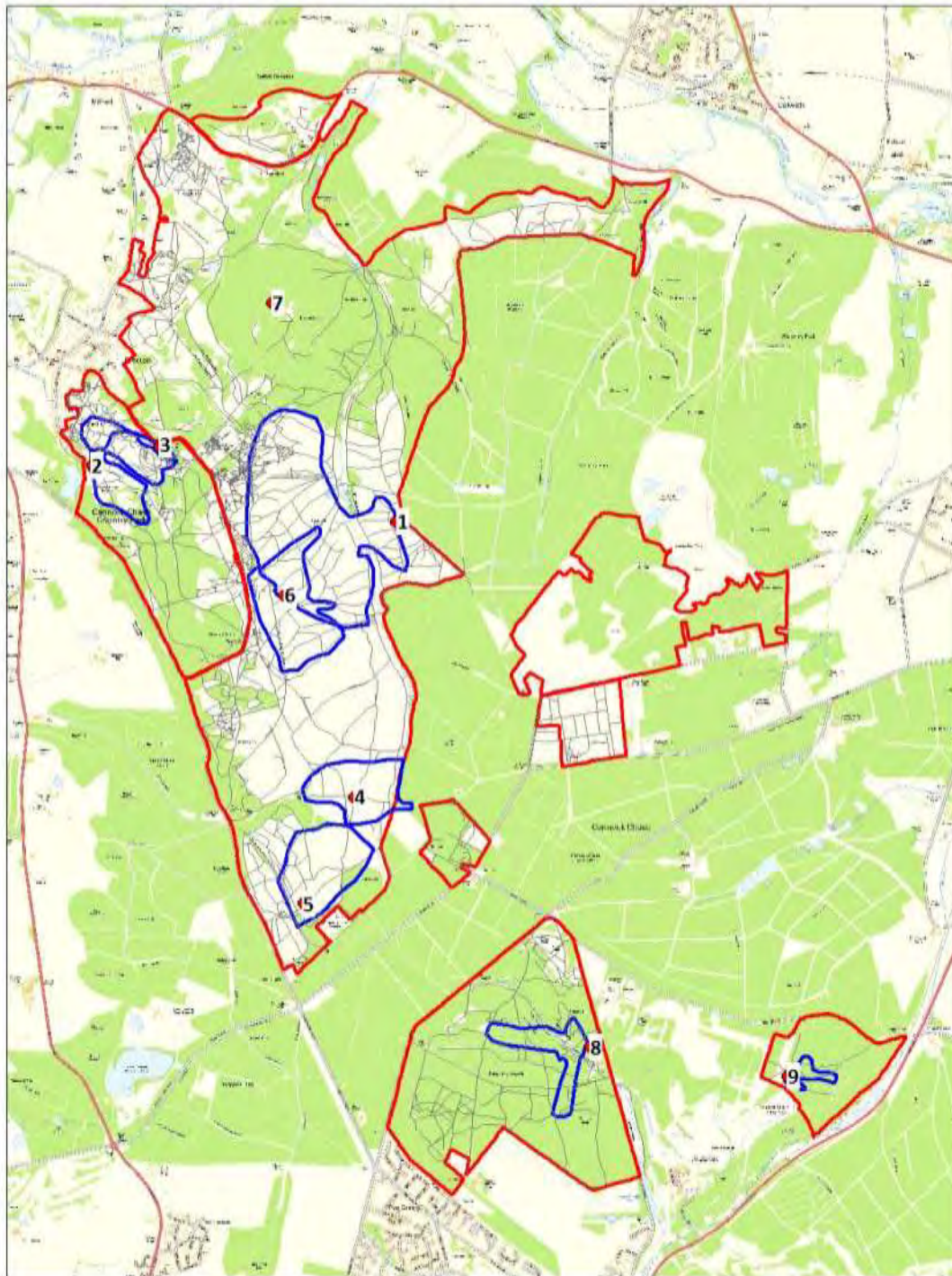
- 2.7 All observations of people visiting for recreation (i.e. not wardens, rangers, contractors undertaking management work etc.) were listed in the diary, with each diary entry corresponding to a different line on the map.
- 2.8 All events (including those visible at the start of the 2 hour period) were recorded sequentially using standard codes, and any additional details noted.

Location 7

- 2.9 Location 7 required a different survey approach. The area (Brocton Coppice) is wooded and there are no clear vantage points. The surveyor therefore walked at a slow, steady pace along different paths, retracing steps as necessary and covering the main paths and lesser paths in the area. The same route was followed on each visit and the route mapped. All people encountered within a 15m radius of the surveyor – i.e. a moving circular radius of 15m in a fashion similar to standard animal recording transects - were recorded on the diary and their location mapped.

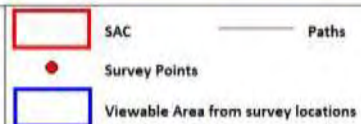
Analysis

- 2.10 The data were summarised by deriving the totals of the different types of activity and events recorded at each survey location. Given that the viewable area at each vantage point involved a different area, direct comparison is difficult and this limitation should be kept in mind when reading the results section.
- 2.11 In order to resolve this limitation and allow direct comparison of numbers of different types of visitors between locations within the SAC, comparative maps were derived using a 25mx25m grid (aligned to the OS National Grid). For each 25mx25m cell the number of people passing through the cell was calculated within a GIS (MapInfo Version 10.5), and these values were adjusted for survey effort by dividing by 2 if the grid square was visible from multiple vantage points. Only data from the stationary vantage points (i.e. excluding location 7) were used. Separate values were derived for different activities/events. For littering and dog fouling, the maps do not show the exact locations where the 'event' occurred, but indicate the number of groups passing through the cell which were observed (at some stage during the survey) to drop litter or not pick up. The map showing the number of dog walkers included the small number of joggers, cyclists etc that were also accompanied by dogs – i.e. all those exercising dogs rather than 'walking'.
- 2.12 All statistical tests were undertaken using Minitab (Version 14).



Map 1: Survey Locations and Survey Areas

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.



3. Results

Overall observation results from viewpoint locations

- 3.1 A total of 1201 observations of recreational events was made during eight two-hour survey sessions at each of eight survey locations with good view points over Cannock Chase. A further 90 observations were made by a roaming surveyor in an area of woodland, where use of fixed viewpoints was not possible. Table 1 summarises 1279 of these observations (excluding incomplete observations e.g. due to obscured views, and duplicate records e.g. of the same group of people observed twice during a survey period). Data from survey location 7 are presented separately due to the different survey methodology used at this woodland site.
- 3.2 Data from fixed survey points suggests that dog walking was the most frequent activity recorded (44%), followed by cycling and walking (24% and 22%). Just over six percent of the observations comprised joggers. A similar proportion was observed dropping litter or straying off the path. A small minority of observations were of horse riders. The median group size was two. The breakdown of user group types was very similar at the woodland site (Location 7), although there was a slightly lower proportion of dog walkers.

Table 1 Observed recreational events at eight survey locations at Cannock Chase according to activity type

Activity type	No. of groups locations 1-6, 8-9	%	No. of groups location 7	%
Dog walking	524	44.1	35	38.9
Cycling	286	24.1	21	23.3
Horse riding	29	2.41	3	3.3
Walking	265	22.3	22	24.4
Joggers	75	6.3	10	11.1
Litter dropped	71	6.0	0	0
1+ people off path	102	8.6	0	0

- 3.3 The pattern of recreational events recorded was not consistent across survey locations 1-6 and 8-9² ($\chi^2_{10} = 123.933$, DF = 14, P-Value = <0.001, activities grouped as dog walkers, cyclists, and other users). In particular, records of cyclists varied between sections, with a greater than expected number recorded in Section 1 and fewer than expected in section 2, 3, 4 and 8. Observations of dog walkers were somewhat higher than expected in section 8, and lower in section 4 and to a lesser extent section 1 and 2.

² Location 7 is not included in this comparison as the methods used were not comparable.

Table 2 Recreational events recorded according to survey area (excluding section 7, for which a different survey method was required).

Activity	1 Firewatch Point	2 Odacre Valley (west bank)	3 Oldacre Valley (nr. Chase vista carpark)	4 Katyn Firebreak (looking N.)	5 Aspens (looking E.)	6 Brocton Field (nr. Womere)	8 Brindley Heath deer plantform	9. Moors Gorse
total groups with dogs	93	78	43	57	81	58	84	46
dog walkers	90	78	43	55	78	57	82	45
joggers	18	1	8	19	17	5	4	3
Cyclists	100	15	5	64	40	36	7	19
Walkers	42	42	42	42	42	42	42	42
Horse riders	10	2	2	4	1	7	3	0
Total	261	138	85	179	174	149	129	74

3.4 The data for groups on dogs can be broken down further according the activity type and whether dogs were on leads or not (see Table 3Table 4). The vast majority of dogs observed were with walkers (nearly 97%). A small number were recorded with joggers, cyclists and horse-riders. These form a variable proportion of each activity group: observations of dog walkers comprised 66% of all records of walkers, while 14% of joggers were accompanied by a dog, nearly 7% of horse rider groups and just over 1% of cyclist groups. Again the data from location 7 largely mirror those found elsewhere, with the exception of the number of walkers with dogs. Only 61% of walkers were accompanied by dogs at location 7, and the proportion of overall observed groups with dogs was lower than elsewhere. The proportion of cyclists and horse riders with dogs was notably larger and smaller respectively, but note the very small sample size for both.

Table 3 Breakdown of activity types according to dog presence at locations 1-6, 8-9.

Activity type	No. of groups locations 1-6, 8-9	% of all groups	% of groups with dogs	% of overall group type
All groups types with dogs	541	45.5	100	45.4
Walkers with dogs	524	44.1	96.9	66.4
Cyclists with dogs	4	0.3	0.74	1.4
Joggers with dogs	11	9.3	2.03	14.7
Horse riders with dogs	2	1.7	0.37	6.9
With dogs on leads	43	3.6	7.95	-
With dogs off leads	487	41.0	90	-
With both dogs on and off leads	8	0.7	1.48	-
Lead status unrecorded	3	0.25	0.55	-

Table 4 Breakdown of activity types according to dog presence at location 7.

Activity type	No. of groups Location 7	% of all groups	% of groups with dogs	% of overall group type
All groups types with dogs	37	41.1	100	41.1
Walkers with dogs	35	38.9	94.5	61.4
Cyclists with dogs	1	1.1	2.7	4.8
Joggers with dogs	1	1.1	2.7	10
Horse riders with dogs	0	0	0	0
With dogs on leads	4	4.4	10.8	-
With dogs off leads	33	36.7	89.2	-

3.5 For all groups with dogs, 90% of groups were accompanied by dogs which were not on leads. For all but one (a jogger) of the records of non-walking activity types the dogs were not on leads. 677 individual dogs off leads were recorded, and 104 individual dogs on leads. Overall, 46 incidences of dog fouling not being picked up were also recorded, this equated to 8% of all groups observed with dogs. The number of times a dog fouled and the fouling was picked up was not recorded. At location 7, 51 (89.5%) individual dogs off leads were recorded and 6 dogs on leads, meaning a slightly higher percentage of dogs at the woodland location were not on leads (89.5% compared to 86.7%).

3.6 For the majority of cases where dogs were off the lead (456), the distance the dog(s) were from the group was recorded (see Table 5). The majority (just over 50%) of dogs were over 15m away from the group at locations 1-6 and 8-9 combined. At location 7 the spread over the distant bands was more equal and the greatest proportion of dogs were within 5m.

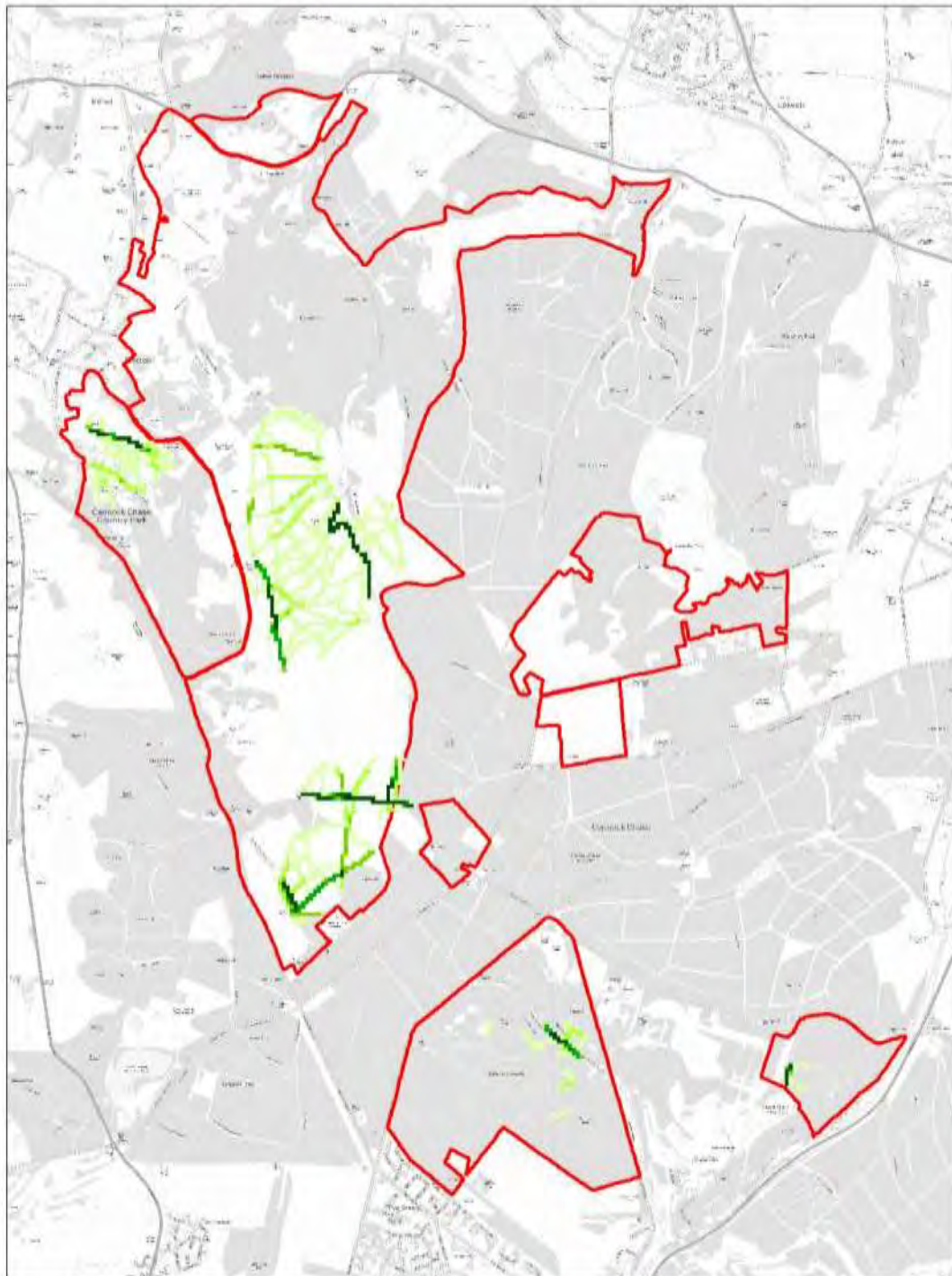
Table 5 Distances between dogs and their groups.

Distance band	No. of dog records at locations 1-6, 8-9.	%	No. of dog records at location 7	%
<5m	43	9.43	10	33.3
<10m	100	21.93	5	20
<15m	81	17.8	6	16.7
>15m	232	50.9	9	30

3.7 The proportion of dogs on/off leads was fairly consistent between survey locations 1-6 and 8-9, with no significant differences found ($\chi^2_9 = 10.632$, DF = 7, P-Value = >0.05). However the proportion of dogs recorded in different distance bands from their group varied significantly between survey locations ($\chi^2_{11} = 22021.929$, DF = 7, P-Value = <0.001). Most notably, in section 1 a larger proportion of dogs was >15m away from their group than expected, while in section 3 and 9 a larger proportion were within 15m than expected.

Maps

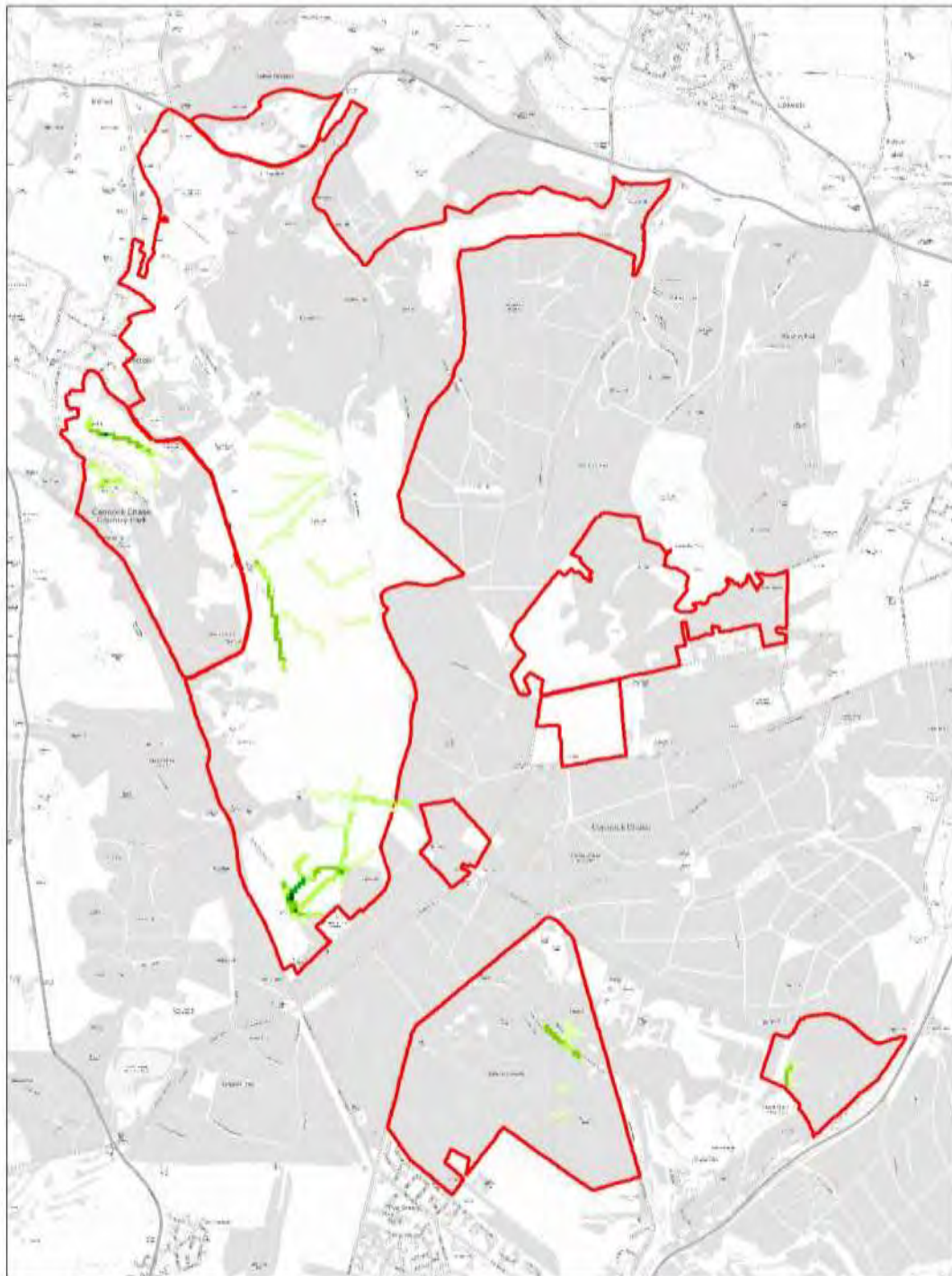
- 3.8 Maps 2-11 show comparative data based on the 25mx25m grid and with the values for each grid cell adjusted for survey effort. It can be seen (Map 2) that overall visitor numbers were highest along the Sherbrook Valley and along the Heart of England Trail (which runs east-west), near Aspens, at Brocton north of the Oldacre Valley (Tar Hill) and near the Glacial Boulder. Most of the high visitor use is therefore along the main access routes/long distance paths. However it is also clear from Map 2 that access is widely dispersed across the site. In particular dog-walkers with their dogs off leads (Map 4) and groups where the dog was observed at least 15m from the owner (Map 5) are widely dispersed within the site. Dog walkers appear to make greater use of smaller paths between main routes than walkers.
- 3.9 Groups where the dog was seen to foul and no 'pick-up' was observed were mostly observed at Tar Hill and along the Sherbrook Valley (Map 6). Routes used by groups who were seen to drop litter seem to be focused around Tar Hill, near the Penkrige Bank Road Car Park and near Aspens (Map 7).
- 3.10 Maps 8-11 show different activities. It can be seen that the spatial distribution of different activities varies within the site. Dog walkers (Map 9) seem to disperse the most widely. The highest volume of cyclists was along the Sherbrook Valley (Map 8), but cycling clearly occurs widely within the site and cyclists do not stick to the marked cycle routes, bridleways etc. Horse riders (Map 10) were mostly observed along the Heart of England way but horse riding also appears to occur away from the main routes etc.



Map 2: Total People; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

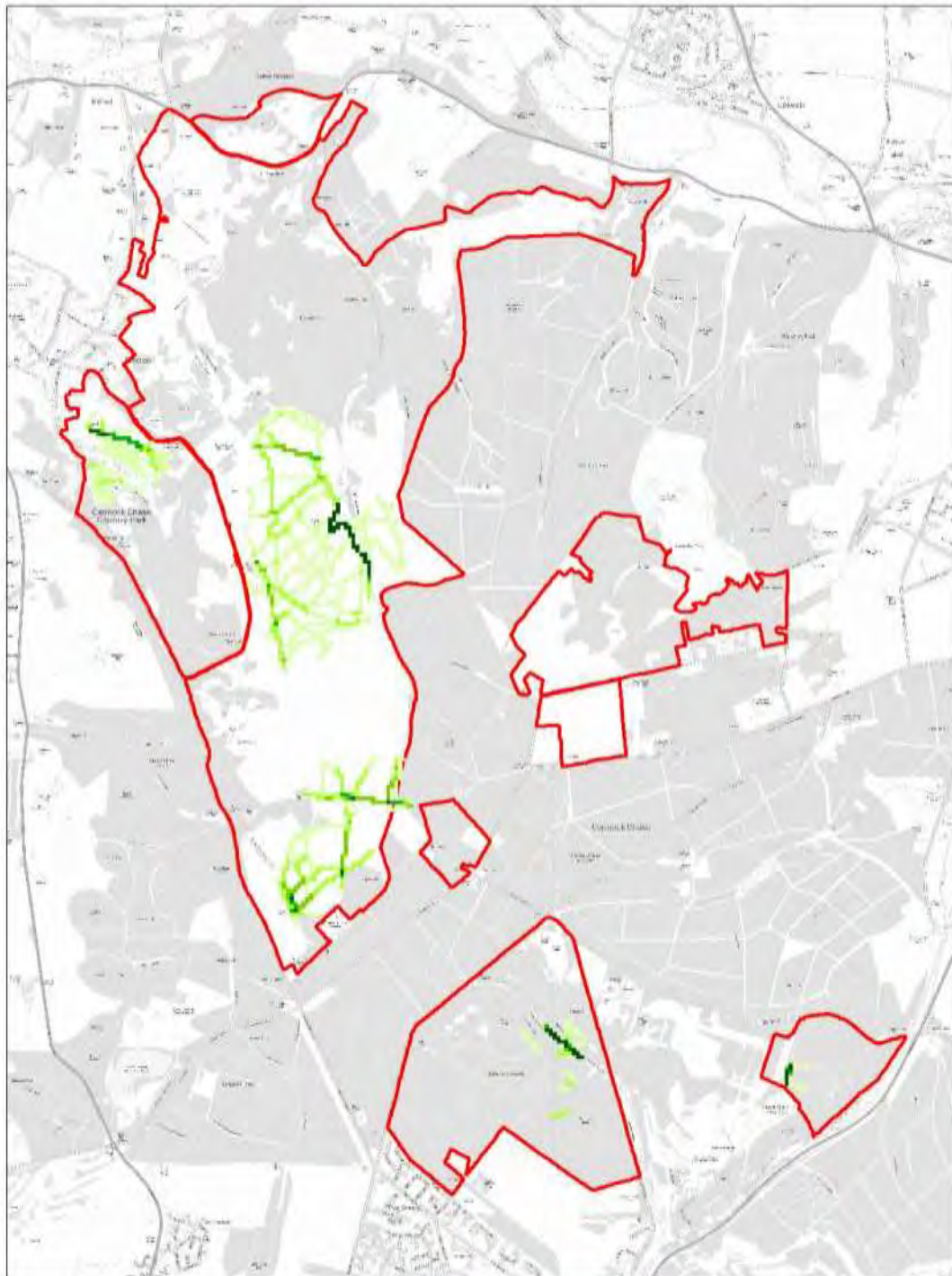
■	100 to 300	(135)
■	75 to 100	(67)
■	50 to 75	(84)
■	25 to 50	(186)
■	1 to 25	(1009)



Map 3: Dogs on Leads; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

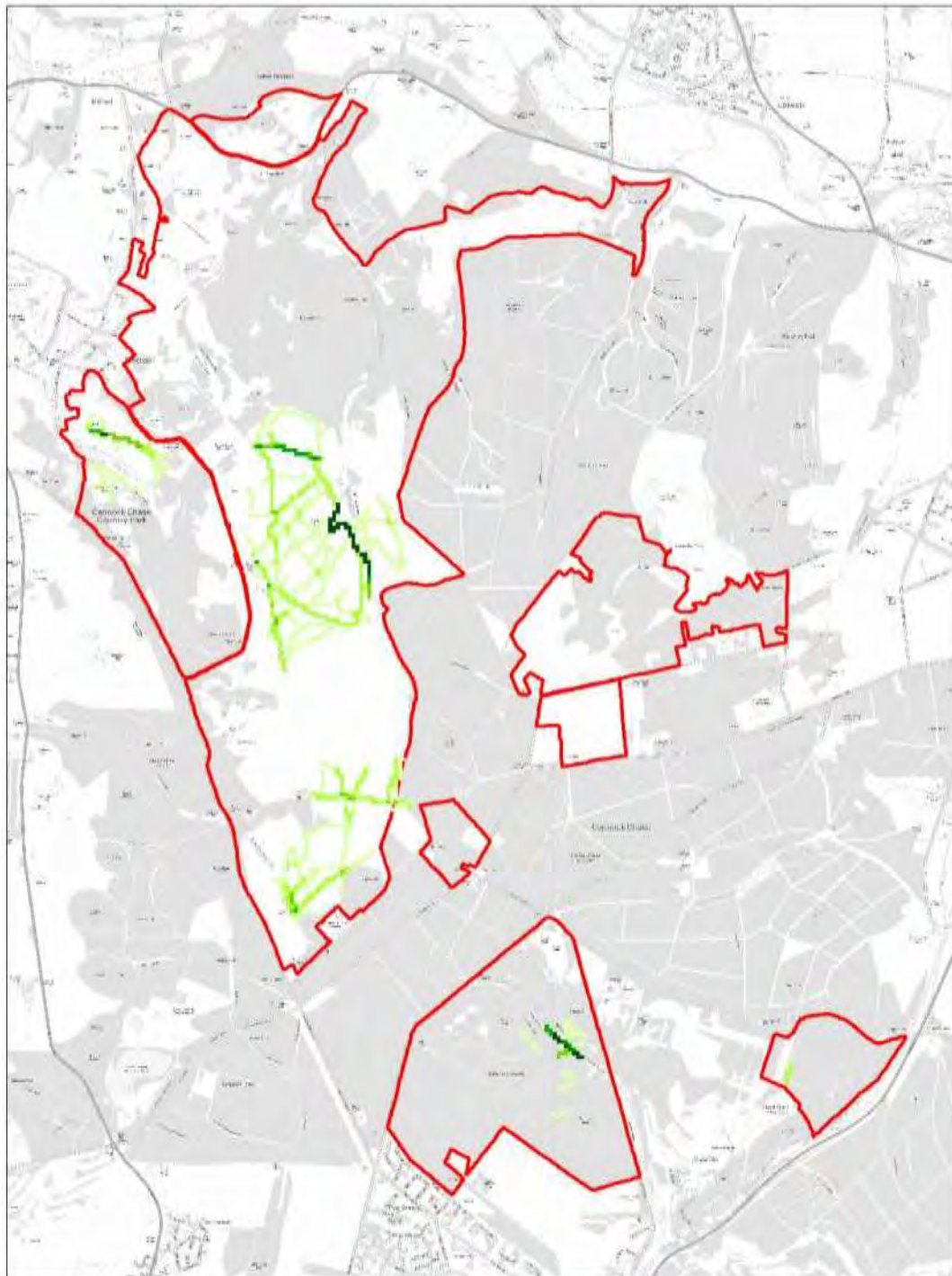
■ 12 to 15	(4)
■ 9 to 12	(10)
■ 6 to 9	(82)
■ 3 to 6	(121)
■ 1 to 3	(348)



Map 4: Dogs off Leads; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

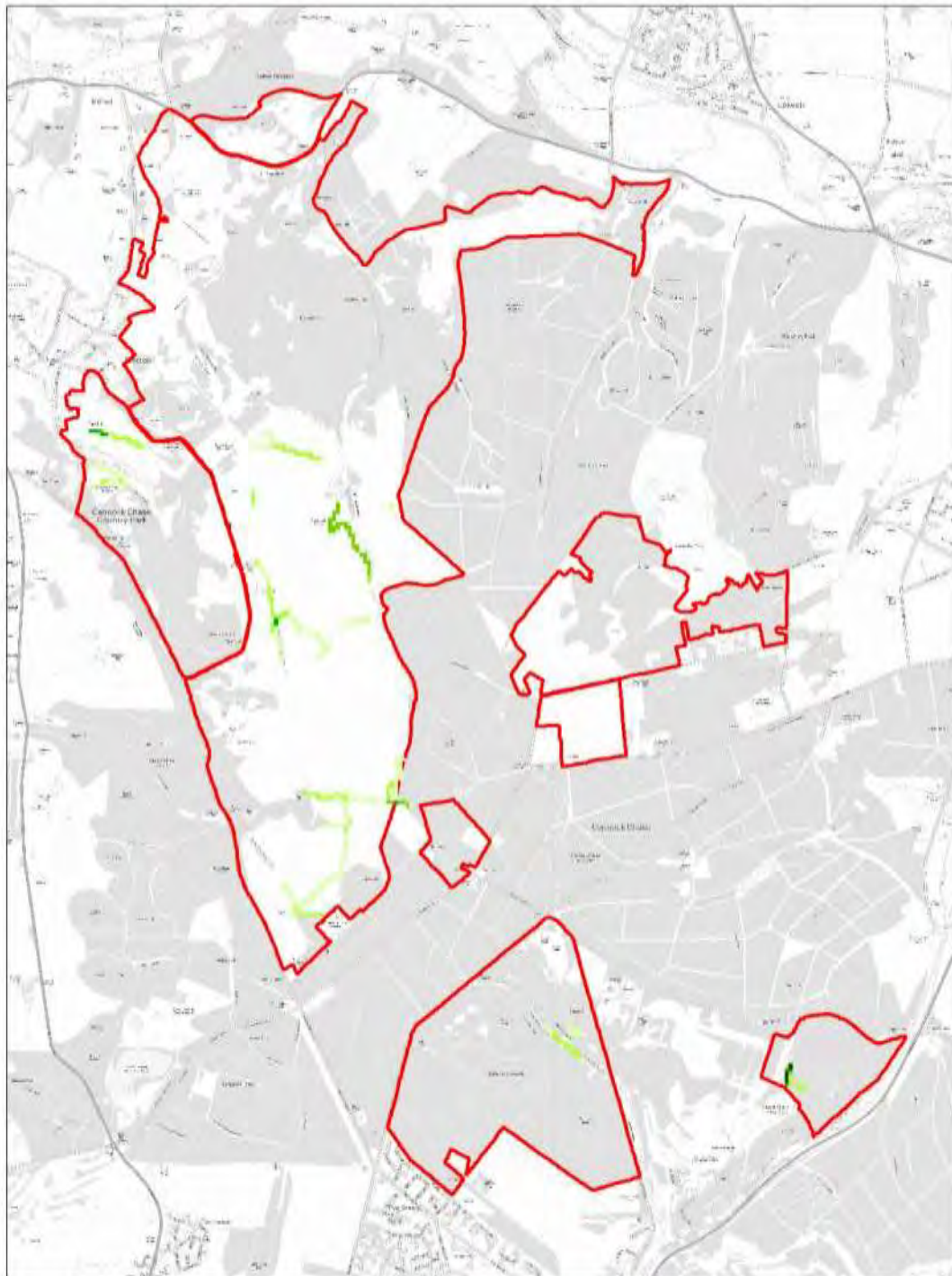
■	40 to 70	(66)
■	30 to 40	(34)
■	20 to 30	(90)
■	10 to 20	(308)
■	1 to 10	(859)



Map 5: Dogs >15m from owner; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

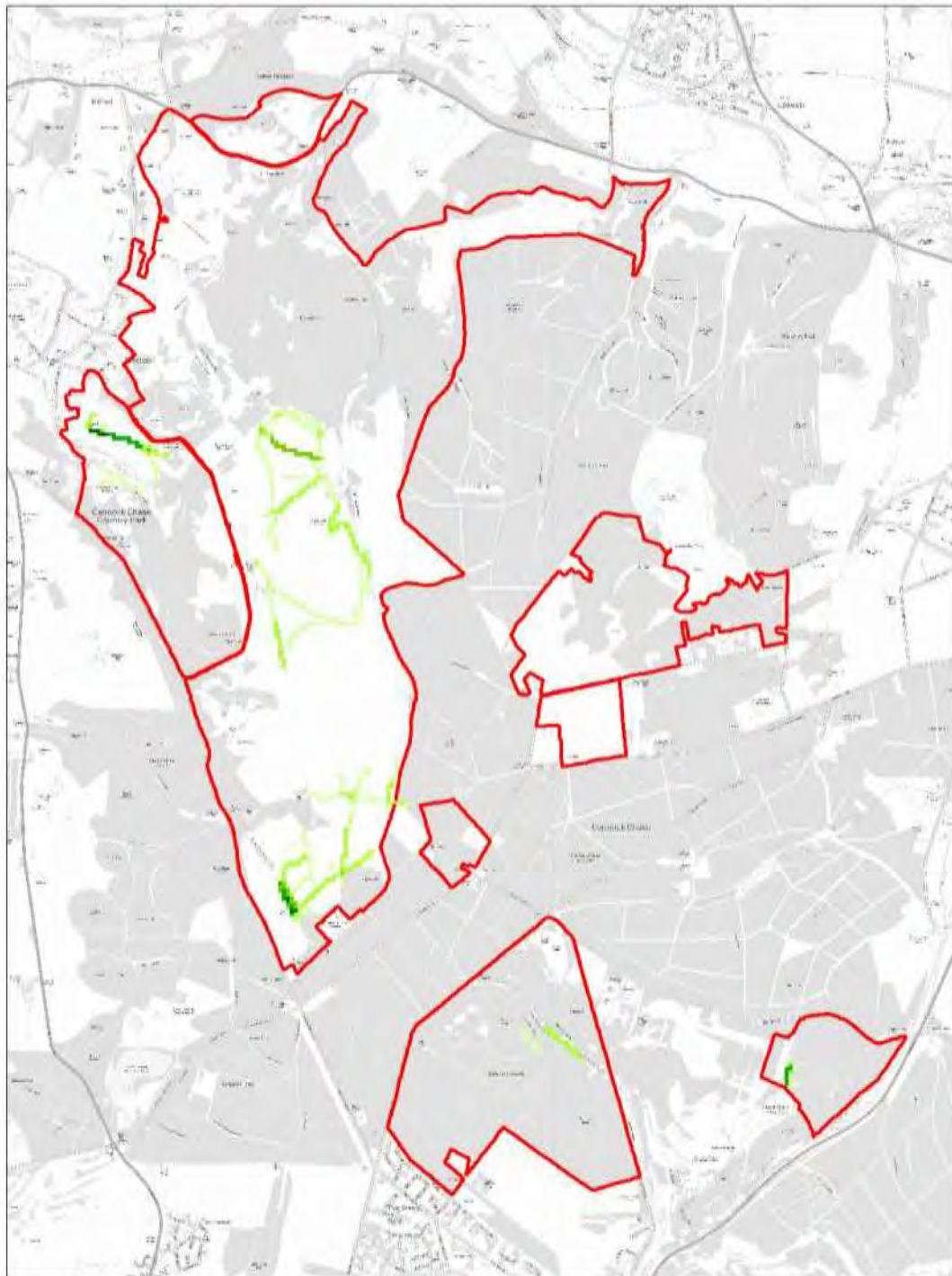
■	20 to 26	(48)
■	15 to 20	(30)
■	10 to 15	(43)
■	5 to 10	(308)
■	1 to 5	(734)



Map 6: Dog fouling not picked up; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

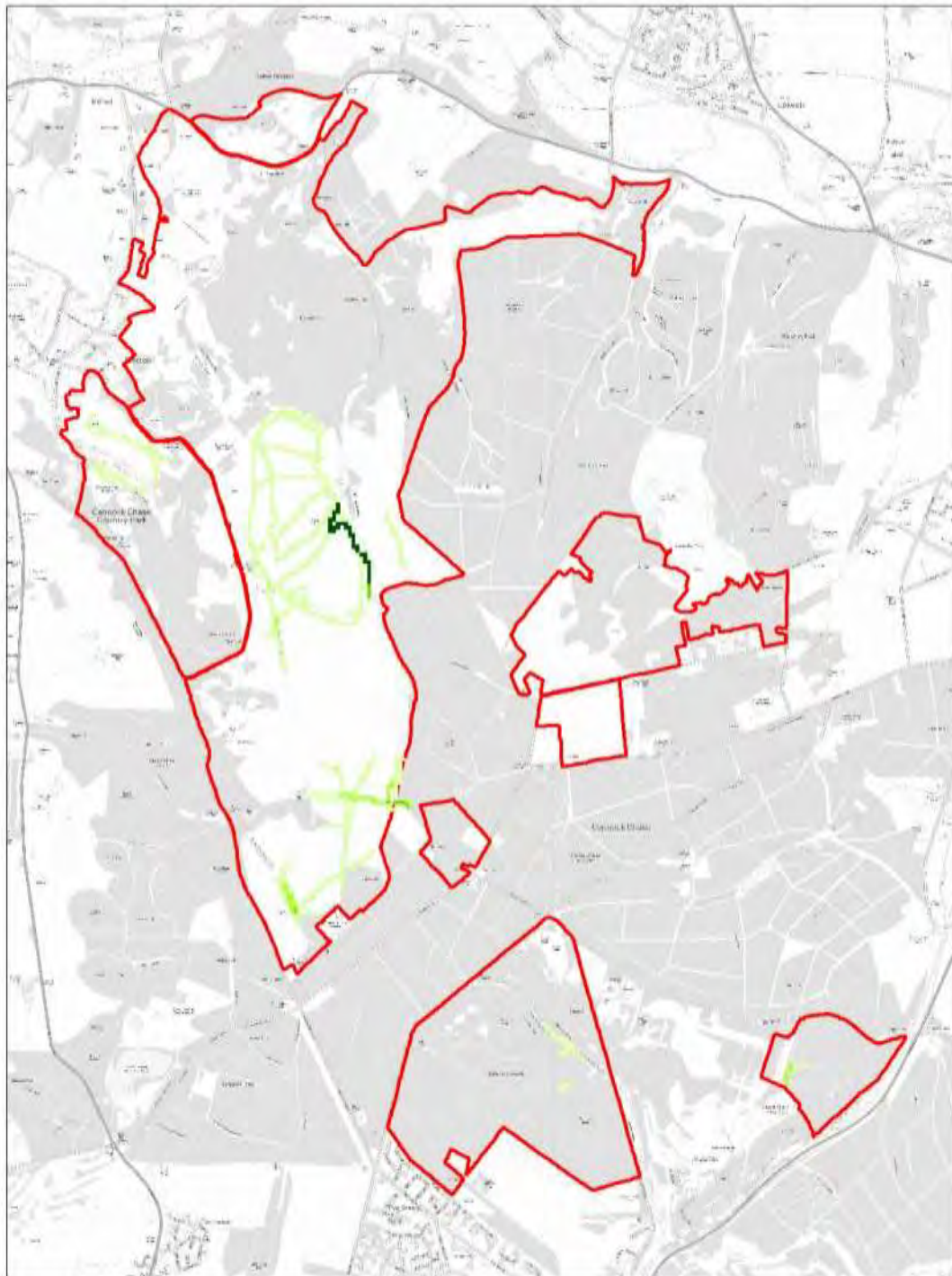
■ 5 to 6	(5)
■ 4 to 5	(9)
■ 3 to 4	(42)
■ 2 to 3	(104)
■ 1 to 2	(218)



Map 7: Litter Dropped; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

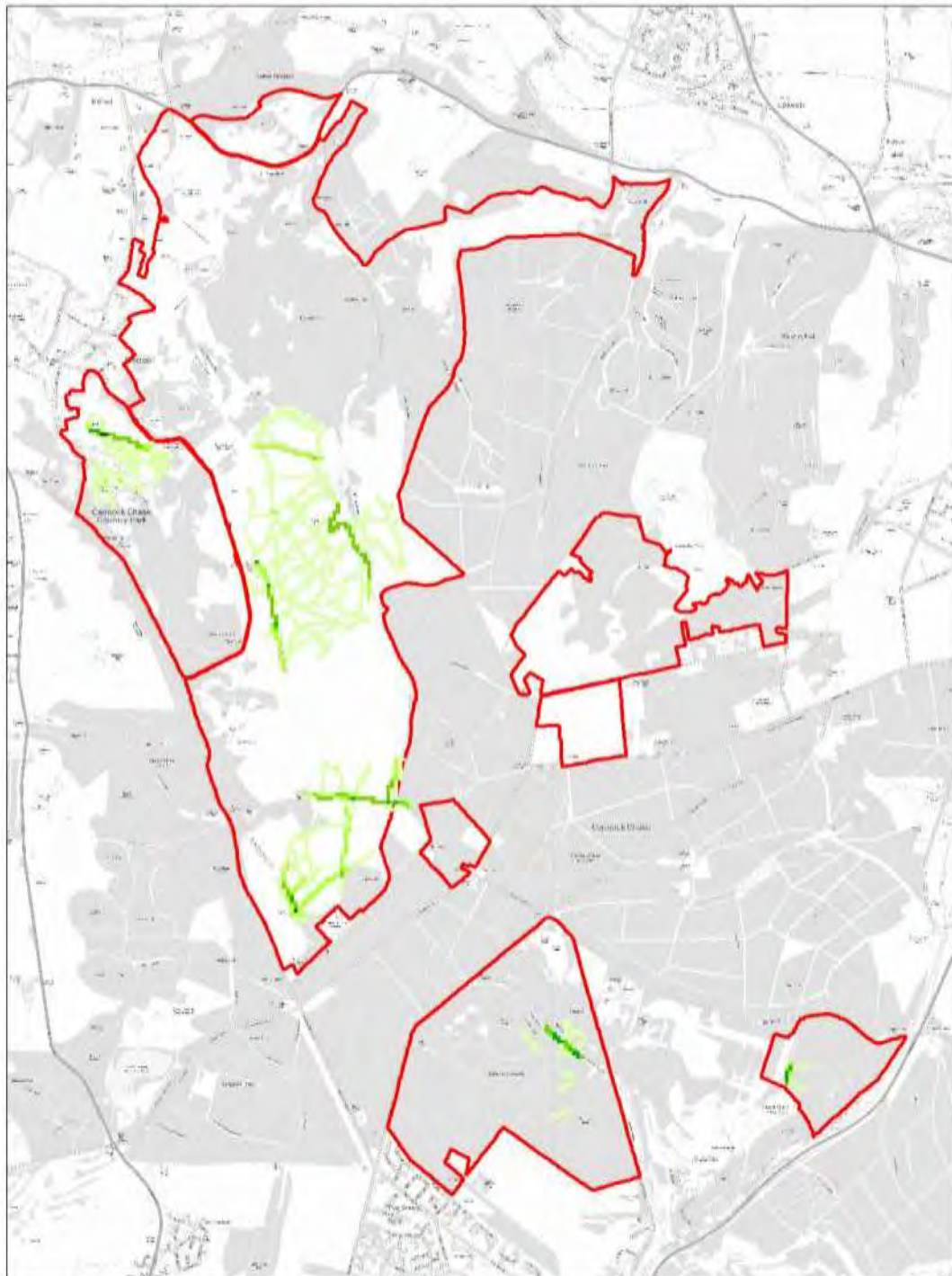
8 to 12	(8)
6 to 8	(26)
4 to 6	(35)
2 to 4	(199)
1 to 2	(375)



Map 8: Number of Cyclists; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

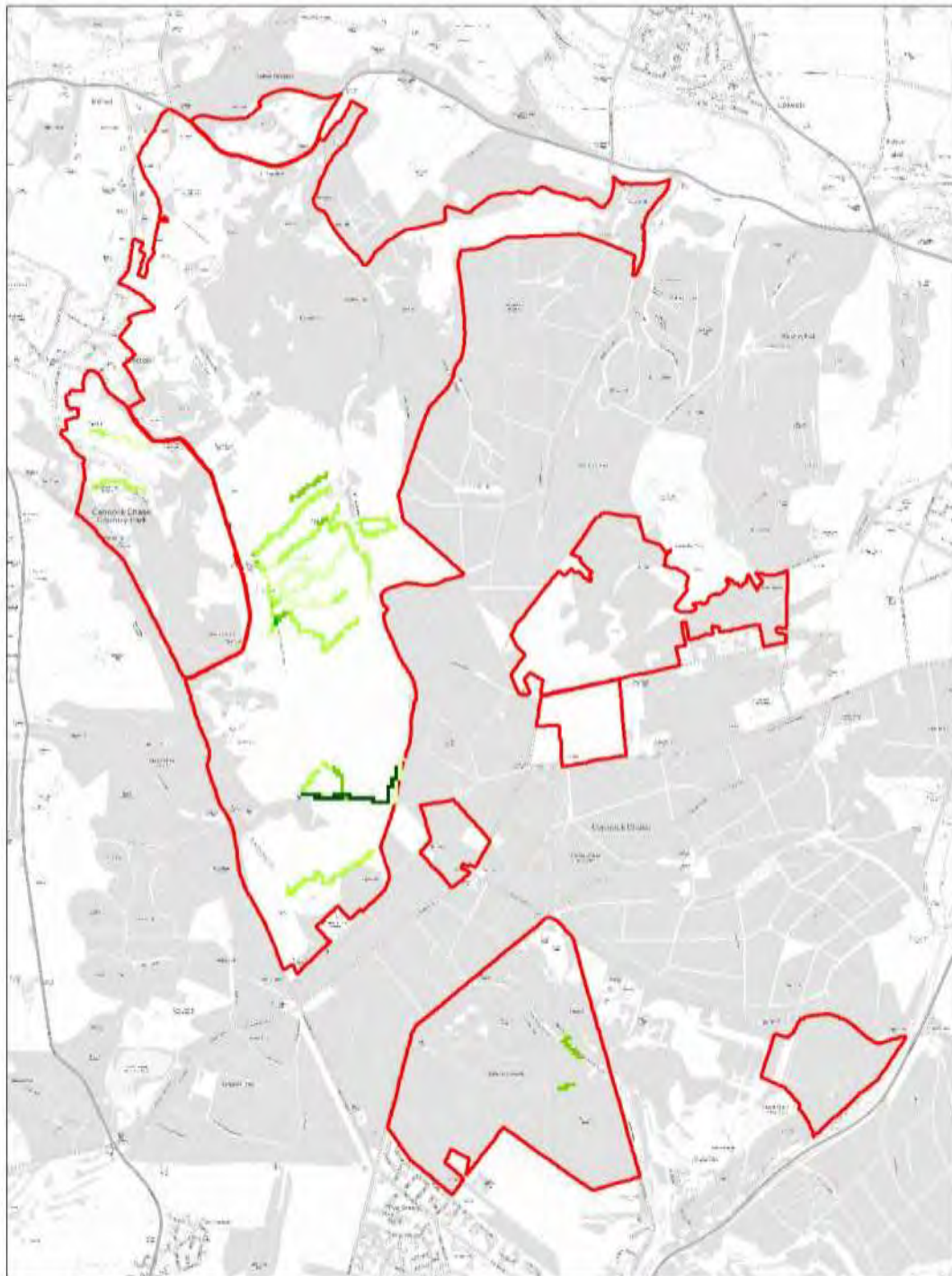
■	120 to 160	(36)
■	60 to 90	(10)
■	30 to 60	(48)
■	1 to 30	(731)



Map 9: Number of Dog Walkers; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

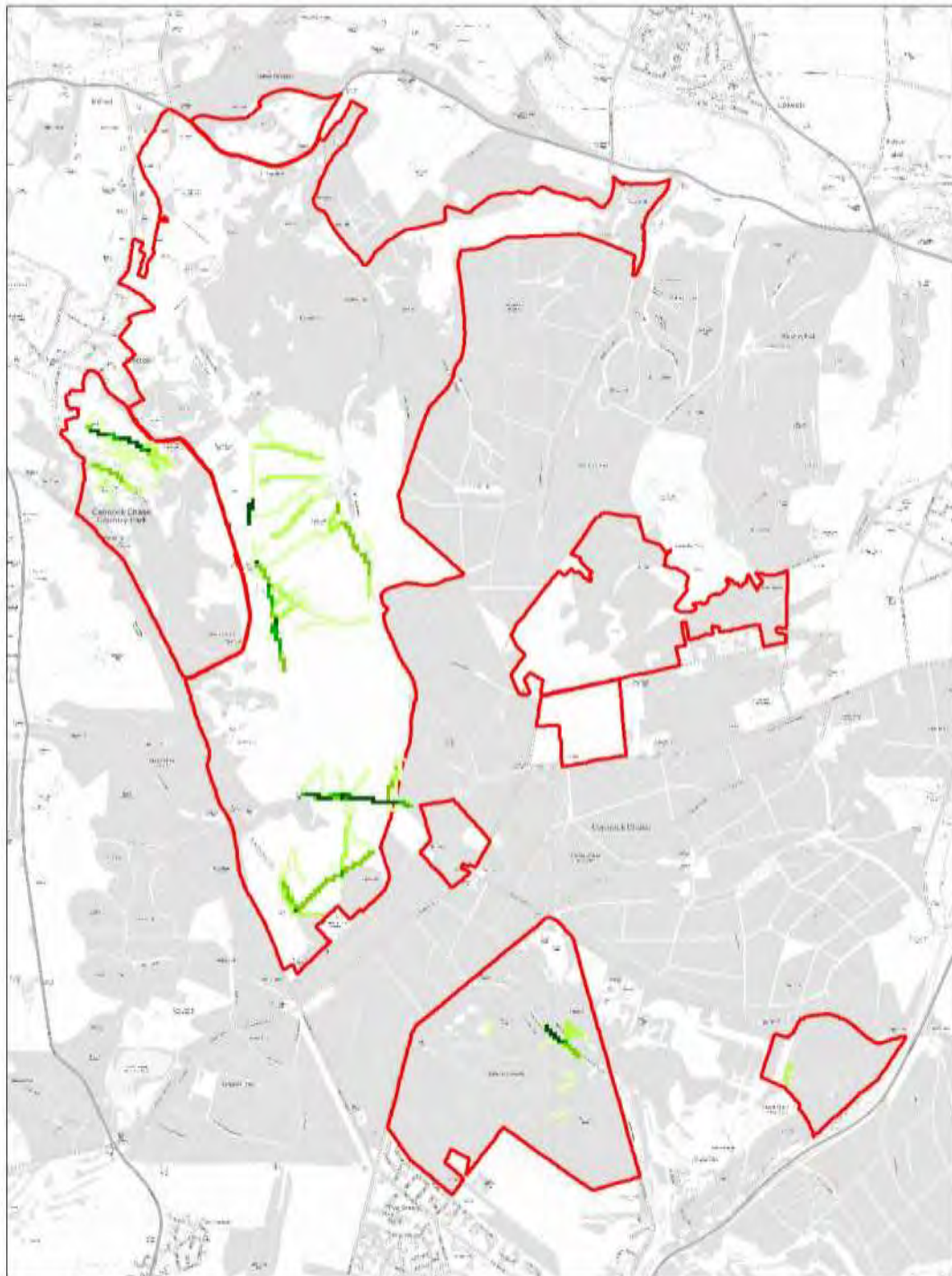
80 to 110	(3)
60 to 80	(23)
40 to 60	(110)
20 to 40	(142)
1 to 20	(1079)



Map 10: Number of Horse Riders; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

8 to 12	(41)
6 to 8	(2)
4 to 6	(58)
2 to 4	(266)
1 to 2	(134)



Map 11: Number of Walkers; 25x25m grid
Legend gives number of cells per band

Contains Ordnance Survey Data.
©Crown copyright and database right 2011.

■	40 to 65	(63)
■	30 to 40	(33)
■	20 to 30	(119)
■	10 to 20	(178)
■	1 to 10	(467)

4. Discussion

- 4.1 This report summarises 144 hours of observation of visitors to Cannock Chase during August 2011. It is a snapshot of visitor's behaviour, visitor density and access patterns within selected areas of Cannock Chase SAC.
- 4.2 The results highlight that visitors spread out within the site and that a wide variety of routes are used. Different locations may be used preferentially for particular activities. A number of behaviours were noted which have consequences for the management of the site. For example, cyclists and horse riders often do not remain on the marked routes. The majority of dog walkers let their dogs off the lead, many running free well away from the owner. Some 8% of dog walking groups were observed not to pick-up after their dog.
- 4.3 In some cases, differences between locations within the site can be interpreted. For example, the higher than expected numbers of dog walkers visiting location 8 (Brindley Heath) may be due to its proximity to the honey pot area at Marquis Drive, plus the nearby conurbation of Pye Green. Dog walkers may also have migrated to this area to avoid restrictions placed upon access as a result of the *Phytophthora* outbreak, affecting in particular, Brocton Coppice woodland area (location 7) and the area around the Katyn Memorial (leading into location 4). This could also explain the apparently relatively low numbers of dog walkers using these areas.
- 4.4 The higher than expected use of location 1 in the Sherbrook Valley by cyclists might reflect the fact that this follows the line of a locally promoted family cycle route. Cyclists may then deviate from this route into all parts of the Sherbrook Banks area, perhaps drawn by the open views into the valleys.
- 4.5 The highest numbers of dogs observed at greater than 15 metres from their owners were in some of the most open countryside within the site. It may be that dogs will wander further, or will be permitted to do so, where they can maintain visual contact with their owners and be called more easily.
- 4.6 The degree of enrichment through animal waste may be higher than indicated by results of the observation study. While 8% of owners were observed not to pick up animal waste, this does not necessarily equate to 92% actually doing so.

Our Approach

- 4.7 Most visitor survey work involves face-to-face interviews. In many surveys visitors are asked where they have walked and the routes mapped (e.g. Clarke *et al.* 2006; Liley, Jackson, & Underhill-Day 2006a; Liley, Underhill-Day, & Gartshore 2006b; Fearnley, Clarke, & Liley 2010) or even have been given GPS units to track their route (e.g. Tourism South East Research Services & Geoff Broom Associates 2005; Cruickshanks, Liley, & Hoskin 2010; Liley *et al.* 2011). Both approaches provide information on how far people travel and where they go within the site. There are

problems with both approaches however. Mapping routes requires individuals to be able to read maps or accurately relate where they have been. This can be difficult where people have cut across open country or on open featureless terrain. People also may not be entirely open with where they have been. GPS tracks are likely to be relatively accurate, but rely on the interviewee being able to return the unit, for example returning to the interview location. People may of course behave differently in the knowledge that their route is being recorded and routes may be inaccurate in wooded terrain due to the limitations of the GPS units. In some cases routes have been used to either map visitor density within sites (e.g. Liley & Cruickshanks 2010) or devise spatial models of visitor densities (Liley *et al.* 2006a; Sharp, Lowen, & Liley 2008b; Clarke, Sharp, & Liley 2010; Cruickshanks *et al.* 2010).

- 4.8 The approach used here does not record how far people travel and instead relies on direct observation. The approach is useful in that it accurately records behaviours such as not picking up after the dog or straying from paths. It allows us to record routes chosen by different users, and the series of comparative maps provides a useful visual comparison of activities and behaviours. The potential limitations to the approach are the fact that it is difficult to see a wide area, for example there are blind spots created by dips, vegetation etc.; when busy it is difficult to keep watch on multiple groups at once (or even multiple dogs!) and we have only collected observations for part of the SAC. It is important to recognise these limitations. For example around 8% of dog-walking groups were seen not to pick up after their dog. However, dogs may typically defecate near the start of a walk (Taylor *et al.* 2005); it proved difficult for the surveyors to keep dogs within view at all times and the short period in which the 'event' might happen means that 8% may be an underestimate. The number of actual times that a dog was seen to foul and it **was** picked up was not recorded and the results cannot be used to suggest that (for example) 92% of dog-walkers do pick-up after their dog.

Implications and Connection to the Other Reports

- 4.9 The results of this work need to be considered in conjunction with the visitor survey analysis and the visitor impact report. Impacts to the SAC from recreation are considered in the visitor impact report and include eutrophication (e.g. from dog fouling), erosion, trampling, soil compaction, spread of disease and creation of desire lines/loss of vegetation. The visitor impact report considers these impacts in more detail and records where these impacts occur. The visitor analysis report considers the origin of visitors, the activities undertaken, mode of transport used to reach the site etc. This observational study links these two reports, showing how people spread out within the site and recording individual behaviours.

5. References

- Adams, W.M. (1996) *Future Nature*. Earthscan, London.
- Alessa, L., Bennett, S.M. & Kliskey, A.D. (2003) Effects of Knowledge, Personal Attribution and Perception of Ecosystem Health on Depreciative Behaviors in the Intertidal Zone of Pacific Rim National Park and Reserve. *Journal of Environmental Management*, **68**, 207-218.
- Bathe, G. (2007) Political and Social Drivers for Access to the Countryside: The Need for Research on Birds and Recreational Disturbance. *Ibis*, **149**, 3-8.
- Bird, D.M. (2004) *Natural Fit, Can Green Space and Biodiversity Increase Levels of Physical Activity*. RSPB, Sandy, Bedfordshire.
- Clarke, R.T., Liley, D., Underhill-Day, J.C. & Rose, R.J. (2006) *Visitor Access Patterns on the Dorset Heaths*. English Nature.
- Clarke, R.T., Sharp, J. & Liley, D. (2008) *Access Patterns in South-east Dorset. The Dorset Household Survey: Consequences for Future Housing and Greenspace Provision*. Footprint Ecology.
- Clarke, R., Sharp, J. & Liley, D. (2010) *Ashdown Forest Visitor Survey Data Analysis*. Natural England Commissioned Report, Natural England.
- Cruickshanks, K., Liley, D. & Hoskin, R. (2010) *Suffolk Sandlings Visitor Survey Report*. Footprint Ecology/Suffolk Wildlife Trust.
- English Nature. (2002) *Revealing the Value of Nature*. English Nature, Peterborough.
- Fearnley, H., Clarke, R.T. & Liley, D. (2010) *The Solent Disturbance and Mitigation Project. Phase II. On-site Visitor Survey Results from the Solent Region*. Footprint Ecology/Solent Forum.
- Liley, D. (2008) *Development and the North Norfolk Coast: Scoping Document on the Issues Relating to Access*. Footprint Ecology.
- Liley, D. & Clarke, R. (2006) *Predicting Visitor Numbers to the Thames Basin Heaths*. Footprint Ecology.
- Liley, D. & Cruickshanks, K. (2010) *Exe Visitor Survey, 2010*. Teignbridge District Council/Footprint Ecology.
- Liley, D. & Sutherland, W.J. (2007) Predicting the Population Consequences of Human Disturbance for Ringed Plovers *Charadrius hiaticula*: a Game Theory Approach. *Ibis*, **149**, 82-94.
- Liley, D., Clarke, R.T., Mallord, J.W. & Bullock, J.M. (2006a) *The Effect of Urban Development and Human Disturbance on the Distribution and Abundance of Nightjars on the Thames Basin and Dorset Heaths*. Natural England / Footprint Ecology.
- Liley, D., Cruickshanks, K., Waldon, J. & Fearnley, H. (2011) *Exe Disturbance Study*. Footprint Ecology/Exe Estuary Management Partnership.
- Liley, D., Jackson, D.B. & Underhill-Day, J.C. (2006b) *Visitor Access Patterns on the Thames Basin Heaths*. English Nature, Peterborough.

Liley, D., Underhill-Day, J. & Gartshore, N. (2006c) *Browndown Visitor Survey and Recommendations for Access Management Within the SSSI*. Footprint Ecology / Hampshire County Council, Wareham, Dorset.

Mallord, J.W. (2005) *Predicting the Consequences of Human Disturbance, Urbanisation and Fragmentation for a Woodlark Lullula Arborea Population*. UEA, School of Biological Sciences, Norwich.

Morris, N. (2003) *Health, Well-being and Open Space Literature Review*. Edinburgh College of Art and Heriot-Watt University, Edinburgh.

Pretty, J., Griffin, M., Peacock, J., Hine, R., Selens, M. & South, N. (2005) A Countryside for Health and Well-being: The Physical and Mental Health Benefits of Green Exercise. *Countryside Recreation*, **13**, 2-7.

Randall, R.E. (2004) Management of Coastal Vegetated Shingle in the United Kingdom. *Journal of Coastal Conservation*, **10**, 159-168.

Saunders, C., Selwyn, J., Richardson, S., May, V. & Heeps, C. (2000) *A Review of the Effects of Recreational Interactions Within UK European Marine Sites*. UK CEED & Bournemouth University.

Sharp, J., Clarke, R.T., Liley, D. & Green, R.E. (2008a) *The Effect of Housing Development and Roads on the Distribution of Stone Curlews in the Brecks*. Footprint Ecology.

Sharp, J., Lowen, J. & Liley, D. (2008b) *Recreational Pressure on the New Forest National Park, with Particular Reference to the New Forest SPA*. New Forest National Park Authority / Footprint Ecology.

Stillman, R.A., Cox, J., Liley, D., Ravenscroft, N., Sharp, J. & Wells, M. (2009) *Solent Disturbance and Mitigation Project: Phase I Report*. Solent Forum.

Taylor, K., Anderson, P., Taylor, R.P., Longden, K. & Fisher, P. (2005) *Dogs, Access and Nature Conservation*. English Nature, Peterborough.

Tourism South East Research Services & Geoff Broom Associates. (2005) *A Survey of Recreational Visits to the New Forest National Park*. Countryside Agency.

Underhill-Day, J.C. (2005) *A Literature Review of Urban Effects on Lowland Heaths and Their Wildlife*. English Nature, Peterborough.