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Hart, Rushmoor and Surrey Heath SPA Mitigation Project: Car Parking Research Study.

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Summary

The strategic mitigation scheme for the Thames Basin Heaths SPA is long-running and has been successful in allowing sustainable housing growth while ensuring protection for the European sites. The scheme has successfully delivered greenspace sites (Suitable Alternative Natural Greenspace – SANGs) that are clearly well used. However, SANGs delivery in the long-term is likely to be increasingly challenging given high land prices and a relative lack of potential sites in some areas. Opportunities for SANG delivery are reducing and there is concern that if the current approach of reliance on SANGs for avoidance and mitigation is not revisited, the challenges to SANG delivery in the future could ultimately result in a moratorium on new residential development in parts of the Hart, Rushmoor and Surrey Heath Housing Market Area. The three Councils have therefore been awarded funding from central government to undertake joint work to investigate and seek to implement alternative and complementary avoidance and mitigation measures.

Management of parking provision is one of a range of measures the Councils are exploring. This report explores the potential for implementing changes to the parking provision as mitigation for new housing growth. The work considers how effective the changes in parking provision might be, the scope to implement them, the capacity (i.e. mitigation) they might achieve and how they might actioned. This report is structured to address the particular questions raised by the client authorities.

Current parking provision

Currently there are around 160 parking locations with around 2,348 spaces that provide access to the SPA. Most parking locations are small with few spaces. Formal car parks account for 27.5% of the locations and provide around 67% of the spaces. There is much variation across different parts of the SPA as to the number of spaces per ha of accessible land. Small sites such as Sheet's Heath, Bisley Common and Lightwater Country Park have the highest densities of parking spaces per hectare of accessible land, suggesting that if the parking were a reflection of visitor numbers, these would have the highest densities of access.

Counts conducted by the Thames Basin Heaths Partnership have recorded an average of 515.6 vehicles parked on or around the SPA at any one time. Taking the peak count at each parking location and summing these gives a maximum of 1,513 vehicles, still well below the overall number of spaces. This would suggest that there is considerable over provision of parking currently, such that there are many more spaces than visitors. This would mean that visitors have a wide choice and that measures to reduce parking might need to be considerable to reduce the choice to a level where distribution can be manipulated.

Only 21% of the SPA is located beyond 750m from a parking location. 750m is used as a value for how far visitors typically reach from a car park before turning back (the figure is approximate and is rounded up from the median value, so many more will reach further than this). This means most of the site is easily accessible from a car park.

There have been limited occasions where parking controls have been implemented around the SPA and these have been contentious and not necessarily delivered the intended outcomes.

Models testing different parking control scenarios

We have used a model to test different scenarios of parking control. The model assumes that if a parking location is full or unavailable cars will shift to the next nearest location. Testing different hypothetical scenarios indicates closing parking could result in marked redistributions of visitors arriving by car.

The model considered 7 scenarios where parking locations and/or spaces were manipulated.

- A: Closure of all but the formal car parks
- B: Reduce formal parking capacity by 20% (decimal capacities rounded)
- C: Closure of all "Track entrances" and "Verges"
- D:Increase formal parking capacity by 20%, but decrease informal capacity by 20%
- E: Closure of MOD parking (locations owned/managed or thought to be MOD)
- F: Parking locations at predominantly coniferous areas (from the National Forest Inventory Woodland England 2018), ie over 50% of the space within 750 metres being coniferous, increased by 40% and all others decreased by 20%
- G: Only the largest locations which account for 75% of parking spaces to be open (based on current mean vehicles)

Our model also includes people arriving on foot, and we predict the numbers of these at different access points based on the amount of surrounding housing. At the SPA level, the model suggests around a third (32%) of all access to the SPA patches is currently on foot, and parking controls will not affect these visitors in any way. We use our model to explore the spatial distribution of access across the SPA under each scenario.

Rural sites where there is little foot access will show the most marked effects of parking control. Currently there is a large over provision of parking on the SPA. Our scenario testing shows that, even with marked parking controls, there is still sufficient parking resource on the SPA for visitors to simply change location to another SPA parking location. It would seem that unless major controls were implemented, there is potential for continued use of the SPA by the same number of visitors, with the potential for some (relatively minor) changes in the spatial distribution of footfall. As such, we cautiously suggest that the mitigation potential for parking changes is minimal.

It is complex to equate a parking approach to a level of avoidance/mitigation. We calculate the relative change in visitor numbers through areas of the SPA with higher bird densities, as a means of exploring the implications of controls in more detail. As an example, if all informal parking were closed and only formal car parks remained, we estimate 1,765 fewer people per day would pass through areas that have supported higher bird densities (>4 territories 2015-2019). While such a redistribution could be beneficial to the SPA bird interest, ultimately it may mean, for example, that some areas of the site are being further damaged making restoration harder. Furthermore, changes in parking that are permanent will result in long-term shifts in access whereas the bird distributions may shift over time. The estimate for the net benefit is also calculated based on a particular choice of thresholds; using different thresholds would result in a different calculation of benefit. As such, we present the figures here simply for information and to prompt discussion. Clearly attributing a level of mitigation to a redistribution in access is not straightforward.

Our models assume vehicles (and therefore visitors) displaced by parking measures are shifted to the next nearest (linear distance) parking location available on the SPA. We have not assumed visitors would be deflected to SANGs or other greenspace. Any deflection to SANGs would reduce the capacity of the SANGs and risk undermining any of the mitigation achieved by those SANGs. The potential for car parking controls to act as mitigation in the absence of further SANG is therefore reliant on visitors remaining within the SPA and changing the visitor distribution, or alternatively not using the SPA or SANGs at all. In reality, there will of course be some displacement away from the SPA and this is likely to include other greenspace sites. Evidence to pin-point the level that this might occur is limited and any level of change is likely to depend on the particular parking controls implemented.

Parking control measures are likely to be most effective if combined with other measures. Changing parking spaces or parking locations is ultimately a means to redistribute access and this can dovetail with engagement measures very neatly. Where visitor use is concentrated it is much easier to engage with visitors and easier to ensure they see signs and other on-site information. Implementing any parking control would require a communication strategy, engagement, information provision and clear guidance to visitors as to what the changes mean for them. Engagement will be required prior to any implementation and for a considerable time period after.

Triggers for introducing parking controls could be temporal, ecological or relate to the type of parking location. Bird distribution is clumped rather than evenly distributed across the SPA and there are some locations with particularly high densities within close proximity to parking locations. This is particularly the case at Chobham Common.

There are parking locations where controls would not be possible or practical, for example those associated with local businesses (such as pubs) or that provide access to local facilities as well as the SPA. We provide indicative costs for parking controls and scale these up for different scenarios. Closing informal parking locations, verges and lay-bys is the least expensive option of those considered.

Car park controls can be highly contentious and how visitors might respond is hard to predict and evidence is lacking. Monitoring will be necessary before and after any controls with regular checks and counts of the number of vehicles parked in different locations. Monitoring can be used to target interventions and enforcement that can include measures such as double yellow lines, physical obstructions to parking, signage, leaflets on windscreens and reporting dangerous incidents to the police.

Contents

Acknowledgements

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1. Introduction

Overview

1.1 This report explores the potential for implementing greater access management measures in the Thames Basin Heaths Special Protection Area (SPA) as mitigation for new housing growth. The work considers the potential for implementing measures which would limit or restrict car parking availability in and around the SPA. Options to be considered include permanent closures/reductions or restrictions and seasonal/rotational closures. It is recognised that these restrictions may need to be implemented on a strategic basis and require significant partnership working.

The Thames Basin Heaths SPA

1.2 The Thames Basin Heaths SPA (Map 1) is designated for the presence of Nightjar *Caprimulgus europaeus*, Woodlark *Lullula arborea* and Dartford Warbler *Sylvia undulata*. The SPA covers some 8,000 hectares of heathland and forestry, fragmented into separate blocks by roads, urban development and farmland. The SPA comprises 13 component Sites of Special Scientific Interest (SSSIs). The individual heaths are surrounded by an existing high level of housing, and are subject to heavy visitor pressure.

1.3 There is now a considerable body of evidence linking visitor access and urban effects to the abundance, distribution and breeding productivity of Annex 1 heathland birds. Research on the impact of disturbance on Woodlark population size (Mallord, Dolman, Brown, & Sutherland, 2007) shows birds avoid areas of high visitor pressure and they occur at lower densities in areas with higher densities of surrounding housing (Mallord, 2005). For Dartford Warblers, studies in Dorset (Giselle Murison et al., 2007) indicate breeding success is related to disturbance, with birds breeding less successfully in heather dominated territories with high levels of access. For Nightjars, there is a clear relationship between nest density and urban development, with lower nest densities on heaths (in both the Thames Basin Heaths and Dorset Heathlands) surrounded by high levels of housing (Liley & Clarke, 2003; Liley, Clarke, Mallord, & Bullock, 2006). Evidence suggests more people visit heaths surrounded by high levels of housing (see Murison 2002; Liley *et al.* 2006b; Clarke, Liley, & Sharp 2008a). In the absence of development/visitors it has been estimated that the Dorset and Thames Basin Heaths could support around 14% more nightjars (Clarke et al., 2008).

1.4 These studies have implications for additional development in the Thames Basin Heaths area, as the sites are protected by strict legislation. There are a number of ways to mitigate the impacts or avoid the problems associated with urban development and recreation, for example through the careful siting of new housing, through management of access on sites, or through the provision of alternative green space. Such approaches have been established strategically through the Thames Basin Heaths Delivery Framework (Thames Basin Heaths Joint Strategic Partnership Board, 2009) and are documented by relevant local authorities in respective planning documents and mini-plans. Within 400m of the Thames Basin Heaths SPA there is a presumption against new development, while within 400m-5km the Delivery Framework recommends the provision of mitigation measures for all new development. Furthermore, large scale development proposals, beyond 5km and out to 7km may also be required to provide appropriate mitigation, considered on a case by case basis. These various buffers are shown in Map 1.

1.5 Pivotal to the measures to mitigate and avoid impacts of new development in the Thames Basin Heaths area is the provision of Suitable Alternative Natural Greenspace (SANGs). SANGs are provided on the basis of at least 8ha per 1,000 population. The creation of such additional greenspace provides opportunities for recreation, such as dog walking, drawing users who might otherwise visit the Thames Basin Heaths SPA.

1.6 In 2018 there were 324,445 residential properties within 5km of the Thames Basin Heaths SPA. Reviewing the previous 5 years, the data suggest an increase of around 4% (12,141 additional dwellings) since 2013, when there were 312,304 dwellings within 5km. The data suggest in the year 2017-2018 around 3,000 new dwellings were built within the zone. These data reflect the steady increase in housing around the SPA and the year-on-year growth. SANGs provision has kept pace with this growth and has been at least in line with the level of new housing growth (Liley, Panter, & Rawlings, 2015).

The need for this work

1.7 The strategic mitigation scheme for the Thames Basin Heaths SPA is long-running and has been successful in allowing sustainable housing growth while ensuring protection for the European sites. The scheme has successfully delivered greenspace sites that are clearly well used (e.g. Liley, 2015; Liley et al., 2015; Panter, 2017). Delivering SANGs is however proving to be a challenge given high land prices and relative lack of potential sites in some areas. Opportunities for

SANG delivery are reducing and the Councils are concerned that if the current approach of reliance on SANGs for avoidance and mitigation is not revisited, the challenges to SANG delivery in the future could ultimately result in a moratorium on new residential development in parts of the Hart, Rushmoor and Surrey Heath Housing Market Area. In recognising this risk and the need to seek solutions that enable continued protection of the Thames Basin Heaths SPA whilst delivering the needed housing growth, the three Councils have been awarded funding from central government to undertake joint work to investigate and seek to implement alternative and complementary avoidance and mitigation measures.

Report structure and approach

1.8 This report directly relates to car parking restrictions as a potential approach to achieving additional mitigation. Other reports – produced in parallel to this one – address other potential mitigation measures, with separate reports covering Access Management, Access Restrictions and Dog Controls.

1.9 In this report we consider how the implementation of parking controls would be effective as a mitigation measure, exploring the scope for implementing these, estimating the capacity of such measures and how these measures might be enforced. Parking restrictions that we consider are:

- Closing parking locations;
- Increasing the number of parking spaces at locations to redistribute access;
- Reducing parking capacity at locations in order to redistribute access;
- Measures to prevent certain types of vehicles accessing car parks (e.g. height restriction bars);
- Measures to control parking at particular times (e.g. locked gates at night).

1.10 We do not explicitly consider parking charging as this is not a control, per se. However, parking charges are discussed in some parts of the report, for example where the introduction of charging has provided useful examples or case study information. We note also that there is little evidence for the effectiveness of parking charges as a means to reduce visitor numbers and the use of countryside sites. For example, a Dutch study by Beunen *et al.* (2006) found that the effects of parking charges were temporary, such that they did not reduce visitor numbers or change in visitor distribution in the long term. Comparative analysis of parking data across European sites and other countryside sites in the UK by Weitowitz *et al.* (2019) suggests that, perhaps counterintuitively, levels of use at car parks of a given size with charges is higher than those with no charges.

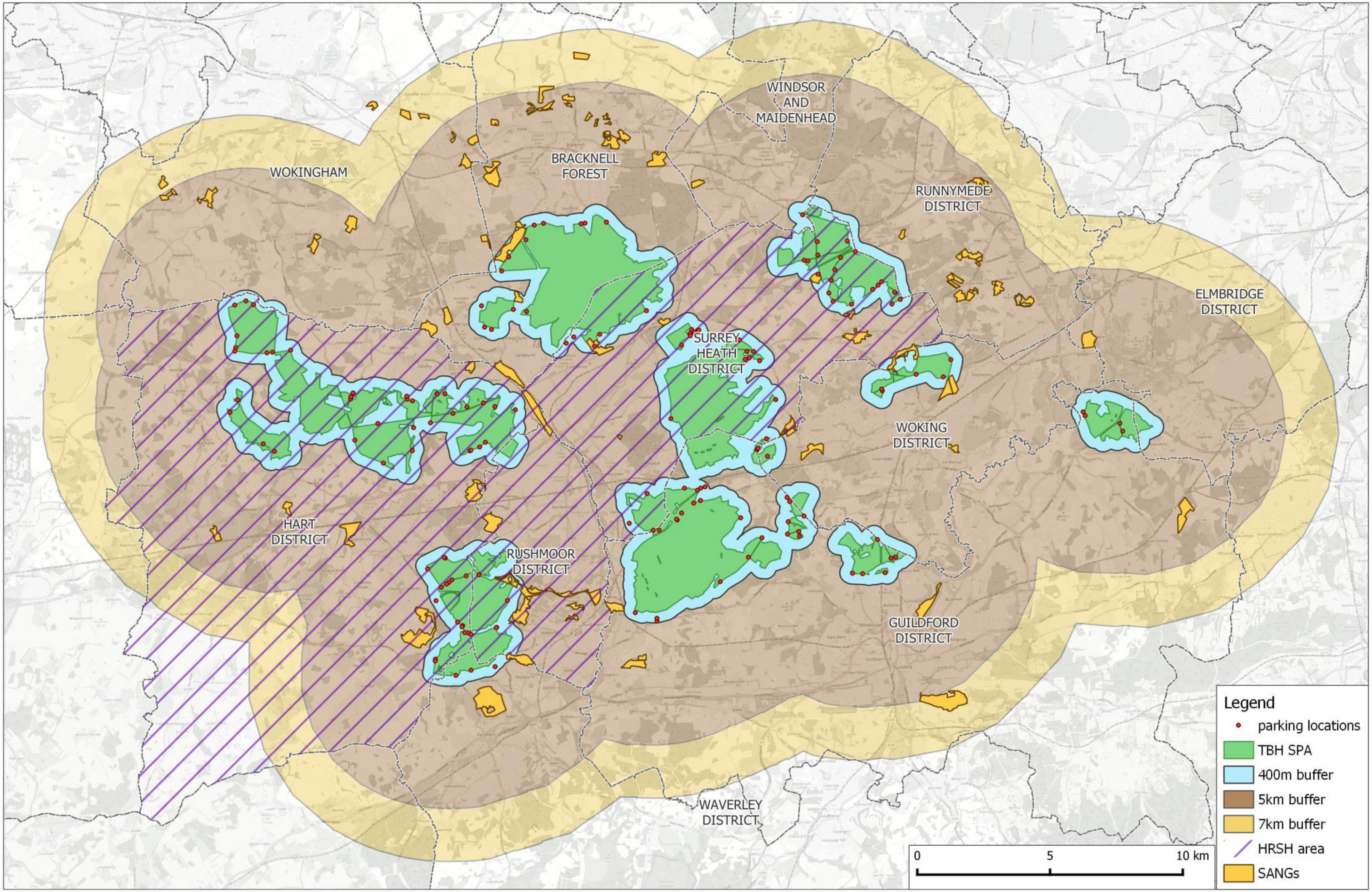
Questions set by the Councils

1.11 The report is structured to address particular questions set by the three councils, namely:

- Aim 1 - To demonstrate how the implementation of parking controls would be effective as a mitigation measure
    - How do existing car parking controls affect visitor numbers on the SPA?
- Aim 2 - To explore scope for implementing parking control measures
    - How controls could be applied in different ways (e.g. seasonal/temporary/permanent; whole SPA/part)?
    - Whether parking control would be best implemented alongside other mitigation options (e.g. seasonal access management)?
    - What could be the triggers for introducing parking controls (e.g. seasonal closures or closure in particular areas)?
    - Are there any areas in which controls could not be implemented?
    - What are the potential costs of delivering these potential measures?
- Aim 3 - To consider the potential capacity of these measures
    - What potential scale of avoidance/mitigation would be provided by implementing parking controls?
- Aim 4 - To consider the potential for displacement
    - Where parking/visitors would disperse to, if parking restrictions were implemented at individual car parks or the whole of the SPA?
- Aim 5 - To determine how the measure(s) could be enforced
    - How parking controls could be enforced?

1.12 We address each question in turn and draw on a range of data sources and analysis which are explained in the relevant section.

Map 1: Thames Basin Heaths SPA, buffer zones, the HRSH area and main parking locations.



2. Aim 1 - To demonstrate how the implementation of parking controls would be effective as a mitigation measure

How do existing car parking controls affect visitor numbers on the SPA?

2.1 There are widespread parking opportunities across the Thames Basin Heaths SPA and visitor survey data indicates – at least at the surveyed locations – a high proportion of car-use. For example, a three quarters (74%) of interviewees in 2018 were travelling to the Thames Basin Heaths SPA by car (Southgate, Brookbank, Cammack, & Mitchell, 2018), little change from the 75% recorded in in 2012/2013 (Fearnley & Liley, 2013).

2.2 Any modifications to the parking provision will clearly therefore have scope to influence the level of distribution of visitor use both within sites and across the SPA as a whole.

Current parking provision

2.3 The Thames Basin Heaths Partnership maintains a database of parking locations. This shows that the capacity is estimated at 2,348 spaces across 160 parking locations. Capacity of individual parking locations ranges from 1 to 387, with an average of 14.7 spaces per location - see Table 1. Formal car parks represent 27.5% of parking locations across the SPA, but typically these are large, with an average of 35.8 spaces and these account for 67.1% of all spaces across the SPA.

2.4 The frequency distribution of parking provision (number of locations by the number of spaces) is shown in Figure 1, highlighting that most parking locations around the SPA are relatively small.

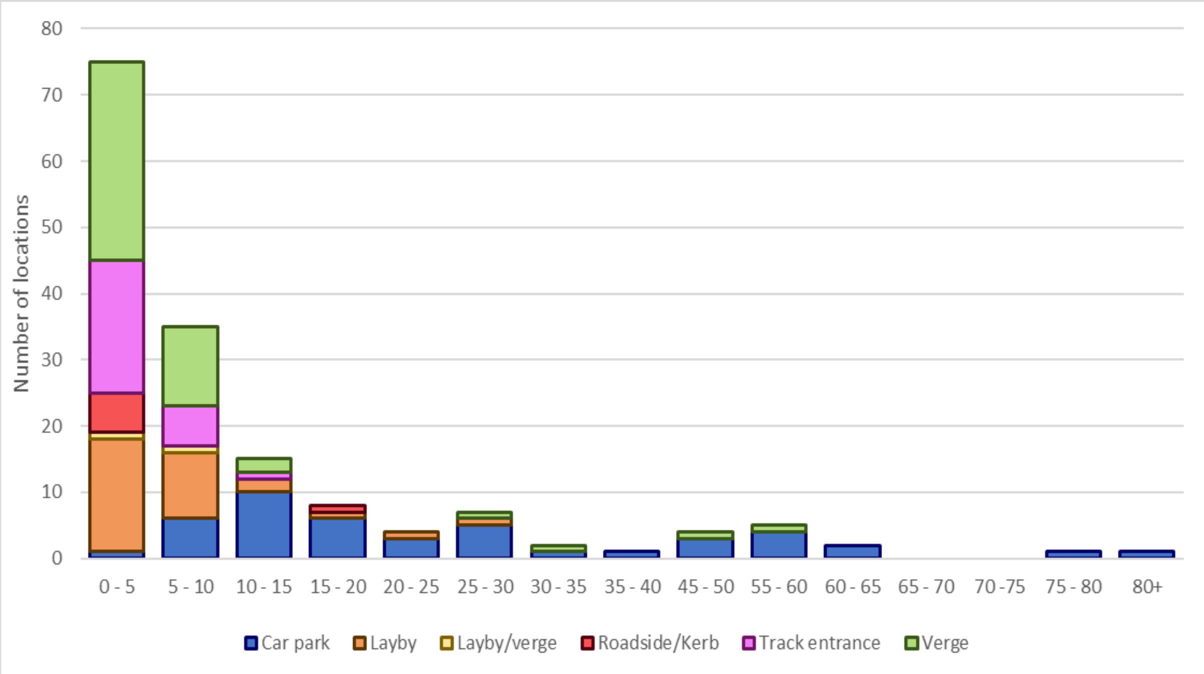


Figure 1: Histogram of parking provision by type. The x axis is the number of spaces.

Table 1: Summary of the number and capacity of the 160 parking locations.

Type	n	Capacity	Average capacity	Min - Max capacity
Verge	48	385	8.0	1 - 60
Car park	44	1575	35.8	4 - 387
Layby	32	229	7.2	2 - 26
Track entrance	27	110	4.1	1 - 12
Roadside/Kerb	7	37	5.3	2 - 18
Layby/verge	2	12	6.0	2 - 10
Total	**160**	**2348**	**14.7**	**1 - 387**

2.5 Looking at individual SSSIs, most are characterised by some formal access provision through set car parks. However, the most common locations are verge parking – see Map 3 and Table 2.

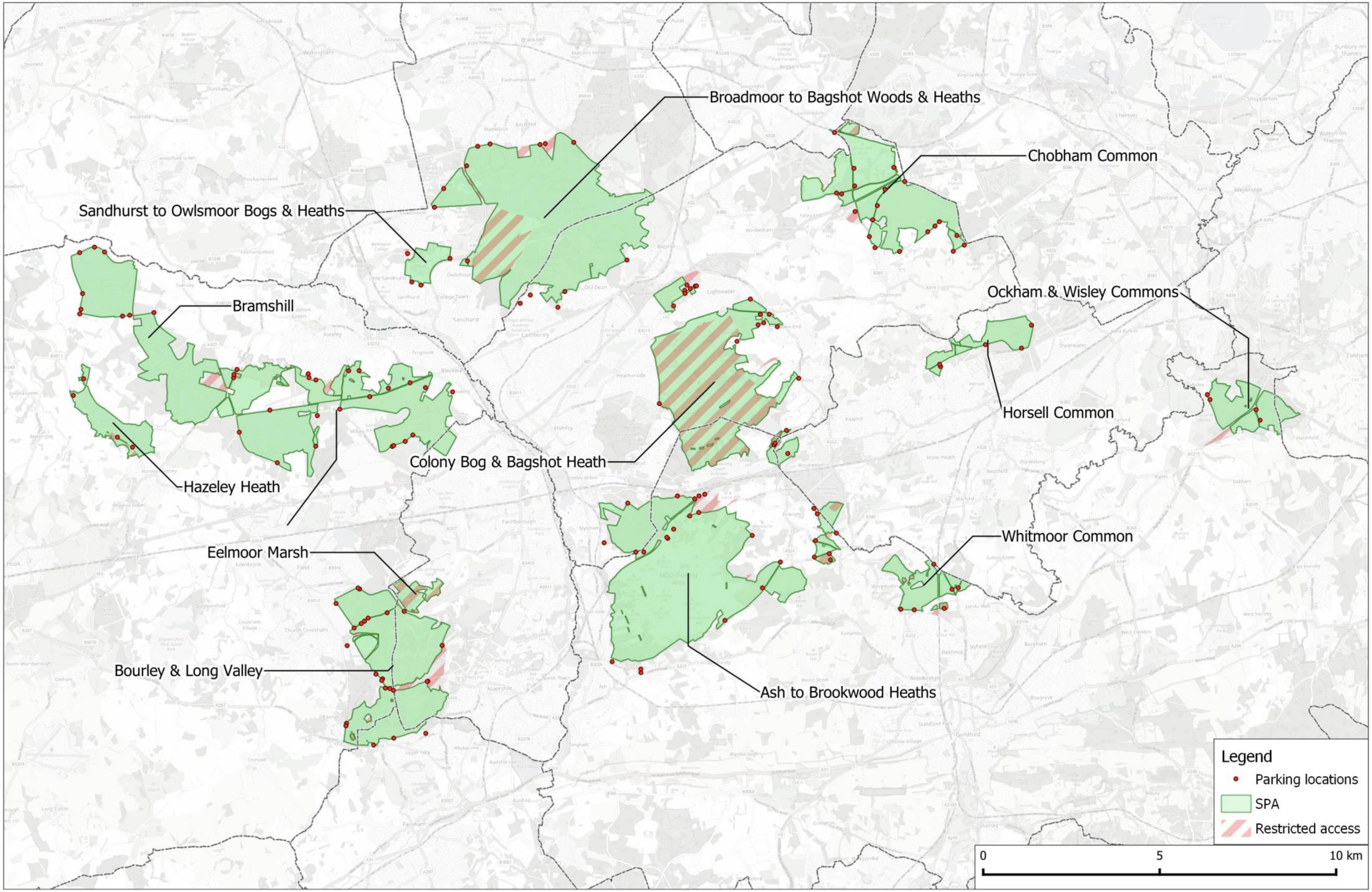
Table 2: Summary of the number and types of parking locations around the SPA, separated for individual SSSIs. Values in brackets show the percentage of parking locations for each row.

SSSI	Verge	Car park	Layby	Track entrance	Roadside /Kerb	Layby/ verge	Total
Ash to Brookwood Heaths	8 (30)	6 (22)	4 (15)	9 (33)	(0)	(0)	27 (100)
Bourley & Long Valley	6 (25)	7 (29)	(0)	9 (38)	1 (4)	1 (4)	24 (100)
Bramshill	4 (44)	1 (11)	3 (33)	1 (11)	(0)	(0)	9 (100)
Broadmoor to Bagshot Woods & Heaths	2 (14)	2 (14)	3 (21)	3 (21)	4 (29)	(0)	14 (100)
Castle Bottom to Yateley & Hawley Common	6 (26)	5 (22)	8 (35)	4 (17)	(0)	(0)	23 (100)
Chobham Common	9 (45)	7 (35)	2 (10)	1 (5)	(0)	1 (5)	20 (100)
Colony Bog & Bagshot Heath	6 (30)	7 (35)	7 (35)	(0)	(0)	(0)	20 (100)
Hazeley Heath	3 (75)	(0)	1 (25)	(0)	(0)	(0)	4 (100)
Horsell Common	1 (20)	2 (40)	2 (40)	(0)	(0)	(0)	5 (100)
Ockham & Wisley Commons	(0)	3 (75)	1 (25)	(0)	(0)	(0)	4 (100)
Sandhurst to Owlsmoor Bogs & Heaths	1 (25)	1 (25)	(0)	(0)	2 (50)	(0)	4 (100)
Whitmoor Common	2 (33)	3 (50)	1 (17)	(0)	(0)	(0)	6 (100)
Total	**48 (30)**	**44 (28)**	**32 (20)**	**27 (17)**	**7 (4)**	**2 (1)**	**160 (100)**

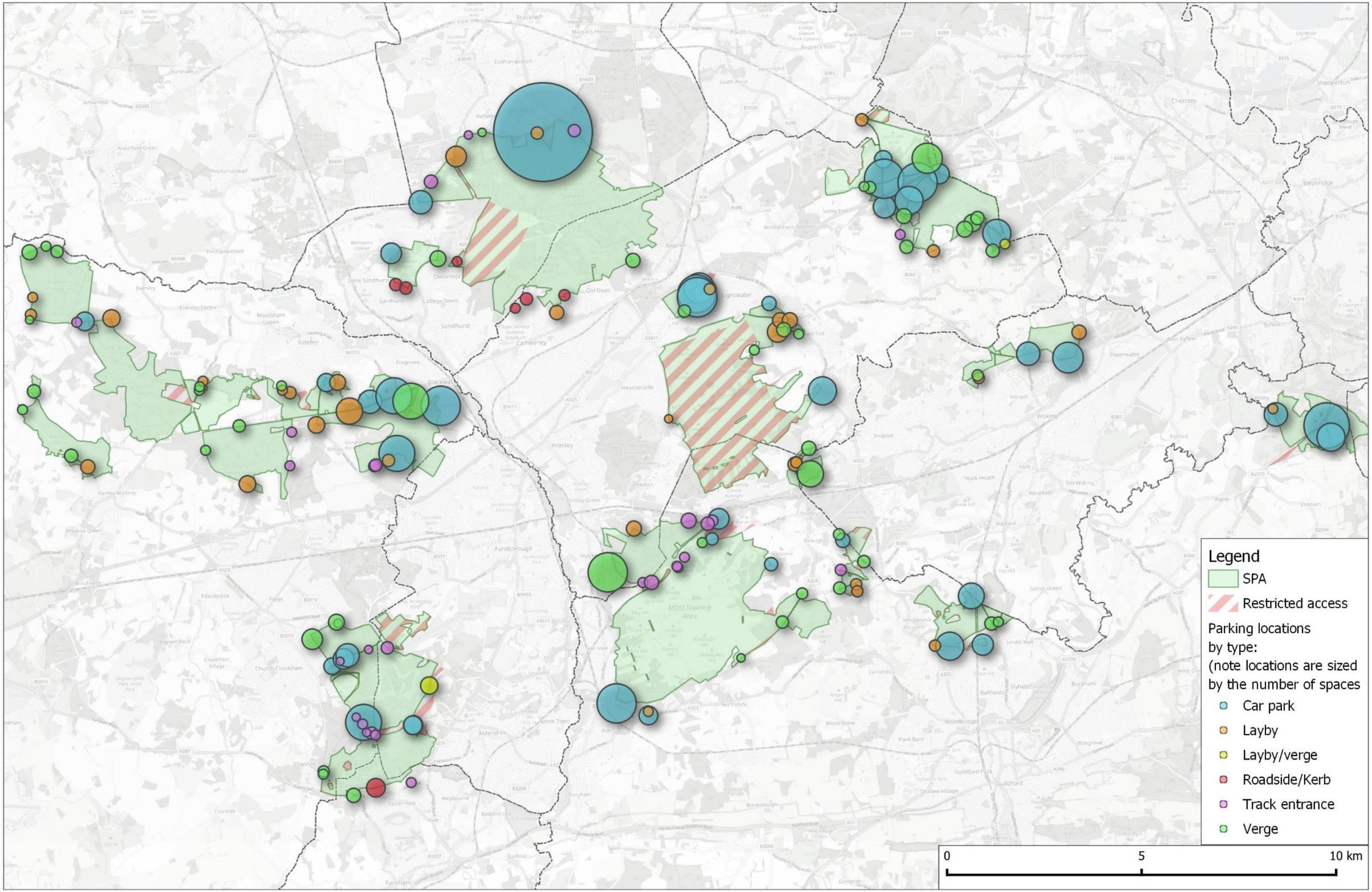
Table 3: Summary of parking provision by owner/manager (note these have sometimes been estimated for informal parking locations and exact management may fall under others not listed). Data sorted by the number of spaces.

Owner/manager	Number of locations	Number of spaces	Number of formal car park locations	Number of formal car park spaces
MOD	55	646	13	332
Bracknell Forest Council	4	412	2	404
Surrey Heath Borough Council	13	262	7	217
Surrey Wildlife Trust	9	237	7	228
Surrey County Council	21	202	4	94
Hampshire County Council	8	124	3	81
Surrey CC/ Surrey WT	2	110	2	110
Forestry Commission	14	107	2	32
Horsell Common Preservation Society	5	89	2	58
Guildford Borough Council	7	30	1	6
Woking Borough Council	1	26		
uncertain	3	19	1	13
Unofficial	6	18		
Hampshire Wildlife Trust	1	15		
Crown Estate	2	14		
Hart District Council	2	11		
Private	3	9		
BBOWT	1	8		
Berkshire County Council	2	5		
Windlesham Parish Council	1	4		
Total	**160**	**2,348**	**44**	**1,575**

Map 2: Parking provision across the Thames Basin Heaths.



Map 3: Parking provision across the Thames Basin Heaths.



2.6 Table 4 summarises the accessible area and number of parking spaces for individual patches (i.e. discrete accessible areas, see Appendix 1 for how these are derived). This shows that patches such as Pirbright Common & Ash Ranges, and Crowthorne Wood & Bagshot Heath have a large number of parking locations and spaces. However, these are large sites and therefore the density of spaces per hectare is relatively low. Sites such as Sheet's Heath, Bisley Common and Lightwater Country Park are much smaller and have the highest densities of spaces per hectare.

Table 4: Parking at component parts of the SPA with access. Table gives the total number of locations and parking spaces and the number of locations and spaces per hectare of accessible area. The bottom three values for each site are highlighted in blue and the top three in red.

Patch	Accessible area (ha)	Parking locations	Parking spaces	Locations /ha	Spaces /ha
1. Edgbarrow Woods (Owlsmoor)	93	4	33	0.04	0.35
2. Sheet's Heath	44	4	41	0.09	**0.94**
3. Bisley Common	**16**	**1**	30	0.06	**1.85**
4. Lightwater Country Park	62	7	189	**0.11**	**3.06**
5. Cuckoo Hill	111	8	51	0.07	0.46
6. Pirbright Common & Ash Ranges	**1,549**	**20**	**237**	**0.01**	0.15
7. Bourley and Long Valley	**889**	**24**	**231**	0.03	0.26
8. Hazeley Heath	169	4	18	0.02	0.11
9. Bramshill and Warren Heath	844	12	51	0.01	**0.06**
10. Yateley Heath Wood	276	5	19	0.02	**0.07**
11. Yateley Common (north)	186	7	98	0.04	0.53
12. Yateley Common (south) & Hawley Common	332	8	211	0.02	0.64
13. Bullswater Common	61	7	30	**0.11**	0.49
14. Whitmoor Common (West)	133	4	83	0.03	0.63
15. Whitmoor Common (East)	39	2	**8**	0.05	0.21
16. Wilsey Common	114	2	22	0.02	0.19
17. Ockham and Boldermere	119	2	110	0.02	0.92
18. Crowthorne Wood & Bagshot Heath	**1,505**	13	**478**	**0.01**	0.32
19. Horsell Common	150	5	89	0.03	0.59
20. Chobham Common south of M3	360	**14**	202	0.04	0.56
21. Chobham Common north of M3	291	6	115	0.02	0.40
22. Broadmoor Bottom	**8**	**1**	**2**	**0.12**	0.24
23. Lucas Green	**23**	**0**	**0**	**0.00**	**0.00**
Total	**7,374**	**160**	**2348**	**0.02**	**0.32**

Levels of access by car

2.7 The vehicle count data collected by the Thames Basin Heaths Partnership staff (see Appendix 1), provide a value for the number of vehicles for each of the 160 parking locations on each survey count. The overall mean number of vehicles at each parking location summed across all visits was 515.6 vehicles. This provides a conservative figure on the “typical” level of car-visits at a given moment across the SPA. However, it is important to note that there are a limited number of winter counts and survey effort doubles during June, July and August (see Appendix), so this figure is likely to be relatively high.

2.8 This average is given in Table 5 and scaled up by typical vehicle occupancy (from visitor data) to give the total number of visitors. Alongside this we also give similar data using different base levels of vehicles. On the recognition that visitor use is likely to fluctuate over time and on occasion (such as bank holidays) marked peaks are likely to occur, we also give the maximum (sum of maxima for each location). We also show the mean and the maximum increased by 20%, reflecting that there is the potential for further peaks to occur (for example when good weather coincides with a bank holiday). Considering the maximum levels of access observed on the counts, only a third of locations (31%) would be full, suggesting there is some scope to modify parking locations and redistribute access currently. Only under the maximum values, increased by 20%, are individual parking locations over capacity and overspill therefore necessary to accommodate the level of access.

2.9 Even at individual patches, there are few locations where the car parking is close to capacity. Table 6 shows the percentage fullness (i.e. the % of spaces in use on a given count), averaged across all parking locations and this shows no SSSI with a value above 34%. This suggests that, at current typical levels of use on a given SSSI, only around a third of the parking spaces are likely to be in use at any given time.

Table 5: Summary of the number of vehicles considered to be using the SPA at a time under four estimates. The table also presents these estimates relative to parking capacity at each location and the overall total parking spaces available (2,348). An estimate for the number of visitors is given based on group sizes from recent visitor surveys (Southgate et al., 2018).

Estimate	Vehicles	Visitors (*1.63)	Full locations (at capacity)	Overspill locations (over capacity)	Total parking spaces available (out of 2,348)
Mean	515.6	840.4	0	0	1832.4
Maximum	1513	2466.2	49	0	835
Mean +20%	618.8	1008.6	0	0	1729.2
Maximum +20%	1815.6	2959.4	56	58	532.4

Table 6: The average percentage fullness of each parking location under the four scenarios of levels of access and under current capacity. These are summarised as an average for each of the patches.

	Mean average %	Max average %	Mean +20% %	Max+20 % %
1. Edgbarrow Woods (Owlsmoor)	14	59	17	71
2. Sheet's Heath	5	40	6	48
3. Bisley Common	30	60	36	72
4. Lightwater Country Park	25	81	31	98
5. Cuckoo Hill	24	78	28	94
6. Pirbright Common & Ash Ranges	18	82	22	98
7. Bourley and Long Valley	16	62	20	74
8. Hazeley Heath	6	22	7	26
9. Bramshill and Warren Heath	12	62	15	75
10. Yateley Heath Wood	2	34	3	41
11. Yateley Common (north)	14	62	17	74
12. Yateley Common (south) & Hawley Common	18	63	22	76
13. Bullswater Common	8	58	10	70
14. Whitmoor Common (West)	34	87	41	105
15. Whitmoor Common (East)	8	50	10	60
16. Wilsey Common	6	20	8	24
17. Ockham and Boldermere	24	48	29	58
18. Crowthorne Wood & Bagshot Heath	18	73	22	87
19. Horsell Common	20	57	24	69
20. Chobham Common south of M3	12	50	14	60
21. Chobham Common north of M3	7	41	8	49
22. Broadmoor Bottom	7	50	9	60
23. Lucas Green				
Total	**16**	**62**	**19**	**74**

2.10 The extent to which people roam from access points on the Thames Basin Heaths were summarised in Liley *et al.* (2006). These data showed that the mid-point of visitor routes were a median distance of 707m from their starting point – in other words visitors typically follow a circular walk and the mid-point of the circumference of that circular walk is 707m (i.e. the diameter) from where they started. This gives an indication that we might expect most of the footfall to be associated with the area within 750m of a car park. Overall, just 21% of Thames Basin Heaths SPA accessible patches are beyond 750m of a parking location. Seven of the 23 patches have none of their area beyond 750m of a parking location, and only three patches had a quarter or more of the area beyond 750m of a parking location[1] (these were: Crowthorne Wood & Bagshot Heath (50% beyond 750m), Bramshill and Warren Heath (28%) and Pirbright Common & Ash Ranges (26%).

Previous attempts to control parking provision

2.11 There have been some closures of informal parking locations by the MOD. These generated some public hostility and anecdotal information suggests that visitors continued to visit the same areas, instead parking on verges or walking from other, nearby parking locations. There have been issues at some MOD sites where attempts to limit access with metal barriers have been broken to allow people entry.

2.12 At Horsell Common the Sandy Lane Car Park was changed to members only and this prompted a marked increase in use of the nearby Roundabout Car Park.

2.13 There have also been parking charges introduced at some sites, for example charging was introduced at Chobham Common in 2018 (and stopped in 2020). While the charges were in place, the Thames Basin Heaths Partnership staff have indicated there was no change in the numbers of people visiting Chobham Common, however the distribution of use changed. Areas of relatively poor quality habitat in the vicinity of the car park were used less while more sensitive areas had an increase in use, as a result of people parking in the village or by the studios in order to avoid parking charges.

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[1] This excludes Lucas Green where there is no parking

2.14 Parking charges vary in prices and have not been audited extensively as part of this project. However, prices at The Look Out, by far the largest parking location in terms of capacity, are currently £2.60 per visit for up to 4 hours and then £4.90 for the whole day.

Summary: How the implementation of parking controls would be effective as a mitigation measure

Currently there are around 160 parking locations with around 2,348 spaces that provide access to the SPA. Most parking locations are small with few spaces. Formal car parks account for 27.5% of the locations and provide around 67% of the spaces. There is much variation across different parts of the SPA as to the number of spaces per ha of accessible land. Small sites such as Sheet's Heath, Bisley Common and Lightwater Country Park have the highest densities of parking spaces per hectare of accessible land, suggesting that if the parking were a reflection of visitor numbers, these would have the highest densities of access.

Counts conducted by the Thames Basin Heaths Partnership have recorded an average of 515.6 vehicles parked on or around the SPA at any one time. Taking the peak count at each parking location and summing these gives a maximum of 1,513 vehicles, still well below the overall number of spaces. This would suggest that there is considerable over provision of parking currently, such that there are many more spaces than visitors. This would mean that visitors have a wide choice and that measures to reduce parking might need to be considerable to reduce the choice to a level where distribution can be manipulated.

Only 21% of the SPA is located beyond 750m from a parking location. 750m is used as a value for how far visitors typically reach from a car park before turning back (the figure is approximate and is rounded up from the median value, so many more will reach further than this). This means most of the site is easily accessible from a car park.

There have been limited occasions where parking controls have been implemented around the SPA and these have been contentious and not necessarily worked well.

3. Aim 2 - To explore scope for implementing parking control measures

3.1 To explore the scope for potential parking measures we used the parking data and a model created to redistribute vehicles when parking locations were full to the next nearest alternative – for full details see the methods in the Appendix. The 7 different scenarios considered are described in Table 7. These are intended to be indicative and not necessarily practical or achievable, simply a way of exploring the implications of different approaches.

Table 7: Details of the 7 model scenarios used to test the implications of different parking controls. These are indicative scenarios and do not reflect practicalities on the ground.

Scenario	Detail	Parking locations available	Parking spaces available
Current	-	160	2,348
A: Formal car parks only	Closure of all but the formal car parks	44	1,575
B: Reduce formal parking	Reduction of formal parking capacity by 20% (decimal capacities rounded)	160	2,033
C: Informal parking controlled	Closure of all “Track entrances” and “Verges”	83	1,841
D: More formal, less informal	Increase in formal parking capacity by 20%, but decrease informal capacity by 20%	160	2,186
E: MOD parking restriction	Closure of MOD parking (locations owned/managed by or thought to be MOD)	105	1,702
F: Increase coniferous, reduce others	Parking locations at predominantly coniferous areas from the National Forest Inventory Woodland England 2018 (over 50% cover of the patch within 750 metres) increased by 40% and all others decreased by 20%	160	2,307
G: Largest top 75% of spaces	Largest locations which account for 75% of parking spaces only open (based on current mean vehicles)	43	1,766

3.2 The models work to manipulate the parking provision, assuming a starting point with the same level of access (vehicles) and assuming that any visitor will seek parking locations on the SPA rather than elsewhere, such that if one parking location is full they will switch to the next nearest available location. As such the models have no strict reduction in access, as we have not considered displacement away from the SPA, but result in different parts of the site having different levels of access as a result of changes in parking distribution, as shown in Table 8. In some cases the changes are marked. For example the closure of parking at all MOD sites would result in marked increases (over 250%) at sites such Yateley Heath Wood and Hazeley and an increase at Wisley by 175%.

Table 8: The maximum count of vehicles at each parking location, totalled by patch, and the percentage change from this value for the number predicted at each patch under the 7 scenarios. For scenario A (the closure of formal car parks), this model could not be run as available parking spaces were exceeded. The total number of vehicles across the SPA was the same in every scenario (1,513). Patch 23, Lucas Green is not shown as there is no parking provision.

Scenario		Maximum count of vehicles	A: Formal car parks only	B: Reduce formal parking	C: Informal parking controlled	D: More formal, less informal	E: MOD parking restriction	F: Increase coniferous, reduce others	G: Largest top 75% of spaces
1	Edgbarrow Woods (Owlsmoor)	25	-	8	-4	12	12	0	-32
2	Sheet's Heath	13	-	32	-31	0	100	**69**	**100**
3	Bisley Common	18	-	**33**	22	**33**	67	**33**	**67**
4	Lightwater Country Park	163	-	**-8**	4	**-7**	16	**-9**	-2
5	Cuckoo Hill	34	-	17	-3	12	29	15	-56
6	Pirbright Common & Ash Ranges	140	-	-1	-15	0	**-97**	3	7
7	Bourley and Long Valley	120	-	0	8	0	**-80**	0	6
8	Hazeley Heath	5	-	0	0	0	**260**	0	**-100**
9	Bramshill and Warren Heath	31	-	0	-6	0	35	0	**-100**
10	Yateley Heath Wood	5	-	**40**	**-60**	0	**280**	20	**-100**
11	Yateley Common (north)	33	-	2	**36**	0	45	0	6
12	Yateley Common (south) & Hawley Common	115	-	**48**	-6	**44**	**-77**	-1	13
13	Bullswater Common	20	-	29	**-40**	30	50	15	**-100**
14	Whitmoor Common (West)	77	-	**-13**	6	**-12**	8	**-14**	3
15	Whitmoor Common (Eastt)	6	-	**33**	**-100**	**50**	33	17	**-100**
16	Wilsey Common	8	-	0	0	0	**175**	0	0
17	Ockham and Boldermere	55	-	0	**33**	0	100	0	**55**
18	Crowthorne Wood & Bagshot Heath	455	-	**-13**	-4	**-12**	0	**-1**	-6
19	Horsell Common	64	-	0	6	0	39	0	5
20	Chobham Common south of M3	71	-	0	7	0	110	0	32
21	Chobham Common north of M3	54	-	0	6	0	24	2	19
22	Broadmoor Bottom	1	-	0	**100**	0	100	**100**	**-100**

How controls could be applied in different ways (e.g. seasonal/temporary/permanent; whole SPA/part)?

Temporal variation

3.3 Options to apply controls seasonally could involve:

- Increasing parking capacity at certain locations and reducing capacity at others on a seasonal basis;
- Gated access with gates closed during part of the day, for example car parks close to key areas for birds could be closed in the early part of the morning and late afternoon to provide periods with reduced access;
- Closing car parks entirely on a seasonal basis.

3.4 The parking data available includes little data for the winter period (see Appendix 1), however the winter counts do show reduced levels of access by car. The average number of vehicles recorded at each parking location in the period March-August (inclusive) was 17% higher compared to the rest of the year (an average of 516 vehicles compared to 440 vehicles).

3.5 During the winter there is therefore more parking capacity, however there is potentially little benefit in changing visitor access patterns outside the bird breeding season.

3.6 Visit use during the day is shown in Figure 2. It can be seen that peak visitor use (averaged across the year) is between 10 and 5 and the number of visitors outside this period is likely to be relatively low at any given access points. Closing a selection of access points outside of this peak visitor period is therefore likely to affect relatively few visitors, but could be a mechanism to create some quieter parts of the SPA. Such an approach would be most relevant at parking locations well away from housing and where there were high numbers of birds nearby.

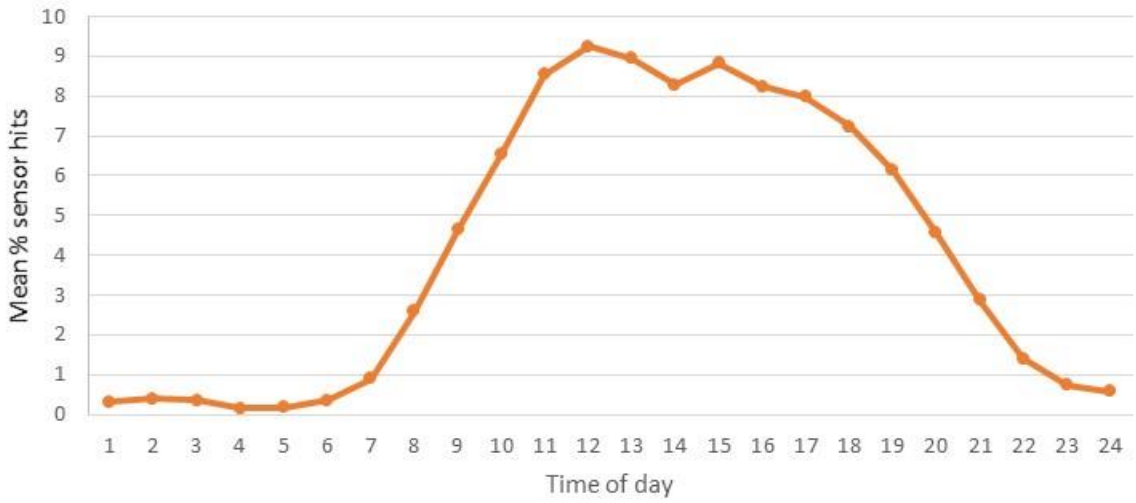


Figure 2: Sensor data (all sensor data 2016-2017, all months) showing mean % of recorded passes per hour.

Controls over part of the SPA only

3.7 Were controls to be instigated over part of the SPA only, then redistribution to other parts of the SPA (and perhaps also to SANGs and other greenspaces) is likely. This is considered in our earlier modelling (Table 8), where some patches have had access by car greatly reduced. In these scenarios we assume that visitors still visit the SPA and do not go to SANGs instead. This is a reasonable approach to take as the aim of this work is to consider the potential to reduce the need for SANG, and were deflection to SANG to occur then this would risk using up the (limited) SANG capacity.

3.8 Targeted scenarios which favour geographic areas such as 'E: MOD parking restriction' result in near complete closure of parking in some areas and thus a 100% or close to 100% reduction in access by car. A number of similar geographic restrictions targeted at particular sites are likely to have a significant result in reducing access. Similarly, the scenario G: Largest top 75% of spaces, results in a complete reduction of access by car to some of the small patches, although many of these are quiet sites already, as they have little current parking provision.

Whether parking control would be best implemented alongside other mitigation options (e.g. seasonal access management)?

3.9 Parking control measures are likely to be most effective if combined with other measures. Changing parking spaces or parking locations is ultimately a means to redistribute access and this can dovetail with engagement measures very neatly. Where visitor use is concentrated it is much easier to engage with visitors and easier to ensure they see signs and other on-site information. For example, having fewer parking locations and each having one clear route out of the car park is likely to help concentrate and funnel use and mean that warden time, interpretation etc. can be directed effectively.

3.10 Any control will need to carefully plan for displacement. This may involve SANG sites and may mean SANG capacity is compromised. It is likely that some displacement will involve visitors trying to visit the same locations but finding new parking locations, and this could include verges, gateways etc. This could create highways issues, be dangerous and antagonise local residents. Monitoring of parking will be necessary prior to the implementation of any control and regularly after, with the monitoring used to target solutions and further interventions as necessary (see para 6.6 for details regarding potential interventions and enforcement).

3.11 In Table 9 we summarise the current number of parking spaces and the potential displacement that could occur under the different scenarios. Our models assume that visitors stick to the SPA and choose the next nearest parking location if a given location is full. Under some scenarios there are a residual number of spaces still remaining while in others it is not possible to accommodate all vehicles on SPA parking locations and we can summarise the overspill that would therefore be displaced outside of the SPA. The table suggests that there are sufficient parking spaces to accommodate visitors under all scenarios based on: the current use; the current use increased by 20%; or even maximum parking use (i.e. the maximum count of vehicles at each car park used as the base). Only when we considered levels of use to be at the maximum plus 20% was there a lack of capacity on the SPA under certain scenarios, and these were scenarios that involved major levels of parking locations no longer available.

Table 9: Summary of the number of parking locations and spaces available currently and under the 7 scenarios. The difference between the number of parking spaces and number of vehicles estimated under four levels of access is given to show the number of parking spaces available (with negative values, highlighted in red, being overspill).

Scenario	Parking locations available	Parking spaces available	Parking spaces remaining (negative being overspill)			
			Mean (515.6)	Mean + 20% (1513)	Max (618.8)	Max + 20% (1815.6)
Current	160	2,348	1,832	835	1,729	532
A: Formal car parks only	44	1,575	1,059	62	956	**-241**
B: Reduce formal parking	160	2,033	1,517	520	1,414	217
C: Informal parking controlled	83	1,841	1,325	328	1,222	25
D: More formal, less informal	160	2,186	1,670	673	1,567	370
E: MOD parking restriction	105	1,702	1,186	189	1,083	**-114**
F: Increase coniferous, reduce others	160	2,307	1,791	794	1,688	491
G: Largest top 75% of spaces	43	1,766	1,250	253	1,147	**-50**

3.12 There is a risk of any parking controls antagonising visitors and creating hostility. It would be unfortunate if this were directed towards the Thames Basin Heaths Partnership and could risk undermining their engagement and awareness raising. To minimise any issues, any engagement specifically relating to parking controls and any warden time/enforcement may be best implemented by a different body.

What could be the triggers for introducing parking controls (e.g. seasonal closures or closure in particular areas)?

3.13 Triggers for introducing parking controls could be temporal (e.g. a particular time of year), ecological (e.g. the presence of Annex I birds) or relate to the type of parking location (for example formal vs informal).

Temporal

3.14 Timing of the bird breeding season in relation to access management is discussed in both the dog control report and access management control report that accompany this document. We have indicated there is some merit in changing the timing referred to as the 'bird breeding season' from the current March 1st – September 15th to include February (to encompass the Woodlark settling period).

Ecological

3.15 An ecological trigger could be the presence of Annex I birds in high densities or suitable habitat. These areas could change over time, for example with forest clearance, but would generally involve areas that could be clearly mapped and identified on the ground.

3.16 Figure 3 shows the frequency distribution for 50m cells in our patches and number of overlapping Annex I bird territories (data from 2015-2019, with point data buffered with circles of different sizes depending on species). Overall:

- 41.7% of cells (13,545 cells) had no bird territories;
- 29.2% of cells (9,478) overlapped with 1 to 3 territories;
- 29.1% of cells (9,450) overlapped with 4 or more territories.

3.17 Checks on the spatial data indicate the 9,450 cells with 4 more territories cover all or part of 84% of the SPA bird territories (2015-2019). These 9,450 cells are equivalent to 2362ha, highlighting the clumped distribution of the bird territories.

3.18 This clumped distribution could suggest the potential to focus controls on car parking that provides access to areas with high densities of birds. Parking locations that have the highest number of bird territories within 750m are summarised in Table 10 [2].

[2] See para 2.10 for background to the choice of 750m. It reflects a distance at which around half of visitors will roam from an access point

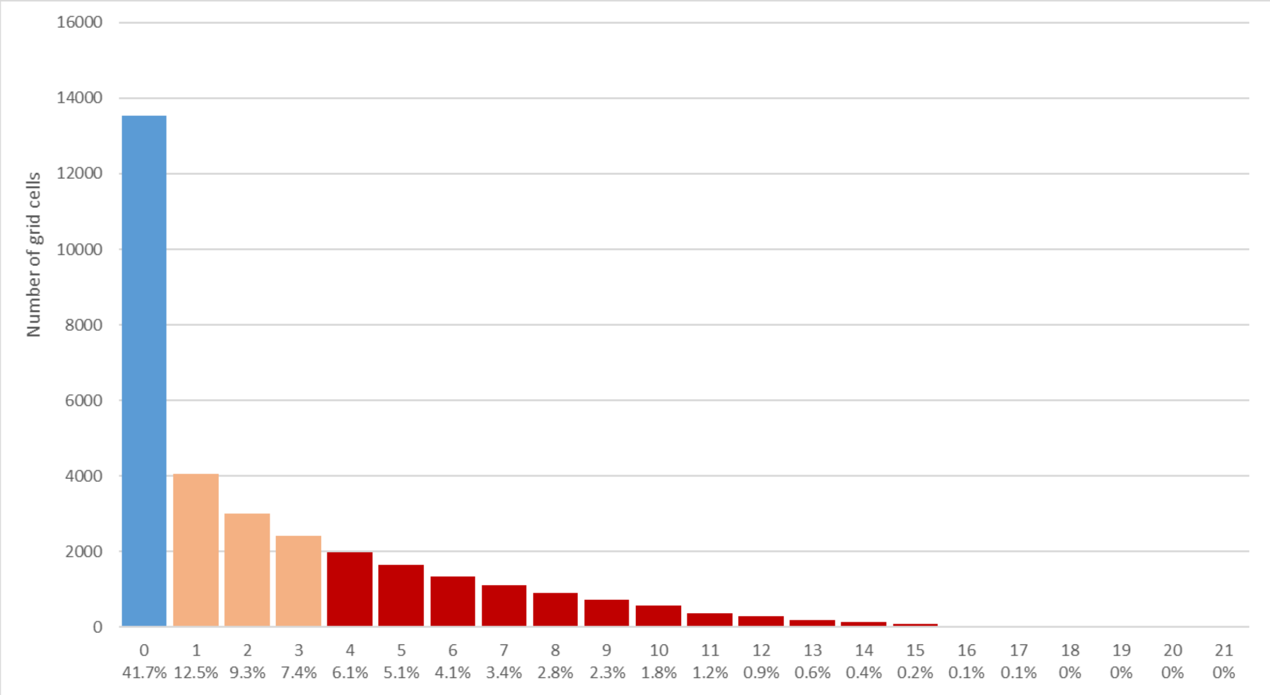


Figure 3: Frequency distribution of values for each count of SPA bird territories per cell from 0 to 21. The percentage of each class as a proportion of all cells is given at the bottom of the axis.

Table 10: Parking locations ranked by the mean number of SPA bird territories within cells which intersect a 750m buffer of the parking location. Top 23 highest locations are listed – all those above a mean value of 4 SPA bird territories.

Car Park ID	Parking description	Parking type	Parking capacity	Patch ID and Name	Mean number of SPA bird territories within cells which intersect a 750 m buffer
4_6	Verges on Burma Rd	Verge	35	21 Chobham Common north of M3	6.8
2_32	Unsurfaced lay-by adjacent to Common	Layby	26	12 Yateley Common (south) & Hawley Common	6.2
5_11	Dirt verge on Chapel Lane	Verge	3	13 Bullswater Common	5.9
4_1	Red Lion road. Entrance to footpath access	Layby	4	21 Chobham Common north of M3	5.5
4_2	Monument car park, Chobham Common	Car park	10	21 Chobham Common north of M3	5.5
4_7	Longcross car park, Chobham Common	Car park	14	20 Chobham Common south of M3	5.0
5_12	Parking area at the end of Chapel Lane	Car park	6	13 Bullswater Common	4.9
3_13	Gate access into Crowthorne Wood	Track entrance	12	18 Crowthorne Wood & Bagshot Heath	4.9
4_8	Staple Hill car park, Chobham Common	Car park	60	20 Chobham Common south of M3	4.6
4_5	Dirt verge opposite school entrance	Verge	2	21 Chobham Common north of M3	4.5
4_9	Jubilee Mount car park	Car park	30	20 Chobham Common south of M3	4.4
4_3	Roundabout car park	Car park	60	21 Chobham Common north of M3	4.4
4_4	Track entrance to Brick Hill off Chertsey Rd	Verge	4	21 Chobham Common north of M3	4.3
2_31	Parking beside Heathlands Cemetery	Layby	8	11 Yateley Common (north)	4.3
3_14	New car park into Crowthorne Forest	Car park	20	18 Crowthorne Wood & Bagshot Heath	4.3
6_20	End of Brentmoor Road, West End	Verge	2	Cuckoo Hill	4.2
4_15	Butts Hill verges	Verge	8	20 Chobham Common south of M3	4.1
4_16	Gracious Pond Farm, Chobham Common	Verge	10	20 Chobham Common south of M3	4.1
4_17	Gracious Pond Road, Chobham Common	Verge	5	20 Chobham Common south of M3	4.1
4_10	Verges on Staple Hill Rd	Verge	7	20 Chobham Common south of M3	4.0
2_21	Hawley Lake - Track entrance	Track entrance	3	12 Yateley Common (south) & Hawley Common	4.0

Are there any areas in which controls could not be implemented?

3.19 We would suggest that parking locations that are within close proximity of SPA bird territories should not be increased. Scenarios such as F (Increase coniferous, reduce others) will be the most likely to avoid these areas. However other measures may indirectly cause displacement to sensitive areas. Only 5 parking locations did not have any SPA bird territories in the 50m cells which intersected a 750m buffer of the parking location. It can be seen in Table 11 that two of our scenarios (C and E), result in parking that on average has a higher density of Annex I birds in close proximity compared to others. It is also notable that were only the formal car parks to be used the average bird density in the areas around available car parks would be low. This would suggest that either the formal car parks are close to poor habitat for Annex I birds or that there are reduced densities around them.

Table 11: Summary of the density of SPA bird territories in close proximity to parking locations remaining opening under the 7 different scenarios. Those above or below the current average are highlighted in red and blue respectively.

Scenario	Parking locations available	Mean number of SPA bird territories within cells which intersect a 750 m buffer
Current	160	2.13
A: Formal car parks only	44	**2.07**
B: Reduce formal parking	160	2.13
C: Informal parking controlled	83	**2.28**
D: More formal, less informal	160	2.13
E: MOD parking restriction	105	**2.34**
F: Increase coniferous, reduce others	160	2.13
G: Largest top 75% of spaces	43	2.13

3.20 We recognise that closures or significant changes to parking locations may be difficult for a number of logistical reasons and these would need to be explored in much more detail on a case-by-case basis. Parking locations are owned and managed by a range of organisations, used by a range of visitors (in some cases including those who do not use the SPA) and in many instances are long established. We acknowledge some of the issues which mean closures could be difficult at specific parking locations and these are listed in Table 10. The 15 parking locations listed in Table 10 account for a total of 734 spaces (31%), however this reduced to just 212 (9%) if we exclude the Lightwater country park/leisure centre and the Look Out.

Table 12: Parking locations with issues with regards to a closure.

Car Park ID	Parking description	Parking type	Parking capacity	Patch ID and Name	Reason
1_17	Gravel car park on Aldershot Road	Car park	15	7 Bourley and Long Valley	Beside pub/restaurant
2_31	Parking beside Heathlands Cemetery	Lay-by	8	11 Yateley Common (north)	Other
2_36	Car park for sports ground at Hawley Green	Car park	60	12 Yateley Common (south) & Hawley Common	Non-SPA recreation
3_7	The Look Out Discovery Centre	Car park	350	18 Crowthorne Wood & Bagshot Heath	Non-SPA recreation
5_2	Gravel car park off Burdenshott Road	Car park	25	14 Whitmoor Common (West)	Beside pub/restaurant
5_25	Gravel car park	Car park	12	6 Pirbright Common & Ash Ranges	Beside pub/restaurant
5_27	Recreation ground car park off Ash Hill Road	Car park	60	6 Pirbright Common & Ash Ranges	Non-SPA recreation
6_17	Verge on Brentmoor Road	Verge	2	5 Cuckoo Hill	Beside pub/restaurant
6_21	Bisley car park on A322	Car park	30	3 Bisley Common	Beside pub/restaurant
6_24	Parking by entrance gate	Layby	3	4 Lightwater Country Park	Non-SPA recreation
6_25	Parking opposite kids playground	Car park	8	4 Lightwater Country Park	Non-SPA recreation
6_26	Roadside parking opposite cafe	Car park	10	4 Lightwater Country Park	Non-SPA recreation
6_27	Parking on side road and area behind cafe	Car park	35	4 Lightwater Country Park	Non-SPA recreation
6_28	Opposite leisure centre	Car park	55	4 Lightwater Country Park	Non-SPA recreation
6_29	2nd car park to west of leisure centre car park	Car park	61	4 Lightwater Country Park	Non-SPA recreation

3.21 There are some locations which are explicitly pub and restaurant car parks, or refer to verges or car parks near to or beside pub/restaurants that appear to be overflow parking for those establishments. These would be difficult to enact any closure, outside of partner ownership, and may result in significant harm to businesses. Furthermore, a number of locations provide non-SPA recreation, ranging from small recreation grounds and tennis courts, to leisure centres and country parks. These are all important leisure and cultural sites and will include other locations (e.g. the Heathlands Cemetery).

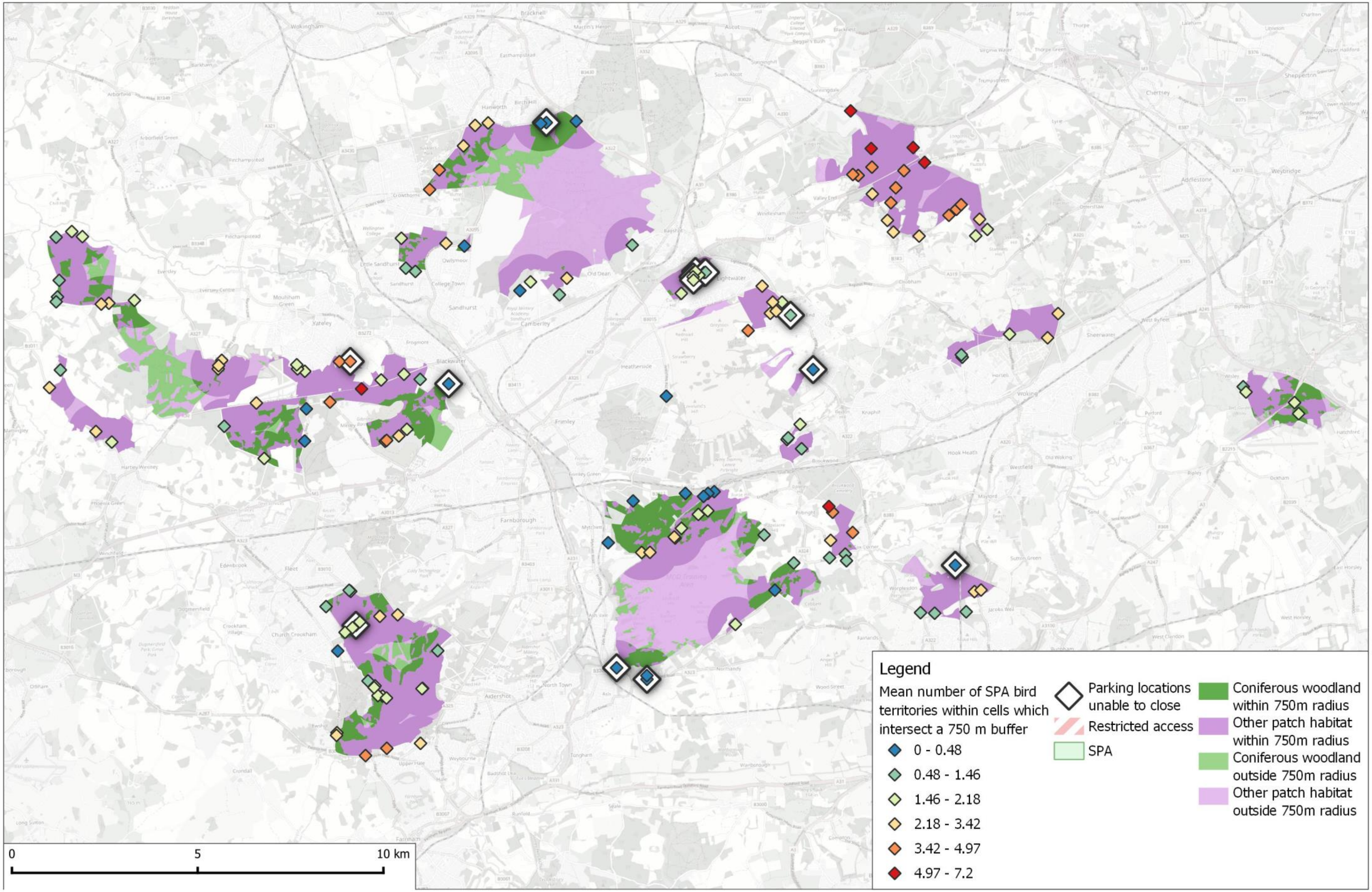
3.22 More generally, closures can often be more difficult at locations with visitor infrastructure (e.g. toilets, cafes), such as at Ockham Common, Boldermere Car Park. However, in some instances these closures could coincide with needed cutbacks in upkeep for such facilities.

3.23 Closures at parking locations which also provide access to SANGs sites also pose a dilemma. This could better be addressed by signage or infrastructure on the SPA which advertised the SANG alternative.

3.24 Control of parking on laybys may be difficult if these are formal laybys and maybe a highways and safety issue. Closure of laybys on narrow access roads, which can function as passing places to business premises (or access to sewage works, MOD facilities etc.) may also be challenging to change.

3.25 Finally, it is noted that some parking locations have recently been opened or improved (e.g. Tweseldown car park) and marked change would be difficult to justify, irrational and potentially more controversial.

Map 4: Habitat and bird density within 750m of parking locations. Parking locations are categorised by bird density and those unable to close highlighted.



What are the potential costs of delivering these potential measures?

3.26 Indicative costs for delivering potential controls are:

- £3,000 for a car park closure (by the use of a simple earth bank or dragon's teeth;
- £24,050 for a car park improvement (surveying, design, assessments, clearance, surfacing and minor infrastructure)
- £4,000 for reduction in parking spaces.

3.27 These costs are drawn from mitigation strategies in other locations but represent very simple, generic costs. Works on individual car parks are likely to be site specific and require on the ground assessment of the works and feasibility. As such costs for individual locations may vary greatly.

3.28 We have applied these generic costs to the scenarios tested in this report and the overall costs for each scenario are estimated in Table 13. Overall, scenarios which simply close parking locations are relatively low cost, under £250,000, ranging to those which require reductions and increases at every location e.g. D where the costs are in the region of £1.5 million.

Table 13: Example indicative costs for scenarios.

Scenario	Parking to remain open	Parking to close	Parking to expand	Parking to reduce	Estimated cost
Current	160	0	0	0	-
A: Formal car parks only	44	116	0	0	£348,000
B: Reduce formal parking	160	0	0	116	£464,000
C: Informal parking controlled	83	75	0	0	£225,000
D: More formal, less informal	160	0	44	116	£1,522,200
E: MOD parking restriction	105	55	0	0	£165,000
F: Increase coniferous, reduce others	160	0	17	143	£980,850
G: Largest top 75% of spaces	43	117	0	0	£351,000

3.29 Reductions are some of least costly parking management options, and have a very high cost benefit for their immediate reduction in access. However, these are also the most controversial with regards to public opinion. The costs above do not include the significant engagement, consultation, communication and monitoring necessary to ensure any controls can be implemented effectively.

3.30 An idea not considered in our scenarios would be the creation of an entirely new parking location, in line with a reduction in other areas to provide the same net level of parking provision. An entirely new parking location would obviously have to be carefully thought through and be targeted in a least sensitive location, and be a large formal car park to accommodate high footfall. A new location could be located on non-SPA land, but provide access into less sensitive SPA areas to provide the same feel (e.g. mixed, predominately coniferous plantation). Costs for a new formal parking location of around 80 spaces is likely to be in the region of £180,000[3]. However, given the number of parking locations available currently and potential difficulties in acquiring land for this, it may be more feasible to expand existing locations than create entirely new locations.

[3] 80 spaces surfaced with a permeable paving grid and associated infrastructure e.g. height barrier. This assumes access onto highway already provided and no drainage issues.

Summary: Scope for implementing parking control measures

We have used a model to test different scenarios of parking control. The model assumes that if a parking location is full or unavailable they will shift to the next nearest location. Testing different hypothetical scenarios indicates closing parking could result in marked redistributions of visitors arriving by car.

There are options for controls to be applied in different ways, including seasonal (bird breeding season), time of day (gating car parks to restrict access in early morning and evenings) or across parts of the SPA only.

Parking control measures are likely to be most effective if combined with other measures. Changing parking spaces or parking locations is ultimately a means to redistribute access and this can dovetail with engagement measures very neatly. Where visitor use is concentrated it is much easier to engage with visitors and easier to ensure they see signs and other on-site information. Implementing any parking control would require a communication strategy, engagement, information provision and clear guidance to visitors as to what the changes mean for them. Engagement will be required prior to any implementation and for a considerable time period after.

Triggers for introducing parking controls could be temporal, ecological or relate to the type of parking location. Bird distribution is clumped rather than evenly distributed across the SPA and there are some locations with particularly high densities within close proximity to parking locations. This is particularly the case at Chobham Common.

There are parking locations where controls would not be possible or practical, for example those associated with local businesses (such as pubs) or that provide access to local facilities as well as the SPA. We provide indicative costs for parking controls and scale these up for different scenarios. Closing informal parking locations, verges and lay-bys is the least expensive option of those considered.

4. Aim 3 - To consider the potential capacity of these measures

What potential scale of avoidance/mitigation would be provided by implementing parking controls?

4.1 Using the scenarios described and the predicted number of vehicles (and therefore visitors) at each access point, we modelled the spatial distribution of visitors across the SPA patches. Full details of how we have generated these models are given in Appendix 1.

4.2 The predicted distribution of visitors is shown in Maps 5 to 12. Map 5 shows the prediction based on current parking provision. The other Maps 6 to 12 show the prediction based on the 7 parking provision scenarios applied to the current mean number of vehicles.

4.3 The maps are revealing in that they indicate that the overall visitor distribution and pattern of access will change relatively little – see also the percentage of cells in classes used in Maps 5 to 12 shown in Figure 4. Despite some relatively marked parking controls, the models using mean vehicles in some instances result in no changes at all, as all parking can be absorbed within the patch area.

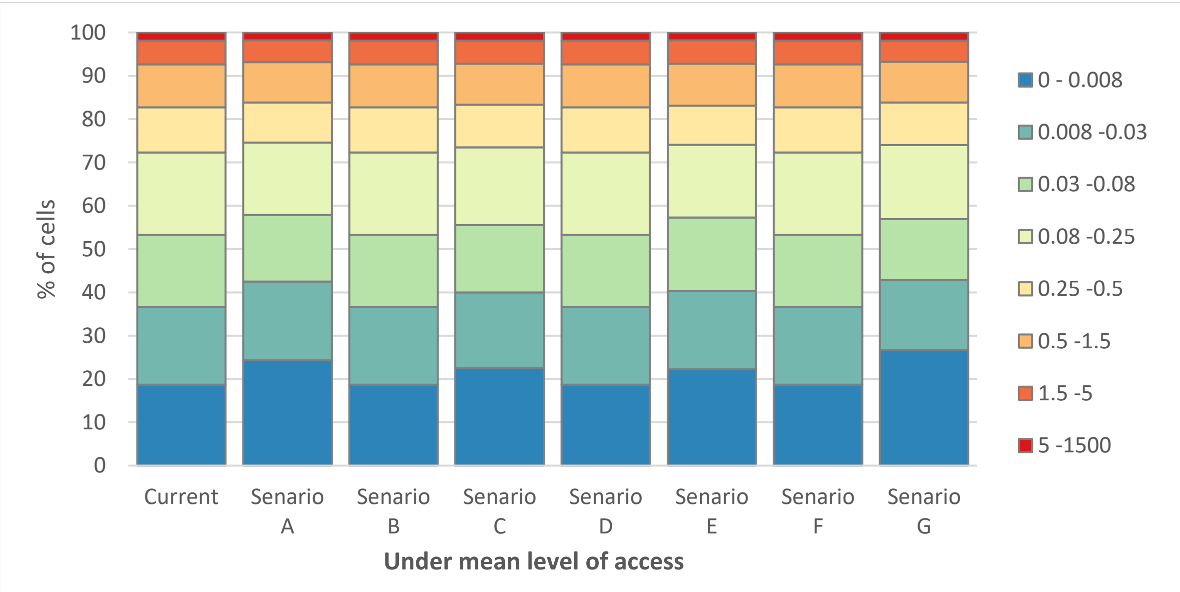


Figure 4: Stacked plot to show the percentage of grid cells in each class of visitors per hour, under the current parking provision and the 7 scenarios, as shown in Maps 5 to 12.

4.4 To highlight the subtle changes in levels of access Maps 6 to 12 include an inset graph which shows the level of change (difference) in predicted level of access for each patch between total visitors predicted under the current distribution of parking provision (i.e. visitor patterns in Map 5) and the total visitors predicted under the scenario. Scenarios B, D and F (Maps 7, 9 and 10) do not have an inset graph as they resulted in no change in access as an overall for the patches.

4.5 Changes in access seen across patches depend greatly on the scenario. For example, scenario A, formal car parks only, shows a reduction at 18. Crowthorne Wood & Bagshot Heath and 12. Yateley Common (south) & Hawley Common, with access displaced to 4. Lightwater and 1. Edgbarrow Woods (Owlsmoor) and 11. Yateley Common (north). Scenarios C and E, Informal parking controlled and the MOD parking restriction, result in reductions at 6. Pirbright Common & Ash Ranges. Scenario G closure of small car parks, results in rural small car parks closing, decreasing access at 8. Hazeley Heath, 9. Bramshill and Warren Heath and 11. Yateley Common (north), but displacing much of this to result in the large increase at 12. Yateley Common (south) & Hawley Common.

4.6 It is also important to note that the models include foot visitors, and foot access to access points is predicted based on the amount of housing surrounding each access point. Our predictions indicate that around a third (32%) of all access to the SPA patches is actually on foot, and parking controls will not affect these visitors in any way.

4.7 The inset graphs in Maps 6 to 12 are also shown in Figure 5, alongside the same set of graphs which show the difference for each scenario when under the maximum levels of access. These increased levels of vehicles inputted caused parking locations to be full and result in more redistributions between patches.

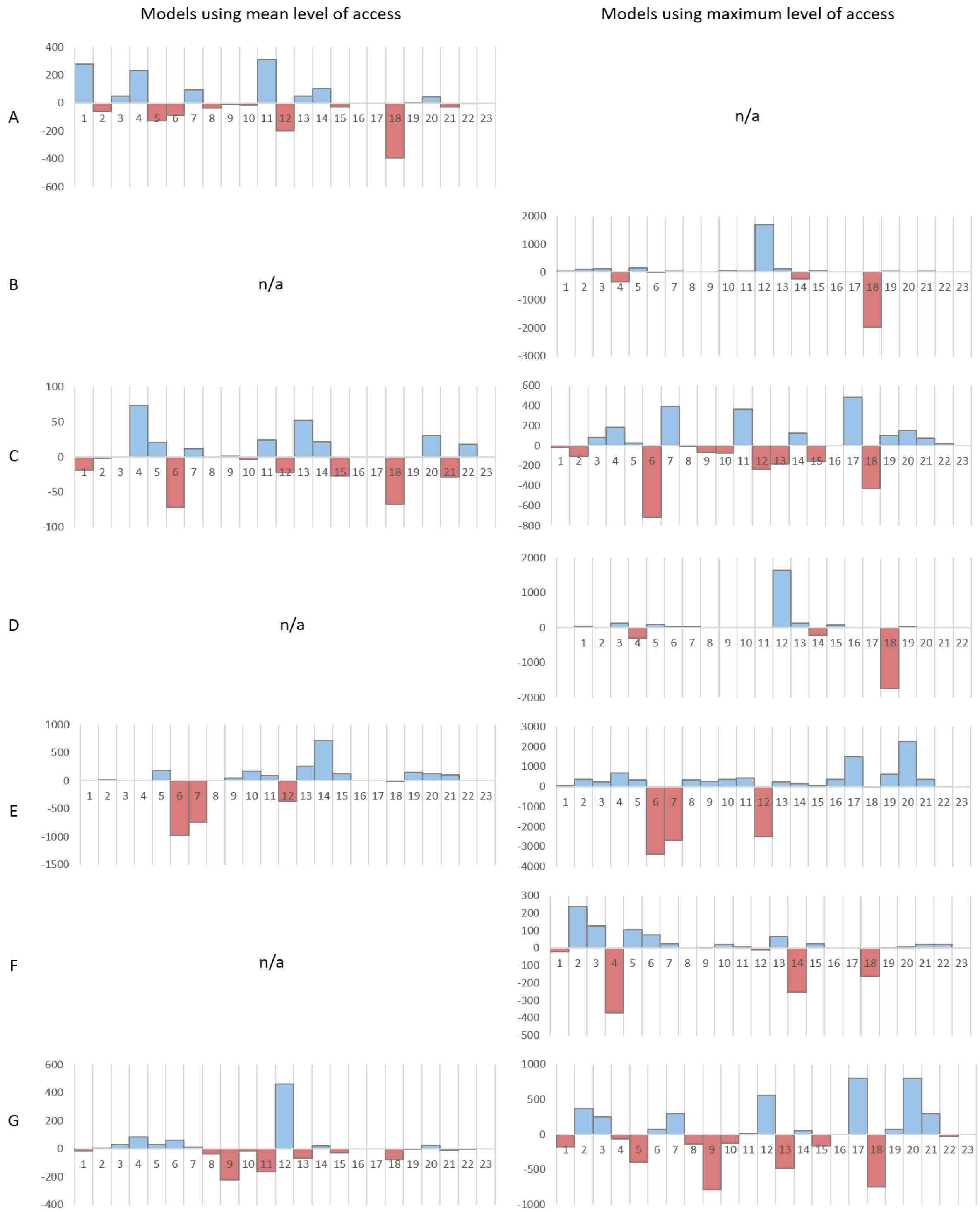


Figure 5: Graphs of the change (difference) in the level of access for each of the 23 patches under each of the 7 scenarios (rows). The scenarios are shown for the change between current level predicted and predicted level of total access under the mean or maximum estimates (columns). The graphs presented for the mean levels of access are the same as those given in Maps 6 to 12. X axis is number for the 23 patches and Y axis change in total visitors for the scenario compared to current parking provision. Positive values (blue bars) indicate an increased level of access in the patch, while

negative values (red bars) indicate decreased access for the patch. Graphs with “n/a” indicate those with no change (B, D, F) or where the model could not run (A).

4.8 In order to compare the visitor distributions in the different scenarios we extracted cells that exceeded 0.25 or more visitors per hour and those with at least 4 SPA bird territories (based on all years between 2015 and 2019) to recognise the extent of area which has high levels of footfall and coincide with areas well used by SPA birds. The change in access under the parking scenarios from the current parking provision is shown in Table 14.

4.9 In Table 14 we use red to indicate cells where the scenario has resulted in a predicted increase in the number of cells with a high level of access. Using the mean level of access there are no increases in the percentage of cells with high levels of access, however when the SPA is under greater strain (e.g. using the maximum parking values), some scenarios show increases in the percentage of cells with high visitor pressure (scenario B: Reduce formal parking and D: More formal, less informal).

4.10 The purple columns in Table 14 show the percentage of cells with high footfall which are also in areas regularly used by SPA birds. It can be seen that scenario B (Reduce formal parking) and E (MOD parking restriction) can result in an increase in the proportion of the area with high footfall in sensitive areas (i.e. high densities of birds) – although this depends on the levels of access being considered. Scenario E is of particular interest, as based solely on the proportion of cells with high footfall, there is a reduction (between 6% and 14% less cells with high footfall). However, cells remaining with high footfall were sometimes in sensitive areas (some scenarios showing a 15% increase in cells with high footfall in sensitive areas).

Table 14: Predicted number of grid cells over a threshold of 0.25 or more visitors per hour ( ), shown as a percentage of all cells for current parking provision (with number shown in brackets). Rows for each scenario then show a percentage change in number of cells below the threshold under the scenarios. Additional purple columns show the percentage grid cells above the threshold of 0.25 or more visitors per hour and with ≥4 SPA bird territories( ).

Scenario	Mean		Max		Mean +20%		Max + 20%	
Current	**28% (8985)**	**4% (1306)**	**42% (13600)**	**9% (2789)**	**29% (9578)**	**5% (1499)**	**45% (14608)**	**10% (3208)**
A: Formal car parks only	**-8.2%**	**-0.8%**	n/a	n/a	**-9.1%**	**-1.1%**	n/a	n/a
B: Reduce formal parking	**0%**	**0.0%**	**1.9%**	**1.2%**	**0%**	**0.0%**	**2.8%**	**1.1%**
C: Informal parking controlled	-4.2%	**-0.7%**	-9.9%	**-1.9%**	-4.3%	**-0.6%**	n/a	n/a
D: More formal, less informal	**0%**	**0.0%**	**1.4%**	**0.8%**	**0%**	**0.0%**	**3.1%**	**0.7%**
E: MOD parking restriction	**-6.3%**	**2.2%**	**-13.9%**	0.4%	**-7.2%**	**2.3%**	n/a	n/a
F: Increase coniferous, reduce others	**0%**	**0.0%**	0.4%	0.0%	**0%**	**0.0%**	**-0.5%**	**-1.1%**
G: Largest top 75% of spaces	-6%	**0.0%**	**-14.8%**	**-3.1%**	**-7.2%**	-0.5%	n/a	n/a

Equating changes to actual mitigation

4.11 It is complex to equate a parking approach to a level of avoidance/mitigation. Currently there is a very large over provision of parking on the SPA. Our scenario testing shows that, even with marked parking controls, there is still sufficient parking resource on the SPA for visitors to simply change location to another SPA parking location. While some deflection to other sites such as SANGs might occur, it would seem that unless very major controls were implemented, there is potential for continued use of the SPA by the same number of visitors, with the potential for some (relatively minor) changes in the spatial distribution of footfall. As such, we cautiously suggest that the mitigation potential for parking changes is minimal.

4.12 Ultimately, a redistribution of access is likely to be beneficial to the SPA bird interest and a positive step towards the long-term protection of the SPA, for example by making engagement easier. In Table 15 we summarise our models to show the relative changes in the number of visitors through areas with high (≥4 bird territories 2015-2019). Five scenarios produce outcomes that are positive for birds. For example under scenario A, where only formal car parks are left open, with all others closed, the outcome is a predicted reduction in use (in areas with ≥4 SPA bird territories) of 147 visitors per hour through these cells (9,450 cells, 29% of all cells).

4.13 While such a redistribution could be beneficial to the SPA bird interest, it is not clear cut that this would act as mitigation. Increasing access to parts of the SPA is essentially equivalent to a deterioration in quality and the ability of that part to support that Annex I bird interest. As such it is – in some ways – equivalent to habitat loss. Ultimately any redistribution in access could mean that some areas of the site are being further damaged making restoration harder. Legal advice regarding this issue may be necessary.

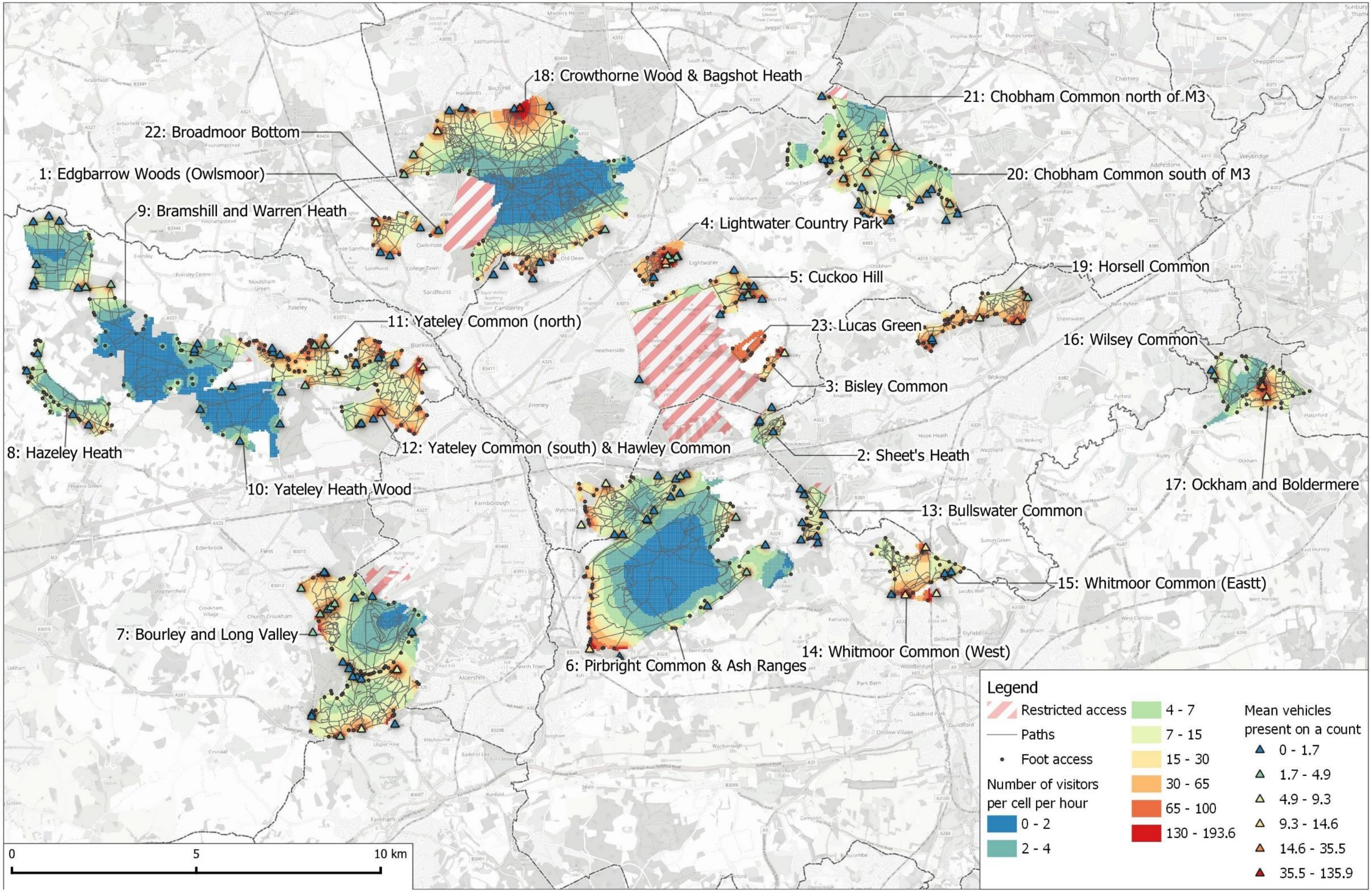
4.14 Furthermore, changes in parking that are permanent will result in long-term shifts in access whereas the bird distributions may shift over time, for example in relation to forestry management, habitat change etc. It may be possible to overcome this concern by having a system whereby parking locations could be opened or closed over time depending on the quality of the habitat nearby. This would be complex as it would suggest that the relative benefit of parking management would fluctuate over time.

4.15 It is also important to note that our totals for the relative changes in access are reliant on the choice of threshold (i.e. number of bird territories per cell) and help provide an indication of the scale of change but cannot be linked to a particular scale of housing change. As such, if we had chosen different thresholds to use, figures for the SANG equivalent would be different. As such the approach provides a means to consider the potential scale of mitigation but should not be relied on.

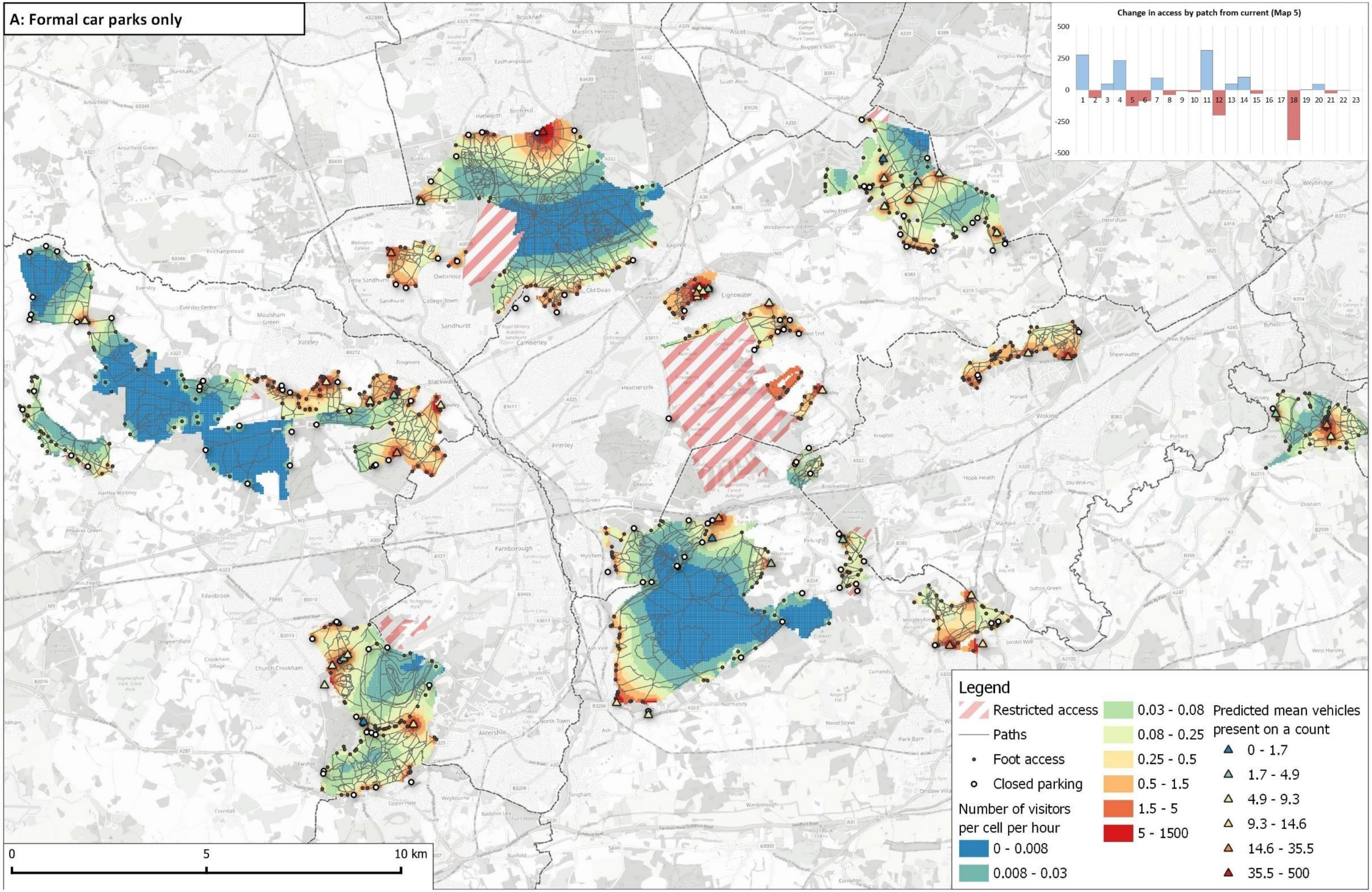
Table 15: Visitor change in areas with high numbers of bird territories under different model scenarios. Number of cells with more than ≥4 SPA bird territories is 9,450.

		a) total visitors in grid cells with ≥4 SPA bird territories	b) total visitors per hour grid cells with ≥4 SPA bird territories under scenario	c) Difference (a-b)
Mean	A: Formal car parks only	1502.0	1354.9	147
	B: Reduce formal parking	1502.0	1502.0	0
	C: Informal parking controlled	1502.0	1501.4	1
	D: More formal, less informal	1502.0	1502.0	0
	E: MOD parking restriction	1502.0	2112.8	-611
	F: Increase coniferous, reduce others	1502.0	1502.0	0
	G: Largest top 75% of spaces	1502.0	1892.4	-390
Max	A: Formal car parks only	3848.4		
	B: Reduce formal parking	3848.4	4307.1	-459
	C: Informal parking controlled	3848.4	3729.6	119
	D: More formal, less informal	3848.4	4067.5	-219
	E: MOD parking restriction	3848.4	5198.9	-1351
	F: Increase coniferous, reduce others	3848.4	3810.8	38
	G: Largest top 75% of spaces	3848.4	4097.9	-250
Mean +20%	A: Formal car parks only	1693.1	1510.8	182
	B: Reduce formal parking	1693.1	1693.1	0
	C: Informal parking controlled	1693.1	1691.8	1
	D: More formal, less informal	1693.1	1693.1	0
	E: MOD parking restriction	1693.1	2385.6	-692
	F: Increase coniferous, reduce others	1693.1	1693.1	0
	G: Largest top 75% of spaces	1693.1	2098.5	-405
Max +20%	A: Formal car parks only	4912.2		
	B: Reduce formal parking	4912.2	5516.8	-605
	C: Informal parking controlled	4912.2		
	D: More formal, less informal	4912.2	5353.2	-441
	E: MOD parking restriction	4912.2		
	F: Increase coniferous, reduce others	4912.2	4576.6	336
	G: Largest top 75% of spaces	4912.2		

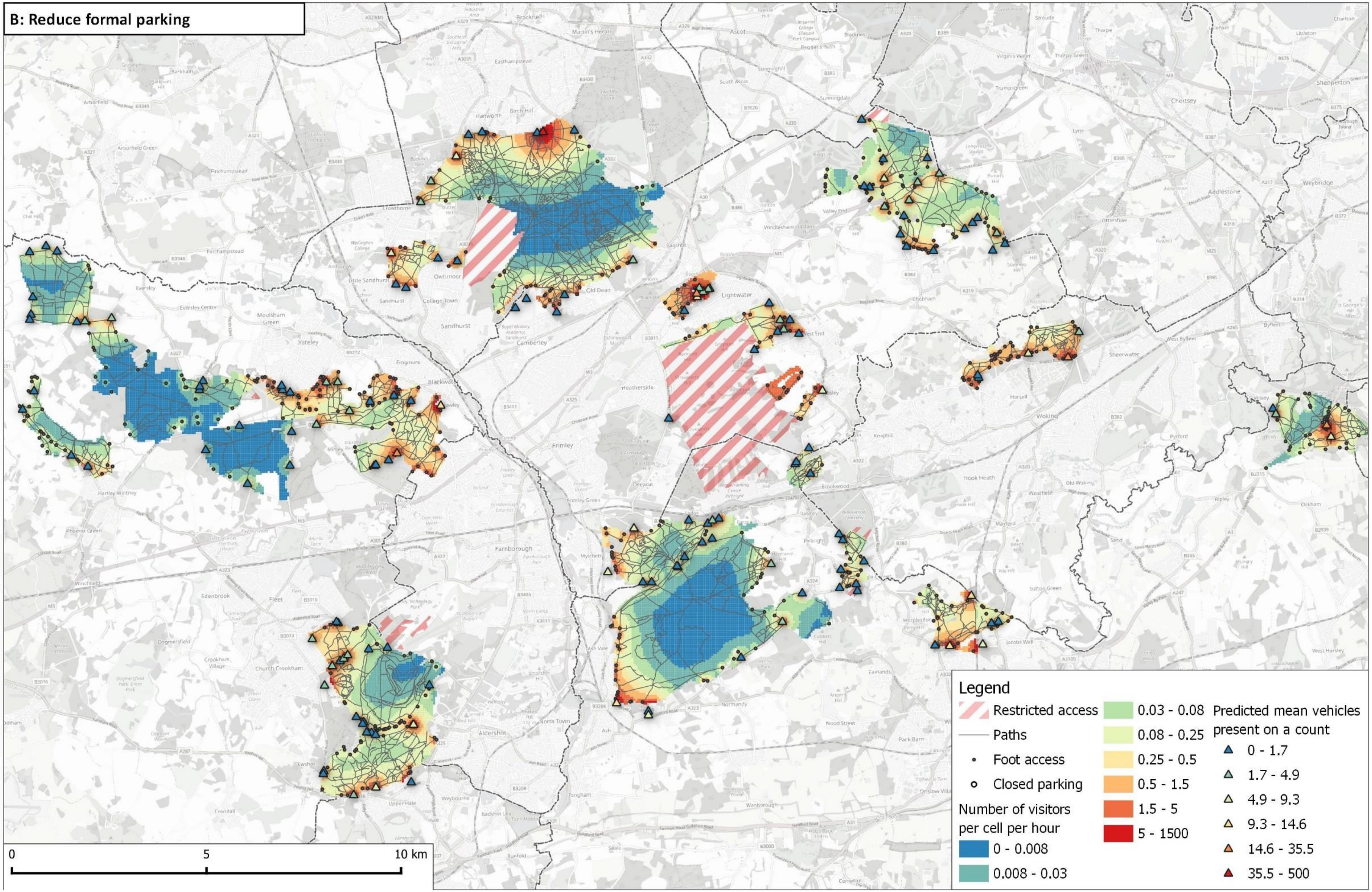
Map 5: Predicted number of visitors per cell per hour based on current levels of access (mean vehicles).



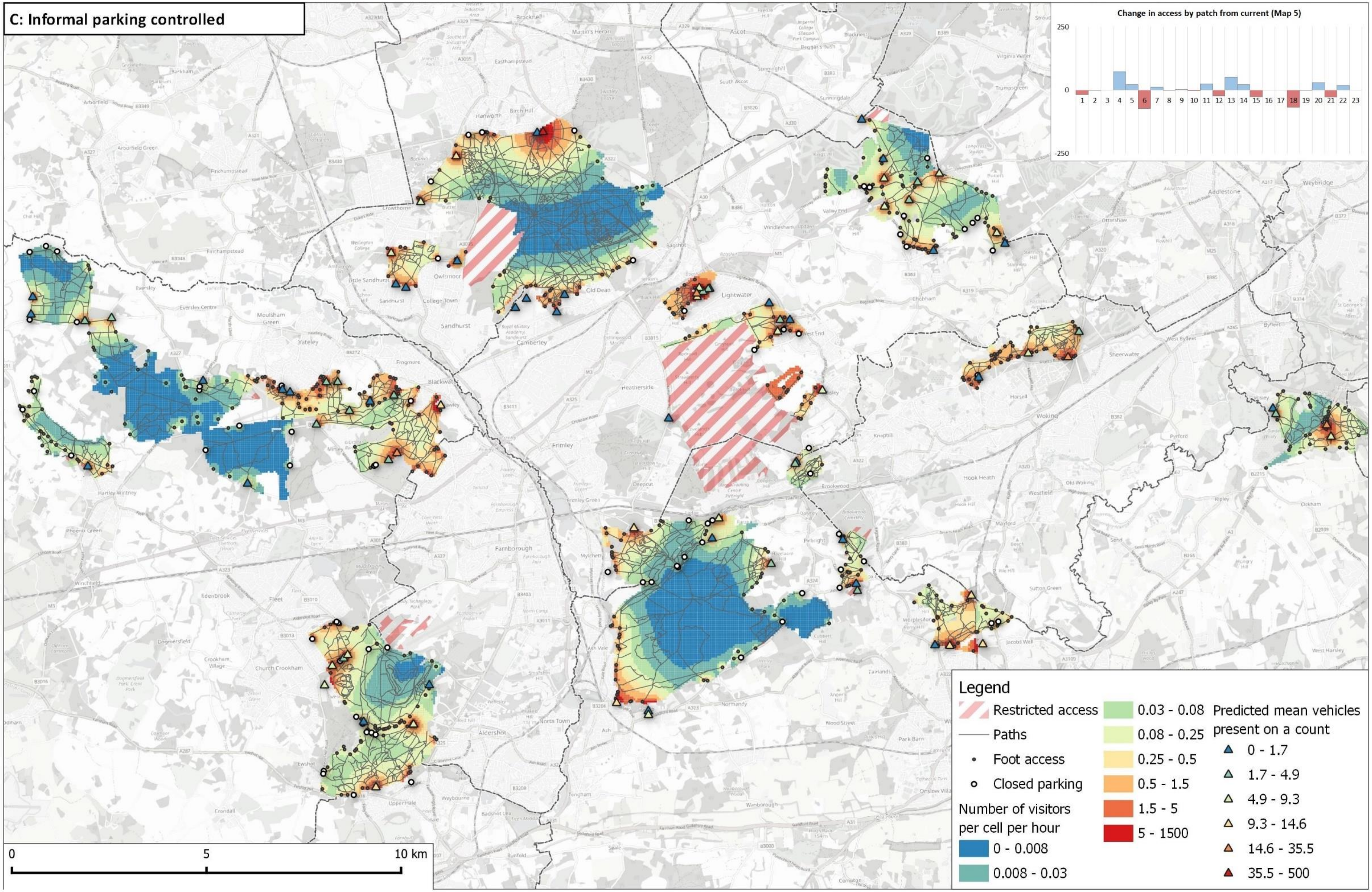
Map 6: Predicted number of visitors per cell per hour based Scenario A. Triangles show predicted mean count of vehicles per parking location.



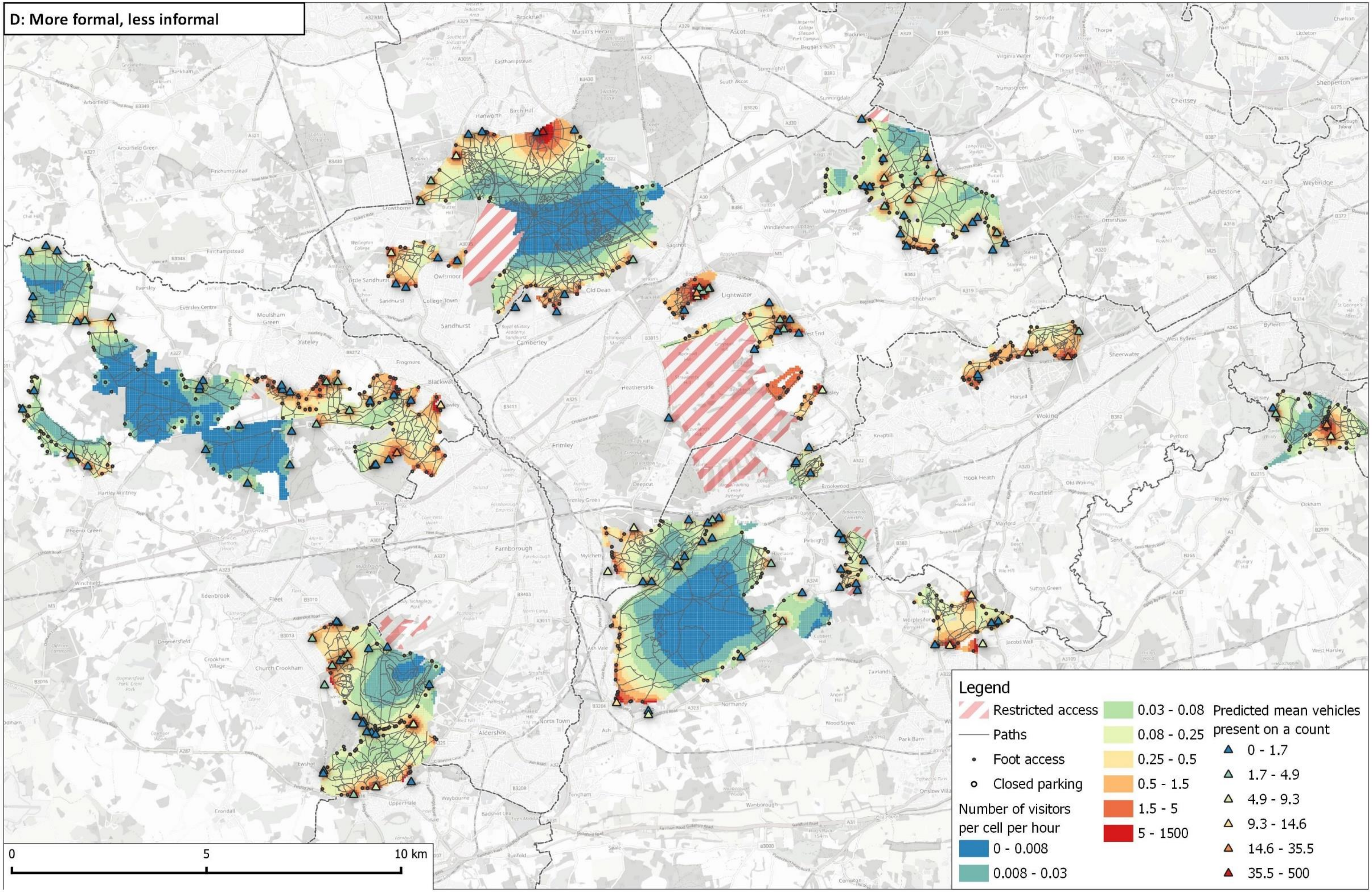
Map 7: Predicted number of visitors per cell per hour based Scenario B. Triangles show predicted mean count of vehicles per parking location.



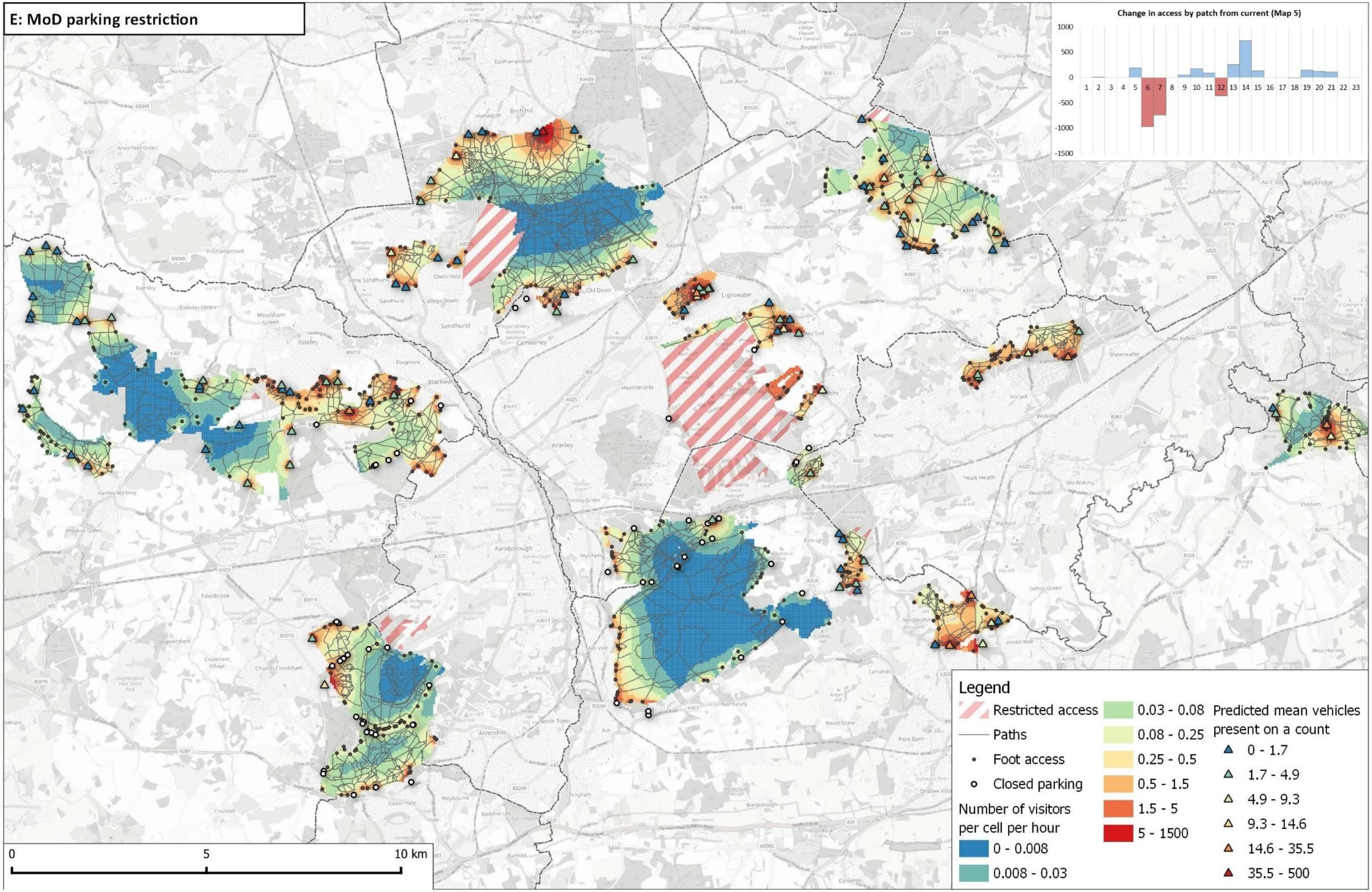
Map 8: Predicted number of visitors per cell per hour based Scenario C. Triangles show predicted mean count of vehicles per parking location.



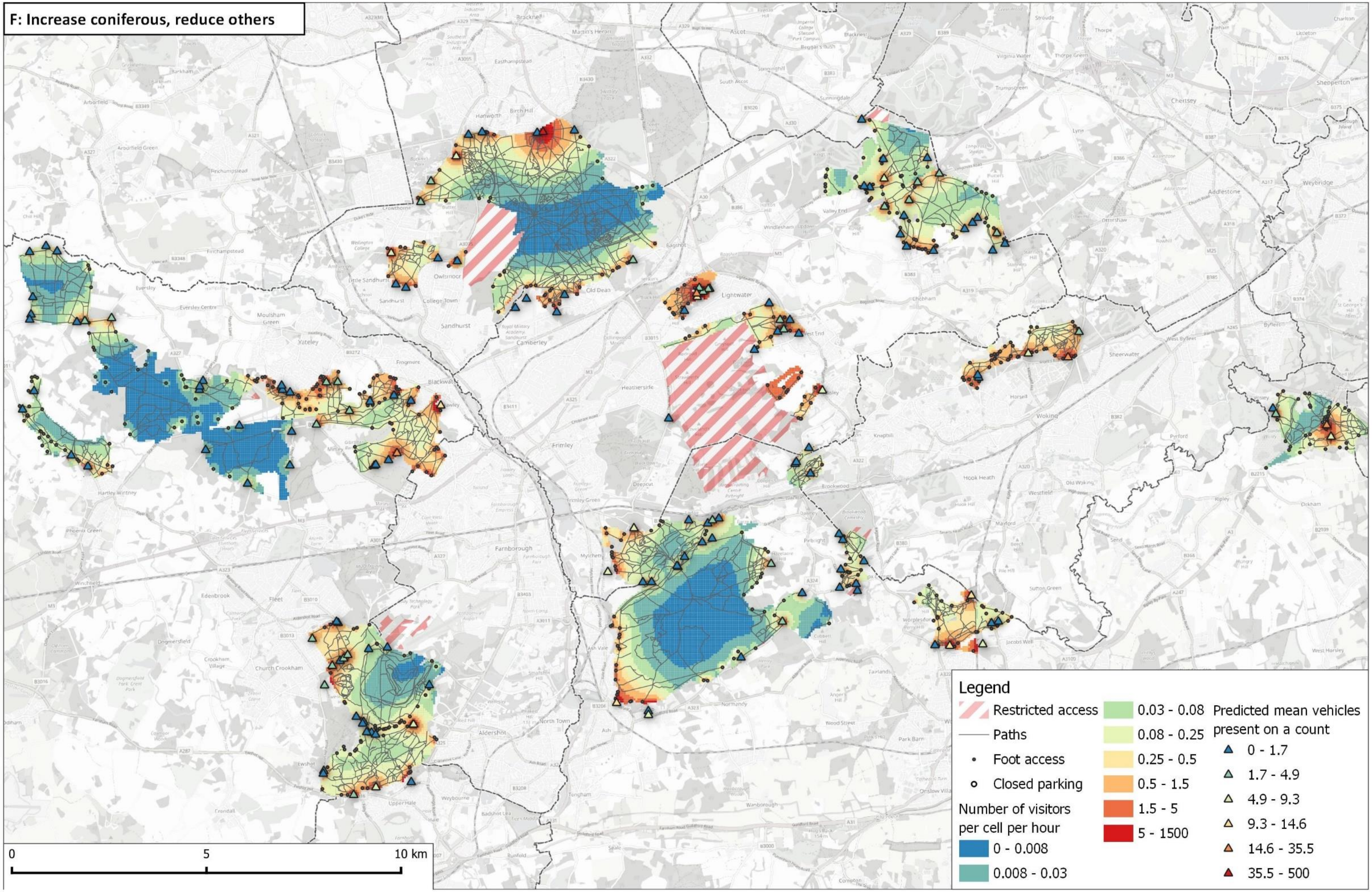
Map 9: Predicted number of visitors per cell per hour based Scenario D. Triangles show predicted mean count of vehicles per parking location.



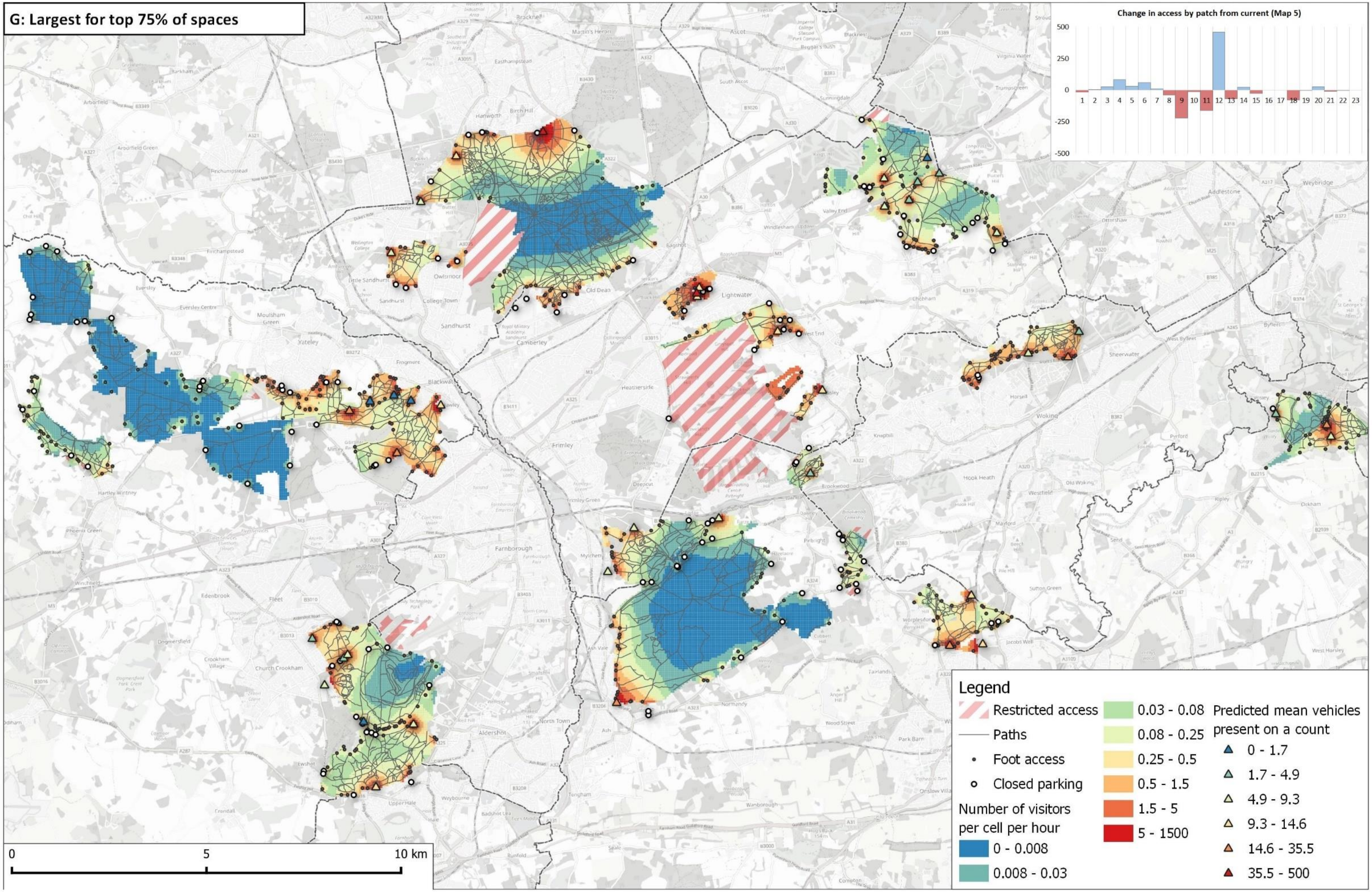
Map 10: Predicted number of visitors per cell per hour based Scenario E. Triangles show predicted mean count of vehicles per parking location.



Map 11: Predicted number of visitors per cell per hour based Scenario F. Triangles show predicted mean count of vehicles per parking location.



Map 12: Predicted number of visitors per cell per hour based Scenario G. Triangles show predicted mean count of vehicles per parking location.



Summary: Potential capacity of measures

We use our models to explore the spatial distribution of access under different scenarios. Our models also include people arriving on foot, and we predict the numbers of these at different access points based on the amount of surrounding housing. At the SPA level, these models would suggest around a third (32%) of all access to the SPA patches is on foot, and parking controls will not affect these visitors in any way.

Rural sites where there is little foot access will show the most marked effects of parking control.

It is complex to equate a parking approach to a level of avoidance/mitigation. Currently there is a very large over provision of parking on the SPA. Our scenario testing shows that, even with marked parking controls, there is still sufficient parking resource on the SPA for visitors to simply change location to another SPA parking location. While some deflection to other sites such as SANGs might occur, it would seem that unless very major controls were implemented, there is potential for continued use of the SPA by the same number of visitors, with the potential for some (relatively minor) changes in the spatial distribution of footfall. As such, we cautiously suggest that the mitigation potential for parking changes is minimal.

We calculate the relative change in visitor numbers through areas of the SPA with higher bird densities, as a means of exploring the implications of controls in more detail. As an example, if all informal parking were closed and only formal car parks remained, we estimate 1,765 fewer people per day would pass through areas that have supported higher bird densities (>4 territories 2015-2019). While such a redistribution could be beneficial to the SPA bird interest, ultimately it may not be mitigation as it may mean for example that some areas of the site are being further damaged making restoration harder. Legal advice may be necessary around this point.

Furthermore, changes in parking that are permanent will result in long-term shifts in access whereas the bird distributions may shift over time. There may be scope to overcome this if it were possible to change which parking locations where open or closed at a given point in time, but this gets very complex.

We can therefore summarise what different redistribution scenarios might look like and the relative change in access in different parts of the SPA, putting figures around these. These are simply for information and to prompt discussion. Clearly attributing a level of mitigation to a redistribution in access is not straightforward.

5. Aim 4 - To consider the potential for displacement

Where parking/visitors would disperse to, if parking restrictions were implemented at individual car parks or the whole of the SPA?

5.1 Our scenario testing has assumed vehicles (and therefore visitors) displaced by parking measures are shifted to the next nearest (linear distance) parking location available. We have not assumed visitors would be deflected to SANGs or other greenspace. Any deflection to SANGs would reduce the capacity of the SANGs and risk undermining any of the mitigation achieved by those SANGs. The potential for car parking controls to act as mitigation in addition to SANG is therefore reliant on visitors remaining within the SPA and changing the visitor distribution, or alternatively not using the SPA or SANGs at all. Quantifying these in terms of mitigation benefit is challenging.

5.2 The model outputs show the redistribution effects of different parking control scenarios on the SPA. Maps 5-10 indicate how access patterns might shift. The modelling highlights that it is rural sites with little surrounding housing that will see the most significant reductions and change as a result of any scenarios.

Use of alternative parking locations away from the SPA

5.3 Current evidence on displacement is limited. While visitor surveys have asked about other sites visited, this is different to explicitly asking where the interviewee might have visited if the interview location were no longer available to access.

5.4 Visitor surveys on the Thames Basin Heaths in 2012 included a question about use of other sites. Visitors were asked what features would be necessary to make another site attractive to them so that they would undertake their main activity there instead of the interview location. Interviewees were able to provide multiple responses and the most frequently cited responses (30%) from 'local visitors' was that nothing could be done to attract them to another site. This was mainly due to the proximity of the site to their home, the large size of their visit destination or the suitability of the site to their main activity. A further 13% stated a large area of open space - this was often cited at locations with a higher proportion of dog walkers and by those who were walking large, energetic dogs or several dogs during their visit. Several (12%) 'local visitor' groups commented that an alternative site would need to be closer to their home address than the site they were visiting to be an attractive visit destination. These kind of responses would suggest that established visitors to the SPA are relatively unlikely to be displaced away from the SPA.

5.5 Visitor surveys were undertaken at Chobham Common in 2017 in order to understand the impact of parking charges and the likely displacement that might occur (Liley, Weitowitz, D., & Hoskin, 2018). Visitors were asked whether they would continue to visit following the introduction of parking charges and if not where they might go instead. The survey indicated around 9% of users at Chobham Common would be deflected to other sites in the Thames Basin Heaths. This was broadly equivalent to 6% of the total cars parking at Chobham Common. These additional visitors were expected to visit Horsell Common (though note that the main SPA car park here at Sandy Track is only accessible to members of the Horsell Common Preservation Society), Lightwater Country Park and Pirbright. In addition, it was anticipated that 23% of visitors at the three car parks would park at other locations around Chobham Common. Around 26% of interviewees at Chobham Common would have gone to an alternative site (outside the Thames Basin Heaths/Wealden Heaths) with Sunningdale Golf Course the most frequently named alternative location. Other alternatives included Virginia Water, Windsor Great Park and the Crown Estate.

5.6 A visitor survey was conducted at a subset of 14 SANG sites by the Thames Basin Heaths Partnership over the winter 2018 (Panter, 2019b). During these interviews with SANG users, the visitors were asked to state alternative locations they also visited. For those arriving by car, 26% named a SANG as their first alternative choice while 35% gave an alternative first choice that was part of the SPA. These percentages were much higher than those who arrived at the SANG on foot, suggesting users who arrive by car are relatively mobile and able to switch between a range of locations, both on the SPA and on nearby greenspaces.

Summary: Potential for displacement

Our models assume vehicles (and therefore visitors) displaced by parking measures are shifted to the next nearest (linear distance) parking location available on the SPA. We have not assumed visitors would be deflected to SANGs or other greenspace. Any deflection to SANGs would reduce the capacity of the SANGs and risk undermining any of the mitigation achieved by those SANGs. The potential for car parking controls to act as mitigation in addition to SANG is therefore reliant on visitors remaining within the SPA and changing the visitor distribution, or alternatively not using the SPA or SANGs at all. Quantifying these in terms of mitigation benefit is challenging.

In reality, there will of course be some displacement away from the SPA and this is likely to include other greenspace sites. Evidence to pin-point the level at which this might occur is limited and any level of change is likely to depend on the particular parking controls implemented.

6. Aim 5 - To determine how the measure(s) could be enforced

How parking controls could be enforced?

6.1 There are relatively few case-studies that document management of car parks to resolve nature conservation issues related to access. One published study from Holland shows that manipulating the number and location of parking spaces can be used to manage both the number of cars and the distribution of cars (Beunen, Jaarsma, & Regnerus, 2006).

6.2 Enforcement will relate to ensuring compliance with any changes. Where parking locations are physically closed, then visitors will have little choice other than to move elsewhere. Challenges will then relate to the other locations used as use may well switch to verges, gateways or other locations where increased parking may be damaging, anti-social or even dangerous.

6.3 An example from the UK is Burnham Beeches, a woodland and heathland SAC site managed by the Corporation of London, where car parking has been rationalised over-time and an ornamental drive bisecting the site closed to traffic. Parking and visitor facilities have been concentrated at the least sensitive part of the site, rationalising the number of locations where visitors can park. Parking charges were then introduced and targeted to peak times (weekends and bank holidays). More recent access management measures have included requirements to keep dogs on leads within a third of the site. These measures have been introduced over an extended period during which time visitor numbers have continued to increase (see Wheater & Cook, 2016). The changes have been carefully implemented, well resourced and considerable consultation and engagement were undertaken.

6.4 The Burnham Beeches example highlights the importance of implementing measures in a carefully planned, controlled way and with monitoring and enforcement dovetailed. In this case parking controls were instigated as part of a package of measures including new visitor facilities and additional infrastructure. They were implemented to provide a long-term solution to the issues associated with increasing recreation pressure and challenges in managing that recreation, however they were not implemented as mitigation for a particular level of housing growth.

6.5 Implementation of any parking control will require a considerable amount of visitor engagement, as discussed in earlier parts of the report (e.g. para 3.9), and monitoring. Monitoring will be necessary before and after any controls with regular checks and counts of the number of vehicles parked in different locations. This monitoring should be used to target interventions to resolve issues that arise at specific locations.

6.6 Options for intervention could then include:

- Double yellow lines;
- Dragon's teeth, stone blocks or ditching to prevent parking;
- Signage to indicate locations are not safe;
- Leaflets placed on windscreens to inform visitors where they should be parking instead;
- Logging dangerous parking and reporting to the police.

6.7 These are in many ways standard and widely used and the choice of approach will depend on the particular circumstance.

6.8 Ideally targeted visitor interviews and work in advance of any controls would help to identify motivations and likely behavioural change, ensuring that changes are effective and no unforeseen issues arise. Redistribution and displacement may not be entirely predictable.

Summary: How measures could be enforced

Car park controls can be highly contentious and how visitors might respond is hard to predict, and evidence is lacking. Implementation of any parking control will require a considerable amount of visitor engagement. Monitoring will be necessary before and after any controls with regular checks and counts of the number of vehicles parked in different locations. Monitoring can be used to target interventions and enforcement that can include measures such as double yellow lines, physical obstructions to parking, signage, leaflets on windscreens and reporting dangerous incidents to the police.

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Appendix 1: Technical details relating to models and how models constructed

7.1 We have used models to map visitor use across the SPA. These provide us with a way of checking the effect of different visitor management scenarios and a way of checking how these might influence the number of people through bird territories.

Modelling datasets used

7.2 The approach taken considers a complex methodology using a wide range of datasets and previous models to consider the likely outcome from possible actions. Existing datasets and previous models used were:

- Existing data produced by Footprint Ecology on access points, restricted access areas and discrete accessible patch areas (Liley, Clarke, et al., 2006).
- Parking information and vehicle count data provided by the Thames Basin Heaths Partnership.
- SPA bird data provided by 2Js Ecology.
- Existing model of the penetration distance for visitors into the sites, produced by Footprint Ecology (Liley, Clarke, et al., 2006).
- Existing model of the relationship between number of visitors arriving on foot and the number of housing in close proximity, produced by Footprint Ecology (Liley, Clarke, et al., 2006).
- Interview data of visitors on sites, most recently produced by EPR (Southgate et al., 2018).

SPA accessible area, patches and use of a 50m grid

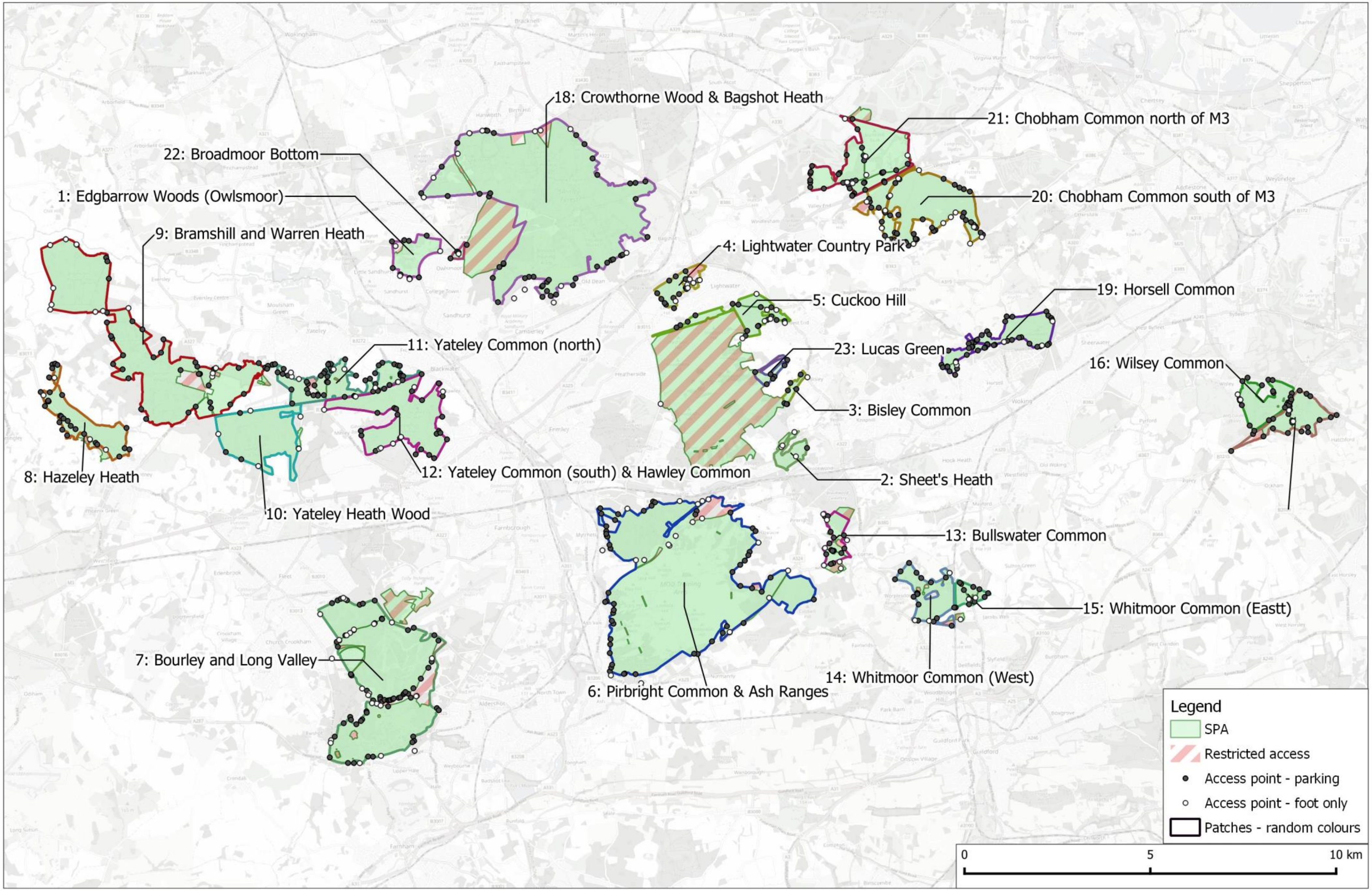
7.3 The SPA has a large number of access points which have been previously mapped, including by Footprint Ecology (Liley, Clarke, et al., 2006). These data were checked against the latest path OSM network and aerial images, resulting in a further 13 new foot only access points added -see Map A1.

7.4 There are also number of areas where there is no public access, for example due to military use, and these areas were also mapped previously in 2006 and are shown on Map A1.

7.5 As part of the work in 2006 we split the SPA into patches that represented single discrete areas that are publicly accessible. Some of these extend beyond the SPA boundary and the boundaries of patches were defined by barriers to access such as private land or major roads (e.g. Chobham Common, considered as two separate patches, north and south of the M3).

7.6 We used a 50m grid overlaid across the accessible patches as the basis for our models. This matches the grid used in previous work (Liley, Clarke, et al., 2006) and totalled 32,473 cells. However, it should be noted that a grid cell was classified as part of a patch based on any sized intersection, so a large number of peripheral grid cells are included based on just a small area of the patch included. Each grid cell was assigned to a patch. Where a grid cell covered more than 1 patch, the patch which formed the largest intersecting area was assigned to the whole cell.

Map A1: Map of the individual discrete access patches across the SPA used in analysis.



Data on parking locations

7.7 The parking locations around the SPA were previously mapped by Footprint Ecology (see Liley, Clarke, et al., 2006 for details). This dataset is now maintained by the Thames Basin Heaths Partnership who undertake annual vehicle counts. The dataset includes 160 main parking locations which provide access to the SPA. The explicit point locations of these locations were mapped in GIS and assigned to a patch.

7.8 The capacity of each of these locations, in terms of the number of standard car parking spaces, has been estimated by Thames Basin Heaths Partnership staff. However, these estimates were made several years ago, and in recent years especially, some parking locations have exceeded their estimated capacity in the vehicle counts. We therefore re-evaluated capacities and for each parking location have used the maximum of either the original estimate, or maximum from the observed vehicle count data.

7.9 Counts of the number of vehicles in parking locations across the SPA were initially conducted by Footprint Ecology (Fearnley, 2013), but in recent years this has become part of the routine monitoring conducted by the Thames Basin Heaths Partnership staff (Panter, 2019a). Data were provided for analysis for 2018 to 2019, collected by the Thames Basin Heaths Partnership staff, but supported with additional data from our previous reporting for the Thames Basin Heaths Partnership of the 2017 data (Panter, 2019a),

7.10 Each year's data consisted of several counts spread over the year as summarised in Table 16. Two counts were always conducted in June, July and August. Typically, all 160 parking locations were counted, but this varied over time. For the later modelling approaches of parking distribution, we only used the spring/summer focus months (green rows in Table 16).

Table 16: Summary of the number of transect counts conducted in each month over the three years, with the number of parking locations to be surveyed given in brackets afterwards. Green rows highlight those surveys months which are the focus of Thames Basin Heaths Partnership for the spring/summer and blue rows those outside this period.

Month	2017	2018	2019
January	1 [151]	1 [155]	1 [149]
February	1 [151]		1 [113]
March	1 [155]	1 [148]	1 [152]
April	1 [155]	1 [149]	1 [152]

Month	2017	2018	2019
May	1 [159]	1 [157]	1 [151]
June	2 [301]	2 [308]	2 [300]
July	2 [309]	2 [307]	2 [303]
August	2 [304]	2 [300]	2 [311]
September	1 [154]		
October	1 [155]		
November	1 [152]		
December	1 [155]		

SPA bird data

7.11 The SPA bird data for the three species (Dartford Warbler, Woodlark and Nightjar) were provided by 2Js Ecology, who conduct the annual bird monitoring. The data were provided as point locations for territory centres and covered the SPA and some peripheral areas for the five years, 2015-2019.

7.12 The point locations of territory centres were buffered to create polygons which could be used to consider a wider area and core part of the territory used by the birds. We used a variable distance buffer for each species; Dartford Warbler 50m buffer, Woodlark 100m, Nightjar 150m for a territory (in line with other similar modelling, e.g. Liley, Panter, & Underhill-Day, 2016).

7.13 Using the 50m grid of the SPA accessible patches, the number of territories intersecting each cell was counted. This provided a figure for the number of SPA bird species per 0.25 ha cell (50m x 50m grid squares). The overall average across all cells was 2.6 SPA birds per cell (see Table 17).

Table 17: Mean number of SPA bird territory areas counted within each 50m cell (cells are 0.25 ha) Bottom three values for each site are highlighted in blue and top three in red.

Patch ID	Patch name	Number of grid cells	Mean number of variable buffered SPA territories intersecting cell
1	Edgbarrow Woods (Owlsmoor)	427	1.5
2	Sheet's Heath	232	1.3
3	Bisley Common	99	**0.0**
4	Lightwater Country Park	314	1.7

Patch ID	Patch name	Number of grid cells	Mean number of variable buffered SPA territories intersecting cell
5	Cuckoo Hill	571	2.3
6	Pirbright Common & Ash Ranges	6561	**3.4**
7	Bourley and Long Valley	3769	2.1
8	Hazeley Heath	805	2.6
9	Bramshill and Warren Heath	3660	2.1
10	Yateley Heath Wood	1227	1.5
11	Yateley Common (north)	864	2.6
12	Yateley Common (south) & Hawley Common	1511	2.6
13	Bullswater Common	309	**3.5**
14	Whitmoor Common (West)	634	**0.5**
15	Whitmoor Common (Eastt)	193	2.6
16	Wilsey Common	525	**1.1**
17	Ockham and Boldermere	585	1.8
18	Crowthorne Wood & Bagshot Heath	6349	2.1
19	Horsell Common	717	2.0
20	Chobham Common south of M3	1623	**4.2**
21	Chobham Common north of M3	1291	**5.7**
22	Broadmoor Bottom	53	**0.0**
23	Lucas Green	154	2.0
			2.6

7.14 It should be noted that only the mapped bird data were used. There were gaps in survey coverage, and coverage differed between years, as summarised in Table 18.

Table 18: Gaps in survey coverage for Annex I birds by year and estimates of likely number of territories missed, information provided by 2Js Ecology.

Year	Note
2015	Ash to Brookwood: an additional two Woodlark territories estimated at Mytchett Place.

Year	Note
	Castle Bottom to Yateley and Hawley Commons: an additional five Nightjar territories estimated, comprising three on Yateley Heath Wood and two on peripheral sites.
	Whitmoor Common: an additional two Nightjar territories estimated.
2016	Whitmoor Common: an additional two Nightjar territories estimated
	Ash to Brookwood: two additional Nightjar and two Woodlark territories estimated to allow for non-coverage of Cobbett Hill.
	Castle Bottom to Yateley and Hawley Commons: two additional Nightjar territories estimated on peripheral sites.
	Colony Bog and Bagshot Heath: two additional Nightjar and six Dartford Warbler territories estimated to allow for non-coverage of Lightwater CP. Also four additional Woodlark and 38 Dartford Warbler territories estimated due to incomplete coverage of Pirbright Ranges.
2017	Colony Bog and Bagshot Heath: due to incomplete coverage of Pirbright Ranges these counts are too low by an estimated four Woodlark and 70 Dartford Warbler territories
	Whitmoor Common: parts of the common were not covered for Nightjars and a further two territories have been estimated.
2018	Ash to Brookwood: two Nightjars and one Woodlark have been estimated for non-coverage of Cobbett Hill.
2019	Ash to Brookwood: coverage of Nightjars was incomplete. A further ten territories were estimated for Ash RDA, two for Cobbett Hill and one for Mytchett Place.
	Colony Bog and Bagshot Heath: ongoing access restrictions resulted in coverage of all three species being incomplete on the RDA. A further five Nightjar territories, four Woodlark territories and 68 Dartford Warbler territories were estimated for the area.

Modelling parking redistribution

7.15 Any changes in parking locations where capacity is reduced are likely to result in a redistribution of visitor access. This displacement of visitors is likely to be to a nearby alternative.

7.16 For this exercise we used the following assumptions;

- that visitors would have gone to the next nearest alternative parking location (based on linear distance);
- that visitors stay within the SPA and if deflected go to the next nearest SPA car park rather than somewhere (such as a SANG) outside the SPA;

- that if any parking location reached capacity it would continue to overflow to the next nearest parking location, until all vehicles assumed to be visiting the SPA are redistributed.

7.17 To undertake this modelled redistribution, we conducted distance matrix analyses in GIS to calculate the linear distances between each of the 160 parking locations to all others. This allowed us to rank for location the nearest alternative parking locations.

7.18 We then produced a framework which allowed for scenario testing, whereby the number of parking spaces could be adjusted and the numbers of vehicles typically redistributed across the SPA. This was an iterative framework such that if a parking location were full, and overspill triggered, then a next redistribution was initiated until all vehicles were distributed.

Modelling access within sites

7.19 We generated models to distribute visitor use across our grid cells based on the data from visitor interviews on how far people roam from access points.

7.20 Our starting point was to predict the number of visitors entering our patches at each access point. We used the average number of vehicles from the car parking transect dataset and derived an estimate for the number of visitors on foot at every access point, based on local housing. This estimate was based on the modelled visit rates produced by Liley et al. (2006) which provide a formula based on number of residential properties in a 2km distance band around the access point to estimate number of visitors accessing on foot.

7.21 To model how visitors may spread from each access point, we used the same approach as Liley *et al.* (2006). This was based on the distances visitors roam from access points as collected from visitor survey data, which provided a 'decay curve' of the percentage of visitors that reach different distances.

7.22 We then calculated the number of cells at each given distance from the access point in order to spread visitor use (as in Liley, Clarke, et al., 2006). This model therefore assumes that visitors fan out from each access point in an even distribution, regardless of the path network, topography etc. It assumes all parts of the site are equally accessible.

Model predictions

7.23 The modelling was therefore set up such that changes to visitor numbers, changes to parking (numbers of spaces at different locations) and which parts of the site are accessible to visitors could be manipulated and the resulting distribution of visitors within the site predicted.

7.24 Three separate reports use these models. The dog control study considers the effect of reduction in visitor use or changes in distribution within sites (e.g. through zoning). In the parking report we consider the effect of changing parking locations and spaces. In the access management report we use our models to check ranger deployment and time.

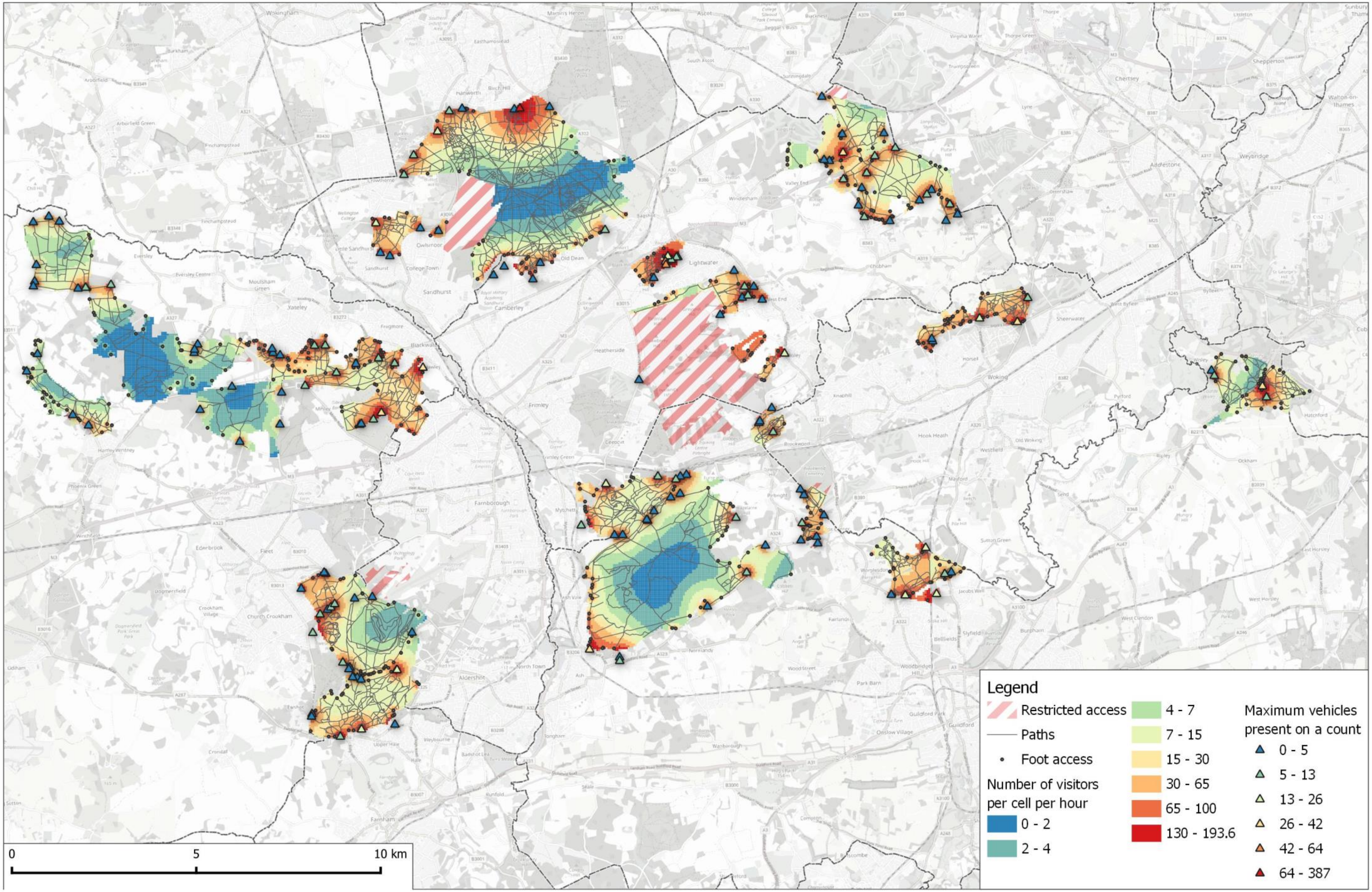
7.25 In the parking report, four levels of use are tested and the total number of vehicles used in the model for each level are given below:

- Mean number of vehicles per parking location: 515.6 vehicles
- Max number of vehicles per parking location: 1513 vehicles
- Mean +20% number of vehicles per parking location: 618.8 vehicles
- Max +20% number of vehicles per parking location: 1815.6

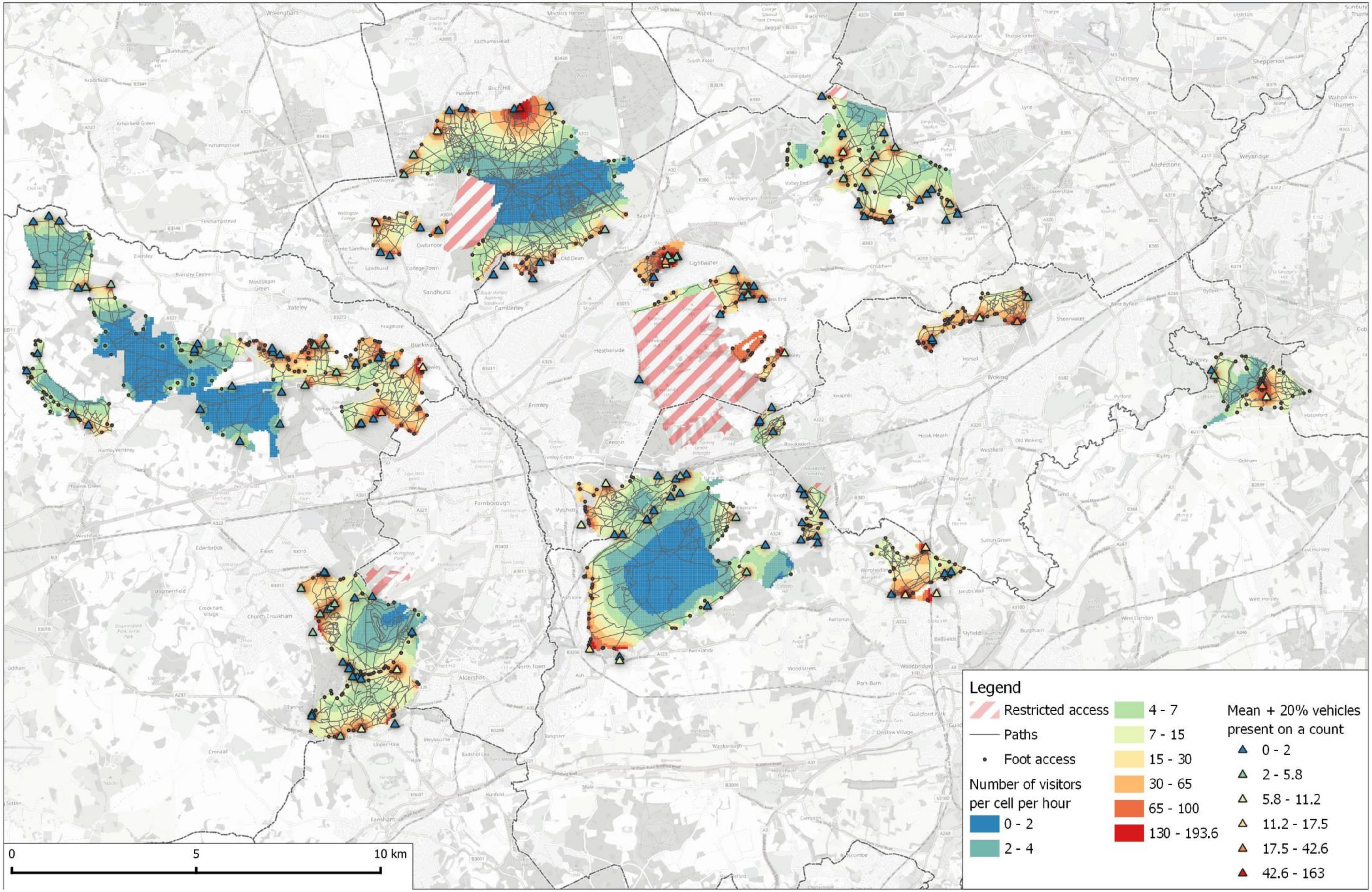
Table 19: Summary of the number of iterations required for parking management scenarios to complete. 0 signifies no model run needed, as all vehicles fit into the car parks without any redistribution. N/A indicates model cannot be run, as the number of vehicles exceeds the number of parking spaces.

	Mean	Max	Mean+20%	Max+20%
Current	0	0	0	23
A: Formal car parks only	31	N/A	31	N/A
B: Reduce formal parking	0	19	0	118
C: Informal parking controlled	9	63	12	N/A
D: More formal, less informal	0	13	0	45
E: MOD parking restriction	38	156	39	N/A
F: Increase coniferous, reduce others	0	23	0	33
G: Largest top 75% of spaces	16	63	31	N/A

Map A2: Predicted number of visitors per cell per hour based on maximum levels of access (from max count of vehicles).



Map A3: Predicted number of visitors per cell per hour based on mean + 20% levels of access (from mean + 20% count of vehicles).



Map A4: Predicted number of visitors per cell per hour based on maximum + 20% levels of access (from max + 20% count of vehicles).