Report

footprint ECOLOGY

Visitor Access Study of the Upper Nene Valley Gravel Pits SPA

Durwyn Liley, Louise Floyd,
Katie Cruickshanks and Helen Fearnley

Forest Office
Cold Harbour
Wareham
Dorset BH20 7PA
Tel/Fax: 01929 552444
info@footprint-ecology.co.uk

connecting wildlife and people

www.footprint-ecology.co.uk

footprint ECOLOGY

Date: 31st January 2014
Version: Final
Recommended Citation: Liley, D., Floyd, L., Cruickshanks, K. & Fearnley, H. (2014). Visitor Access Study of the Upper Nene Valley Gravel Pits SPA. Footprint Ecology. Unpublished report for the NIA partnership.
Cover image: Walker in snow at Summer Leys. Louise Floyd.

Summary

This report provides information and analysis of visitor activity across the Upper Nene Valley Gravel Pits Special Protection Area (SPA).

In total, 126 access points were mapped; these provide direct access to the SPA (81) or to green space sites in the vicinity of the SPA (45). Of the access points that provided direct access onto the SPA, 34 are foot-only and a further 47 have some parking provision. Parking provision around the SPA is predominantly small car-parks. There are also a number of large car-parks just outside the SPA that provide access to Country Parks and similar sites but have no direct link to the SPA. Across all 126 access points, 2,098 parking spaces were counted and mapped; 693 spaces were at points with direct access onto the SPA.

A series of fifteen transects were undertaken to count the number of parked cars around the SPA (10 transects were conducted in the winter 2012-13 and 5 during the late spring 2013). The total number of parked cars counted across the SPA and adjacent areas ranged from 112 – 423. The highest counts of parked cars were on transects conducted during the midweek in February. Overall there was no significant difference in the number of parked cars present on weekdays compared to weekend days and on spring days compared to winter days.

Direct counts of people at a sample of 21 access points recorded 2.6 groups and 1.8 dogs entering per hour. The ratio of dogs to people was 1 dog for every 2.8 people. Stanwick Lakes was by far the busiest location surveyed, with roughly a quarter of all the people counted.

At the same sample of 21 access points, 939 face-face interviews were conducted (638 during the winter; 301 during the spring). Key results from the face-face interviews included:

- The majority (98%) of visitors were on a short visit from their home
- Group size for interviewed groups ranged from 1-8; 51% of interviewees were visiting on their own. Stanwick Lakes was notable in that group size tended to be larger here.
- Half of the 939 interviewees had dogs with them (636 dogs in total).
- Across all sites and survey periods, dog walking was the most common main activity (48% of interviewees).
- During the winter, a higher proportion of people interviewed were dog walking (48% of interviews during the winter compared to 36% in the spring at the 6 locations surveyed in both seasons).
- Over the winter, the main activities given by interviewees were: dog walking (53%), walking (26%), and wildlife watching (6%).
- Most (77%) interviewees had arrived by car to the survey point
- Most interviewees were frequent visitors (60% indicated that they visited at least once a week).
- Most visits were short: 50% of visitors stated that they spent less than one hour on site and, in total, 88% spent less than two hours at the survey location.

- The quality of the site was the most common reason for choice of site (61% interviewees), but was not the most common 'main' reason'; 32% interviewees gave proximity to home as the main factor underpinning their choice of site. Proximity to home seemed particularly important for dog walkers (44%) and those fishing (40%).
- A total of 863 visitor routes were collected, either through lines on paper maps during the interview or via GPS units which were given out.
- There were significant differences between sites in the lengths of routes taken by visitors. There were also differences between activities. The mean route length for dog walkers was 3.1km. For cyclists the average route was 7.3km while those fishing tended to have the shortest routes (0.6km average).
- At three of the six sites that were surveyed in the winter and the spring/summer, the median route length increased in the spring/summer when compared to the winter, stayed the same at two and fell at one, suggesting no real pattern of people walking further in the summer .
- A relatively high proportion (78% of interviewees) indicated that they were aware of the importance of the area for wintering birds. Around a quarter (24%) of all interviewees responded that they were aware that of the international importance of the area for nature conservation.
- 908 postcodes were mapped reflecting the home postcodes of visitors. The two main settlements were Northampton (137 postcodes from the winter interviews fell within the settlement) and Wellingborough (88 postcodes from the winter interviews).
- Dog walkers and joggers lived closest to the site at which they were visiting, with median values of 2.3 and 2.9km respectively
- Visitor rates (visits per household) declined rapidly with distance such that a relatively small proportion of people visit from distances beyond 3km of the surveyed access points.

Using the visitor data we have generated a visitor model which shows the spatial distribution of visitors to the whole SPA and surrounding parts of the Upper Nene Valley. We estimate around 2,884 visitors per day during the day to the focal area covered in the model, very approximately equivalent to around 900,000 visits per annum.

The spatial model shows the busiest area is between Higham Ferrers and Irthlingborough, running north to the main Stanwick Lakes area and towards Raunds. High visitor numbers in this area originate from the main Stanwick Lakes car-park and also from numerous other access points, including a number that are foot only. It appears that there is a real focus of visitor levels in this area. Other 'busy' areas are around Summer Leys, the edge of Northampton and at Thrapston.

The spatial model provides a strategic overview of visitor intensity across the SPA. The implications of the results for management of access in terms of the SPA interest and disturbance impacts are discussed.

Contents

Summary 1

Contents 3

Acknowledgements 6

1. Introduction 7

Overview 7

The Nene Valley 7

The Nene Valley Nature Improvement Area (NIA) 7

Upper Nene Valley Gravel Pits Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) 7

New Development, Access and Nature Conservation 8

Visitor access and the condition of key sites in the Nene Valley 9

Aims 10

Structure of Report 10

2. Overview of Access Infrastructure, Access Points and Access within the NIA 12

Methods 12

Mapping Access Points 12

Mapping the Path Network and Use of Grid to Summarise Spatial Data 13

Results: Access Points and Parking 13

Results: Path Network 14

3. Visitor Numbers: Car-park Transects, Automated Counters and Tally Counters 18

Overview 18

Methods 18

Tally Counts 18

Car-park transects 21

Automated counters 22

Results 26

Tally Data 26

Car-park Transects 30

Automated Counters 31

Discussion 32

4. Face-face Interviews 36

Overview 36

Methods 36

Face-face interviews (Winter) 36

Face-face interviews: (Spring) 37

Visitor postcodes 37

Postcodes and visit rates in relation to distance 38

Data Presentation and Analysis 38

Results: overview 40

Results: Group Size: people and dogs per group 42

Results: Activities 43

Results: Mode of Transport to Reach Site 51

Results: Frequency of Visit 52

Results: Temporal Variation 55

Time Spent on Site 56

Results: Factors influencing choice of site 59

Results: Other Locations Visited 62

Results: Visitor routes 64

Length of routes by season and survey location 64

Length of routes by activity 67

Factors influencing choice of route 69

Impacts of winter flooding on routes 71

Results: Recognition of importance of the site for conservation 71

Results: Visitor postcodes and distance travelled to site 74

Visitor origins 74

Distance from home postcode to survey point 74

Distance and main activity undertaken 80

Distance and transport mode 80
Results: Visitor comments and suggestions 85
Discussion 88
5. Scaling up the Data: Footfall within and around the SPA 91
Overview 91
Methods 91
Predictions of visitor numbers 91
Estimates of Overall Visitor Numbers 92
Foot visitors 92
Car visitors 93
Other visitors 93
Overall totals 94
Spatial Distribution of Visitors within the SPA 94
Discussion 98
Assumptions within the model 98
The Potential to Use the Model alongside bird data 99
6. Recommendations and Implications for Management 101
Introduction 101
SPA designation and implications 101
Options to Reduce Disturbance 103
Consideration of Particular Options in Relation to the Upper Nene Valley 105
7. References 112
Appendix 1: Access points included in the car-park transects. 116
Appendix 2: Visitor Questionnaire (Spring) 121
Appendix 3: Visit Rates per Settlement 124

Acknowledgements

This project has been supported by Defra, DCLG, Environment Agency, Forestry Commission and Natural England. The report was commissioned by the RSPB on behalf of the Nature Improvement Area (NIA) partnership. Colin Wilkinson (RSPB) has been the main point of contact and we are grateful for his support throughout the work. Our thanks also to Heather Ball (The Wildlife Trust for Bedfordshire, Cambridgeshire & Northamptonshire), Brenda Cooknell (RSPB), Matt Johnson (The Wildlife Trust for Bedfordshire, Cambridgeshire & Northamptonshire) and Nicola Orchard (Natural England).

Survey work was conducted by Louise Floyd, Neil Gartshore, Nick Hopper and Douglas Whyte.

We extend our thanks to those landowners and site managers who allowed access for the survey to take place. We are also very grateful to all those who gave their time to be interviewed and provided the information that underpins this report.

1. Introduction

Overview

1.1 This report sets out the results of a visitor survey of the Upper Nene Valley, focussing on the gravel pits that form the Upper Nene Valley Gravel Pits Special Protection Area (SPA). This SPA designation reflects the internationally important waterfowl present in the area in the winter.

1.2 The SPA lies within the Nene Valley Nature Improvement Area (NIA), one of twelve landscape scale projects within England, established where there are opportunities to build and enhance ecological networks which will benefit both people and wildlife. The Nene Valley NIA is in the UK's second largest growth area, which means particular pressures from built development, demand for public access and recreation opportunities. The visitor survey was commissioned by the NIA partnership to assess the current levels of recreation and identify sites where visitor pressure may already be having an adverse effect on wildlife and the environment; sites where (if current trends continue) such an adverse effect might be anticipated; and sites where access and visitor facilities could be enhanced, including (potentially) increasing numbers of visitors.

1.3 In this section of the report we provide context to the rest of the report, setting out the background and the aims and objectives of the work.

The Nene Valley

1.4 The River Nene runs from Northamptonshire to the Wash. The river flows through a wide, flat valley formed of glacial deposits. For around 35km, from the southern outskirts of Northampton, downstream to Thorpe Waterville, north of Thrapston, runs a series of active and exhausted sand and gravel pits. These pits form an extensive series of shallow and deep open waters which occur in association with a wide range of marginal features, such as sparsely-vegetated islands, gravel bars and shorelines, and a range of habitats including reedswamp, marsh, wet ditches, rush pasture, rough grassland and scattered scrub. The pits lie at the core of the NIA and are designated for their wildlife interest.

The Nene Valley Nature Improvement Area (NIA)

1.5 The NIA covers 41,350 hectares and extends from Daventry to Peterborough (Map 1). It is one of twelve 'flagship' landscape projects in England that have received significant government funding. The Nene Valley NIA has been established with the aim to achieve a step-change in the mechanisms for delivering nature conservation and involves a range of organisations. One of the key objectives is to enhance public awareness, access and benefits in a sustainable and sympathetic way, while ensuring that the designated sites at the core remain in favourable condition.

Upper Nene Valley Gravel Pits Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI)

1.6 The SPA designation (map 1) is perhaps the most relevant and applies to the heart of the NIA. Such European wildlife sites (Special Protection Areas and Special Areas of Conservation) are given the highest level of protection in legislation. The original

European Birds Directive (Council Directive 79/409/EEC) was introduced into Europe in 1979 to protect rare and threatened birds and their habitats. This Directive includes the requirement for all Member States to classify 'Special Protection Areas' (SPAs) for birds of particular nature conservation concern, where such areas are found to be important for particular bird species or assemblages of species listed within the legislation. This may include areas that are important as stop off points for migratory birds, such as large assemblages of waterfowl. The original Birds Directive has now been updated and replaced by the Birds Directive 2009 (Council Directive 2009/147/EC). Species for which SPAs are classified are listed on Annex 1 of the Directive, and commonly referred to as 'Annex 1 species.'

1.7 The Upper Nene is one of the newest additions to the UK SPA network, and was designated in 2011. The interest features are:

Article 4.1, over-wintering species:

- Great Bittern *Botaurus stellaris* (2% of the GB population)
- Golden Plover *Pluvialis apricaria* (2.3% of the GB population)

Article 4.2, over-wintering species:

- Gadwall *Anas strepera* (2% of the GB population)

Article 4.2, internationally important assemblage:

- Non-breeding assemblage including Northern Shoveler *Anas clypeata* , Wigeon *Anas penelope*, Mallard *Anas platyrhynchos*, Gadwall *Anas strepera*, Common Pochard *Aythya ferina*, Tufted Duck *Aythya fuligula*, Great Bittern *Botaurus stellaris*, Eurasian Coot *Fulica atra*, Great Cormorant *Phalacrocorax carbo*, Golden Plover *Pluvialis apricaria*, Great-crested Grebe *Podiceps cristatus*, Lapwing *Vanellus vanellus*.

1.8 Whereas the SPA designation solely reflects the wintering bird assemblage, the SSSI designation in addition recognises a nationally important breeding assemblage (of 21 species; that includes the largest heronry in Northamptonshire, breeding wildfowl, waders and passerines) and also the presence of wet woodland. The SPA boundary matches the SSSI boundary except for this area of wet woodland, which has no significant bird interest and no public access.

New Development, Access and Nature Conservation

1.9 A critical issue for UK nature conservation is how to accommodate increasing demand for new homes and other development without compromising the integrity of protected wildlife sites. Development in the wider landscape around important sites brings particular issues, such as increasing the isolation/fragmentation of individual sites and increased levels of recreation. As development levels and the number of people increase, areas that are important for nature conservation fulfil a range of other services, which include providing space for recreation, ranging from the daily dog walk to extreme sports.

1.10 There is now a strong body of evidence showing how increasing levels of development, even when well outside the boundary of protected wildlife sites, can have negative impacts on the sites. The issues are particularly acute in southern England, where work on heathlands (Mallord 2005; Underhill-Day 2005; Liley & Clarke 2006; Clarke, Sharp & Liley 2008; Sharp *et al.* 2008) and coastal sites (Saunders *et al.* 2000; Randall 2004; Liley & Sutherland 2007; Clarke, Sharp & Liley 2008; Liley 2008; Stillman *et al.* 2009) provide compelling indications of the links between housing, development and nature conservation impacts.

1.11 The issues are not straight forward. It is now increasingly recognised that access to the countryside is crucial to the long term success of nature conservation projects and has wider benefits such as increasing people's awareness of the natural world and health benefits (Alessa, Bennett & Kliskey 2003; Pretty *et al.* 2005; Moss 2012). Nature conservation bodies are trying to encourage people to spend more time outside[1] and government policy (for example through enhanced coastal access) is promoting access. Furthermore access to many sites is a legal right, with an extensive Public Rights of Way network and open access to many sites through the Countryside and Rights of Way Act (2000). There is therefore a difficult balancing act required to resolve impacts associated with recreation without compromising the ability of people to be outside and enjoying the green spaces near their homes.

1.12 The potential for conflict is greatest where high human populations occur alongside areas of conservation importance, particularly where there are existing rights of access to those sites. Areas where the population is increasing markedly – for example through the provision of new housing – without consideration of the implications for nearby sites will be those where the conflicts will be greatest. Carefully planned and adaptable schemes to allow sustainable development in the right locations, whilst ensuring the highest levels of protection for wildlife is now an increasingly important aspect of spatial planning.

Visitor access and the condition of key sites in the Nene Valley

1.13 The majority of the SPA was judged to be in favourable condition when designated. The SPA standard data form[2] recognises that the main threat to the site is human recreational pressure. The form states:

"The intensity and location of recreational activities taking place just prior to SSSI notification ….. was considered compatible with maintaining favorable population levels. This is managed through voluntary agreements assisted by powers within Wildlife & Countryside Act 1981 as amended and The Conservation of Habitats & Species Regulations 2010.

The development of future recreational opportunities is to be addressed through valley-wide tourism and recreational strategies to provide a coordinated approach; including the development of access management plans for key sites and that appropriate

[1] For example through Project Wild Thing, http://projectwildthing.com/
[2] http://jncc.defra.gov.uk/pdf/SPA/UK9020296.pdf

planning policies are incorporated within strategic planning documents to ensure developments take account of direct and indirect recreational disturbance."

1.14 Currently the SSSI is assessed such that 41% is considered to be in favourable condition, with the remainder in unfavourable, recovering condition. Natural England identify the whole site as being "at risk" from increasing levels of recreation disturbance. Particular units in the condition assessment where disturbance is mentioned as an issue or a particular need to monitor access levels is stated include Units 1 (Great Houghton, on edge of Northampton), 6 (Stanwick) and 8 (north of Thrapston).

1.15 Within the SPA some sites, such as Stanwick Lakes, are well publicised visitor destinations offering a range of facilities including a visitor centre. By contrast, some parts of the SPA appear to be barely used and have limited access infrastructure.

Aims

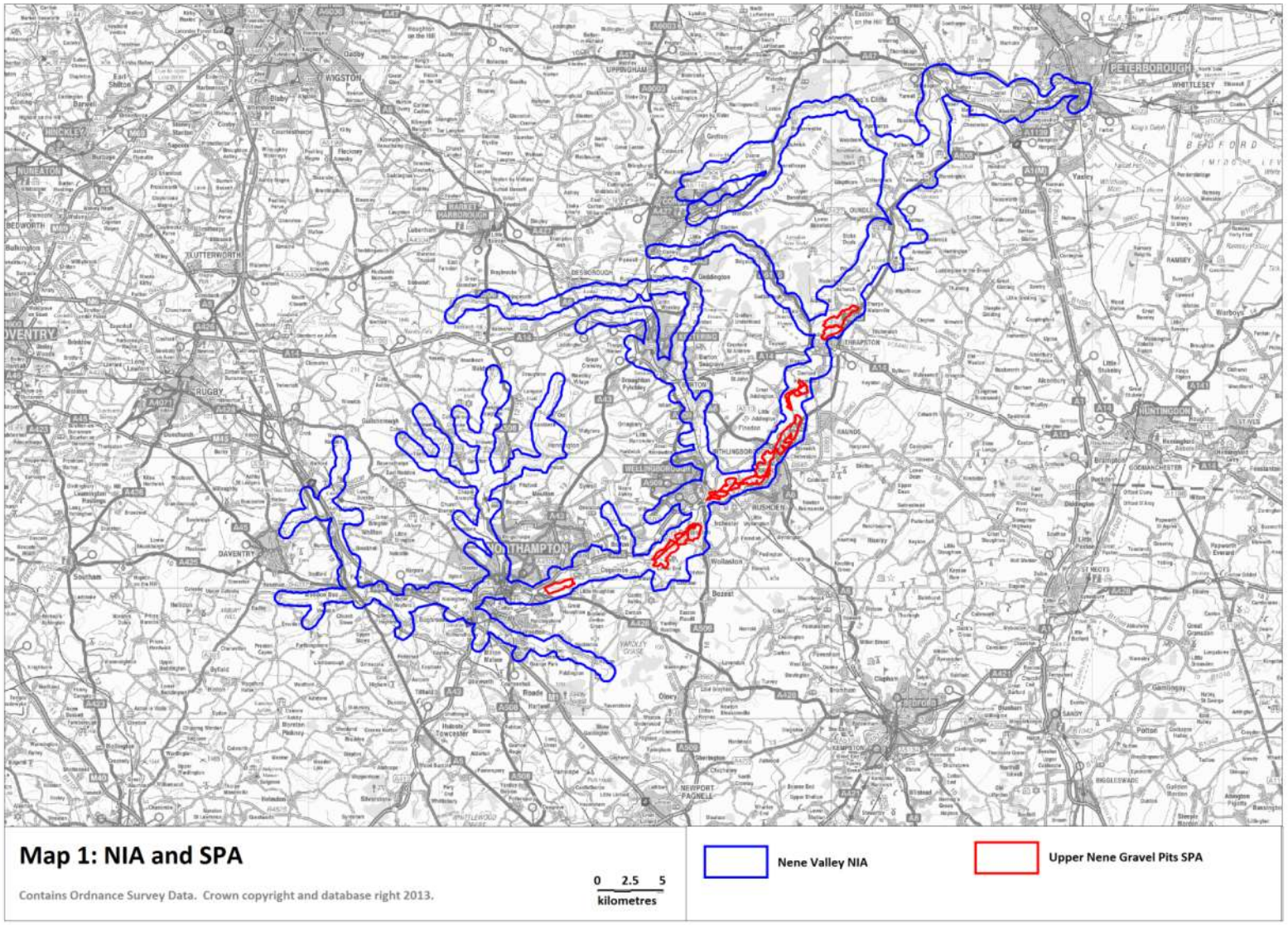
1.16 There is a clear requirement for a single study to provide a strategic overview of the access within and around the SPA, assessing visitor numbers, distribution, links to local development, visitor profiles and visitor behaviour. This information needs to be presented in context with the nature conservation interest to guide future management.

1.17 This report has been commissioned by the NIA partnership and aims to:

- Assess visitor numbers to the SPA
- Record the types of activity, behaviour of visitors, geographic and temporal spread of access and awareness of the nature conservation interest of the area among visitors
- Identify areas within the SPA where visitor numbers may be posing a threat to maintaining or achieving favourable condition and sites where access could increase without posing a risk to the nature conservation features in them
- Identify measures which could be established to reduce or avoid disturbance impacts and recommend which measures might be implemented

Structure of Report

1.18 The report has five subsequent sections. In the next section (Section 2) we focus on the access infrastructure present, focusing on mapping access points, parking provision and the path network within and around the SPA. Section 3 contains the results of visitor counts and the survey results relating to visitor numbers: from counts of parked cars, direct observation (tally counts) and automated counters. The following section (Section 4) is the longest, and contains the results of the face-face interviews conducted at a sample of locations. Section 5 scales up the data, with estimates of visitor numbers per day and a model of the spatial distribution of people within and around the SPA. The final section (Section 6) considers the implications of the visitor survey work and makes recommendations relating to the long-term management of the SPA and visitor access.



Map 1: NIA and SPA

2. Overview of Access Infrastructure, Access Points and Access within the NIA

2.1 In this section we review the infrastructure present, focusing on mapping access points, parking provision and the path network within and around the SPA. While of fundamental interest in their own right, these data provide the foundation for later sections of the report, namely for selecting visitor survey points, scaling up estimates of visitor numbers and making recommendations for future management.

Methods

Mapping Access Points

2.2 An initial GIS base map was provided by the RSPB which identified the key points of access onto the SPA. We focused on a core area of the NIA surrounding the Upper Nene Valley Gravel Pits SPA stretching from the A5076 to the south west of Northampton, up to Thorpe Waterville, beyond Thrapston. Site visits were carried out in October 2012 and all areas of open water and significant public open space were identified. Visits included the whole SPA and some nearby areas of public green space. The start of all footpaths, tracks, bridleways and other potential means of access were identified using an Ordnance Survey 1:25,000 map; checked on the site visit and later through the use of satellite imagery. All confirmed access points were then mapped onto paper maps and way-points were recorded using a handheld GPS.

2.3 All access points were subsequently mapped as point data within a GIS (MapInfo version 10.5) and assigned a unique identification number, ascending from south west to north east of the study area. These identification numbers are used throughout the report – for example a subset of were used to conduct the face-face interviews.

2.4 Multiple types of access point were incorporated, including formal car parks, lay-bys, track entrances to public rights of way etc. Each point was categorised as:

- Formal parking (i.e. a formal car park, or a surfaced lay-by with signs about access)
- Informal parking (i.e. verge parking, roadside or un-surfaced lay-by)
- Foot-only access (i.e. no clear parking available)

2.5 The maximum parking capacity was estimated from observations during site visits and cross-referenced to aerial photographs or satellite imagery. Estimates were more complicated for some informal car parks such as lay-bys, in which case the estimates were based on the space available in the immediate vicinity of the access point. In some cases, no capacity estimate was calculated due to difficulties in providing an accurate figure. An example of this was the car park next to Northampton Town Football Club at Sixfields Stadium; a very high number of spaces are available and it was not possible to give an accurate estimate of capacity.

2.6 Other information was collected for each access point, such as the presence of interpretation information, presence of facilities such as toilets or a visitor centre, name of location where applicable and the organisation responsible for the management of that location.

Mapping the Path Network and Use of Grid to Summarise Spatial Data

2.7 A single map of the path network provides a basis for later mapping of visitor intensity within the SPA and is a useful starting point for making recommendations. We generated a map of the path network using OpenStreet Map and data provided by the RSPB (primarily showing rights of way). The mapped network was digitised as a series of polylines to allow it to be used within the GIS as a route network (utilising the Routefinder Add-in for MapInfo).

2.8 The mapped network included minor roads, tracks, informal paths and rights of way. A 100m grid was used to summarise this path network – this grid forms the basis for the modelling in later chapters. The grid was aligned to the OS National Grid. The use of a grid allows data to be simplified and more easily presented graphically. We used the path network to identify grid cells that had access (i.e. grid cells that were intersected by the path network) and also cells which were entirely comprised of water.

Results: Access Points and Parking

2.9 In total, 126 access points were identified and these are shown by type in Map 2. The number of access points identified within each category and the estimated parking capacity for each is summarised in Table 1. In total 2,098 parking spaces were counted and mapped, with 693 providing direct access onto the SPA (Table 1).

Table 1: Summary of access points around the SPA showing the number of access points and parking spaces by access point type. Percentages are in parentheses.

	Number of Access Points		Estimated parking capacity	
	All core area	**Direct link to SPA**	**All core area**	**Direct link to SPA**
Foot only	58 (46)	34 (42)		
Formal Parking	36 (29)	20 (25)	1929 (92)	542 (78)
Informal Parking	32 (25)	27 (33)	169 (8)	151 (22)
Total	**126 (100)**	**81 (100)**	**2,098 (100)**	**693 (100)**

2.10 For those car-parks with direct access to the SPA, 20 were classified as formal parking and 27 as informal parking, giving a total of 47 car-parks. These are mostly small car-parks and distributed across the entire SPA area, with the majority (30) having ten or less parking spaces (Figure 1, Map 3). We also mapped and recorded 21 access points that didn't have direct access to the SPA, and these were usually linked to green space sites, such as Irchester Country Park or Sywell Country Park. These 21 access points tended to be large car-parks (Figure 1, Map 3).

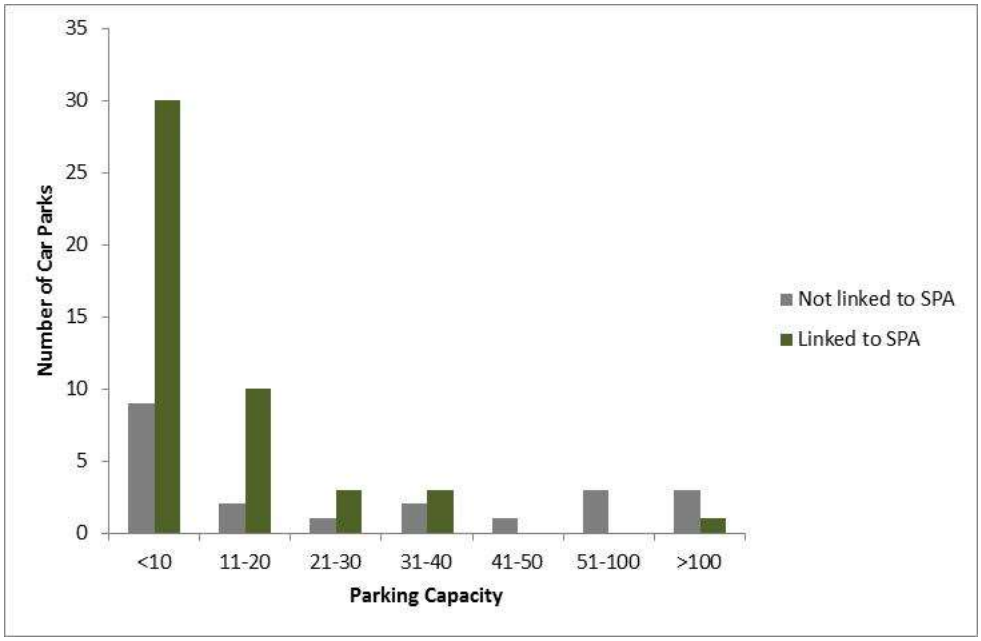


Figure 1: Number of car-parks by capacity

Results: Path Network

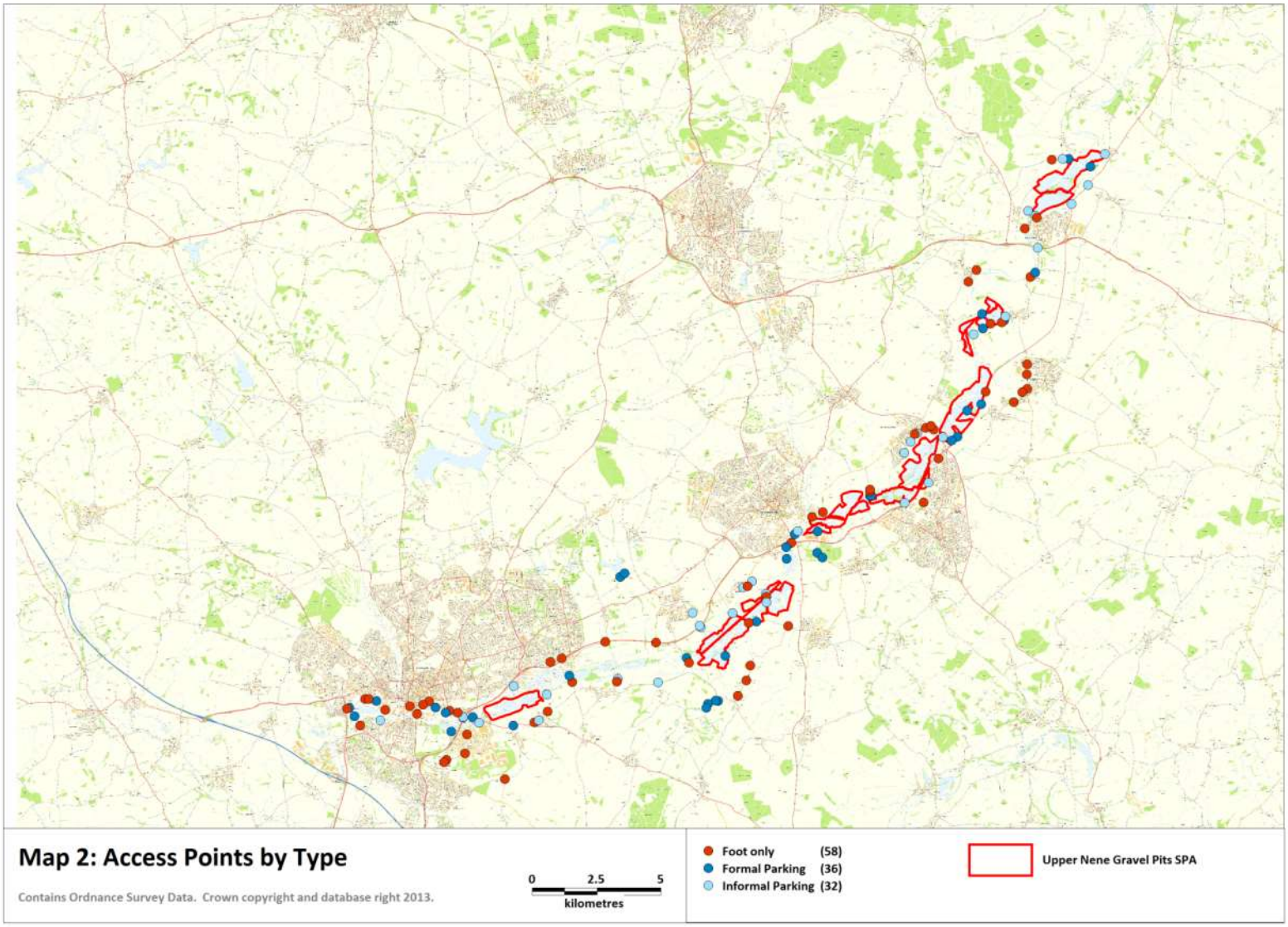
2.11 The path network as mapped comprises a total of 205km of paths or tracks and a further 90km of roads (excluding trunk roads) where foot access is also possible. Around 87km of path or tracks intersect and run within the SPA boundary.

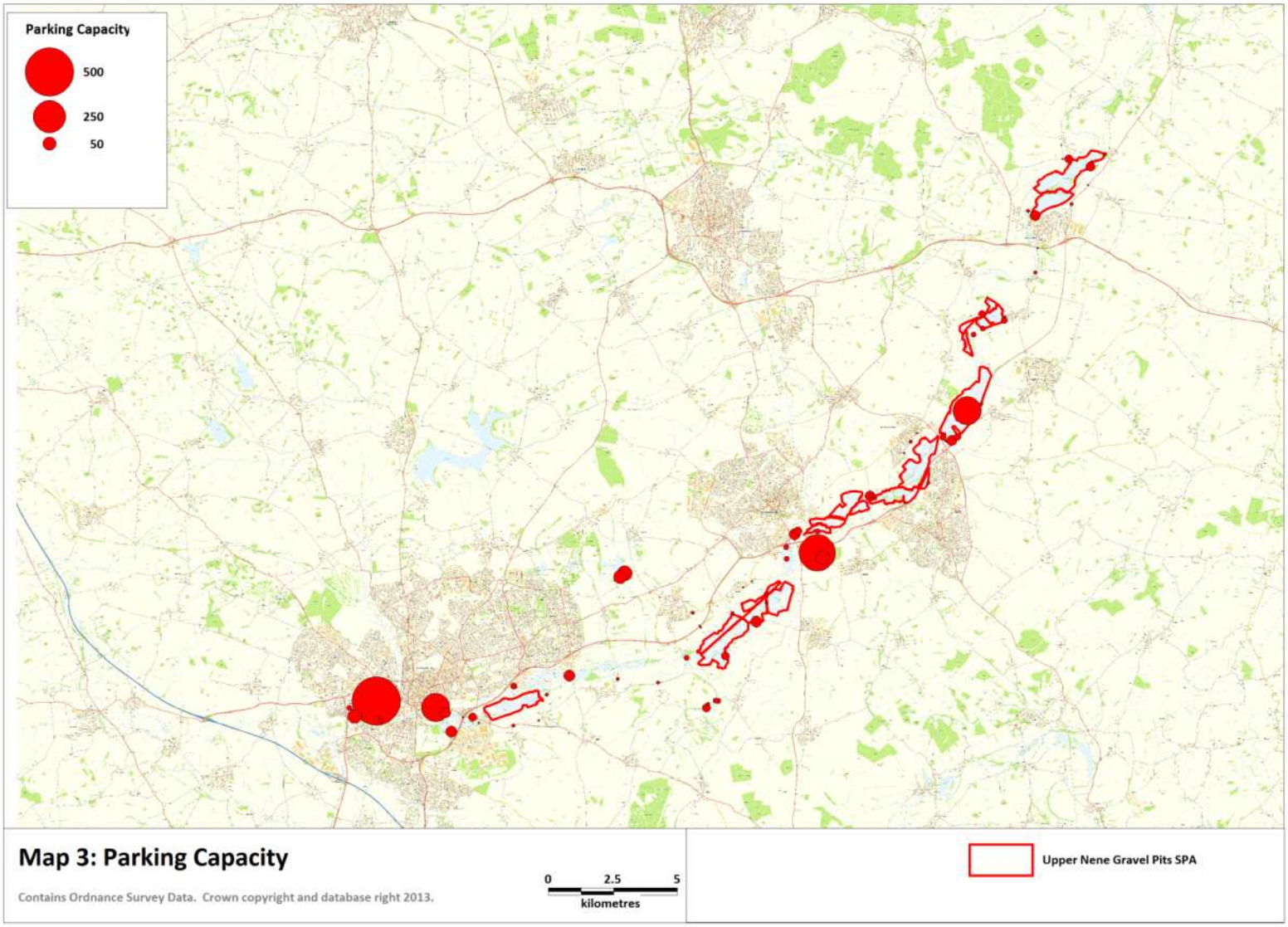
2.12 Map 4 shows the grid with cells with access shaded green and those that are entirely open water (i.e. access on foot impossible) shaded blue. The grid (which extended through the valley from either end of the SPA) was comprised of 7,734 grid cells, each of 1ha (100m by 100m). Of these cells not quite half (3,069) had access and a further 141 were entirely open water.

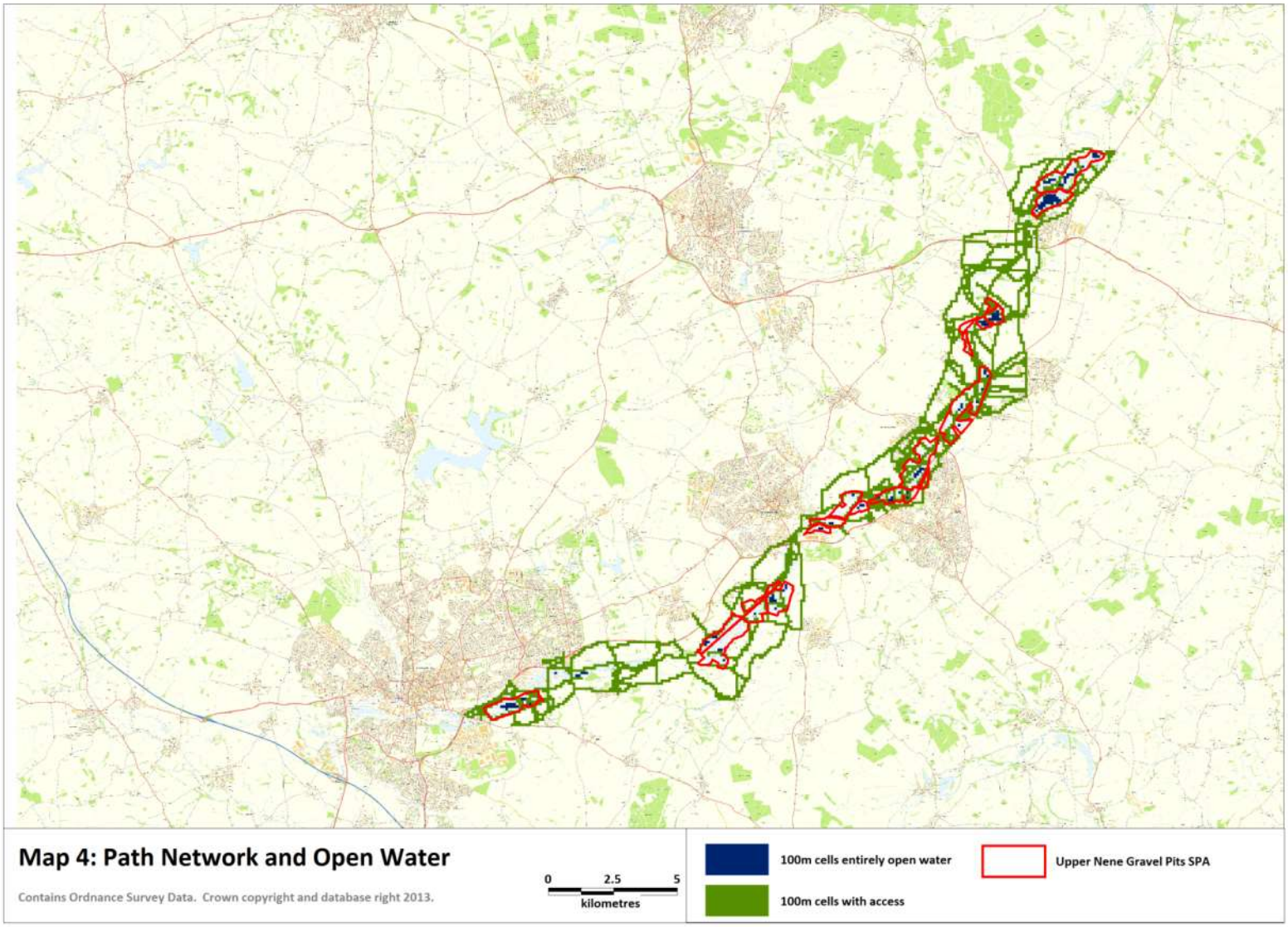
Summary

Data on the path network and access points provide a foundation for later parts of the report and are informative in their own right. 126 access points were mapped that provided direct access to the SPA (81) or to green space sites in the vicinity of the SPA (45). A total of 34 access points onto the SPA are foot-only with a further 47 access points providing access to the SPA and some parking provision. Across all 126 access points, 2,098 parking spaces were counted and mapped; 693 spaces were at points with direct access onto the SPA.

Parking provision around the SPA is predominantly small car-parks distributed across the area. There are also a number of large car-parks just outside the SPA that provide access to Country Parks and similar sites but have no direct link to the SPA.


Map 2: Access Points by Type
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Foot only (58)
Formal Parking (36)
Informal Parking (32)
Upper Nene Gravel Pits SPA


Parking Capacity
500
250
50
Map 3: Parking Capacity
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Upper Nene Gravel Pits SPA


Map 4: Path Network and Open Water
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
100m cells entirely open water
100m cells with access
Upper Nene Gravel Pits SPA

3. Visitor Numbers: Car-park Transects, Automated Counters and Tally Counters

Overview

3.1 In this section we present the results of the survey work that relate to visitor numbers. Three different count types were used. Tally counts involved direct counts of people by a surveyor standing at an access point; a sample of access points were surveyed in this way. Counts of parked vehicles were undertaken across the SPA and nearby sites. These counts were undertaken through a series of transects. The third approach involved automated counters, placed at a small number of locations as a check on levels of use at relatively quiet locations.

Methods

Tally Counts

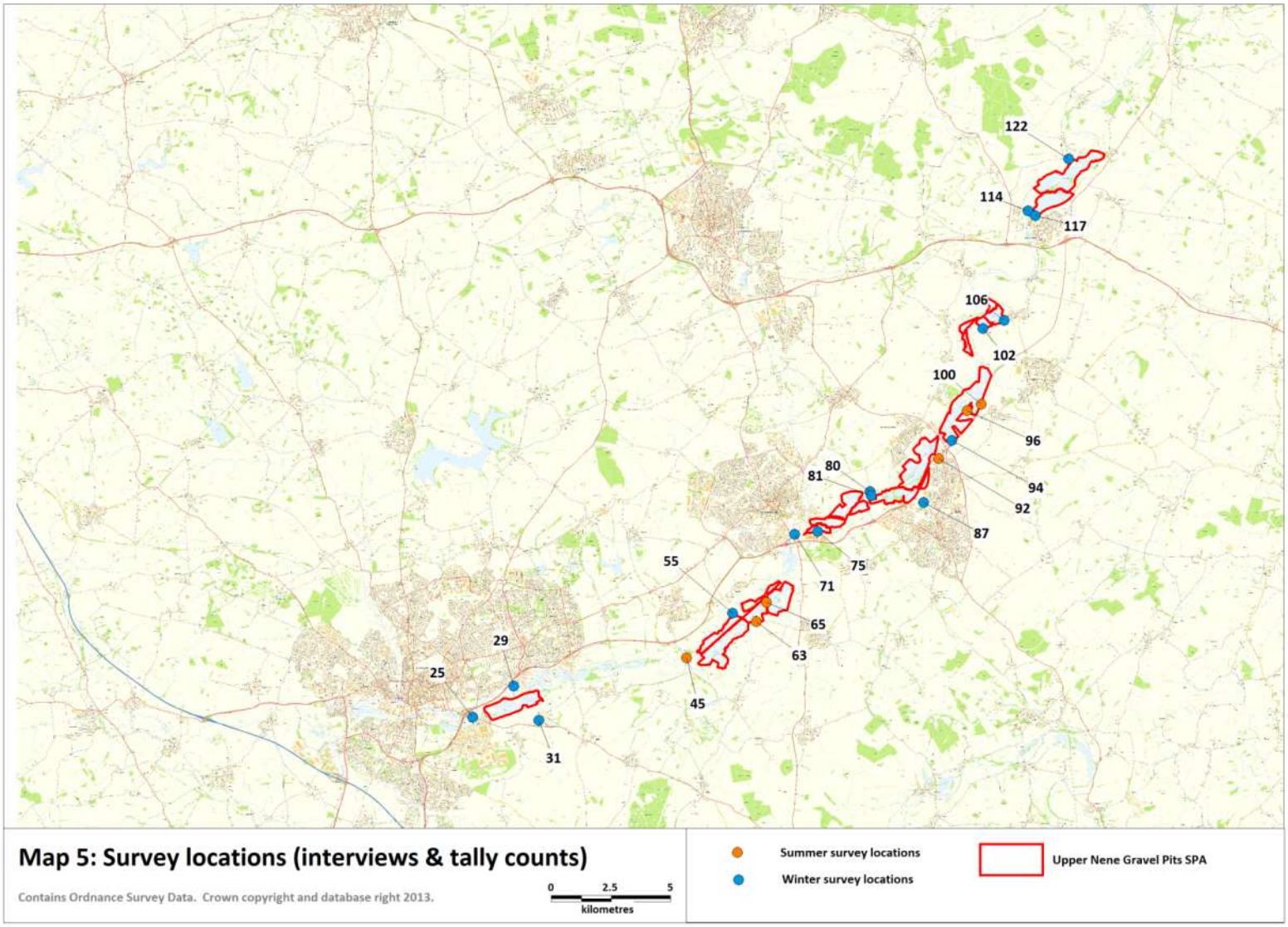
3.2 Using information gathered on the site visits and in discussion with the NIA partnership, a subset of access points with direct access onto the SPA were selected for the visitor survey. The full list of the 21 visitor survey locations is provided in Table 2 below and the sites that were resurveyed in the spring/summer are shown in bold.

3.3 All selected survey locations provided direct access onto the SPA; of these, 12 were formal car parks, 6 informal parking and 3 were foot-only locations (Table 2: Map 5). The selection was stratified to reflect the range of types of access point by grouping access points by type, then within each group, ranking by parking capacity and then by coordinates, such that points with similar parking capacity were ranked from east to west. A spatial spread of survey points was confirmed by visually checking the map to ensure key areas of the SPA for wintering birds were incorporated and where adjacent access points were selected, alternatives were chosen.

Table 2: List of survey locations. Those listed in bold were surveyed in both the winter and spring/summer periods. Map reference refers to Map 5.

Location (Map reference)	Parking Estimate	Access Point Type	Comments
Bedford Road Holiday Inn (25)	20	Formal	Gated car-park accessed via entrance to Holiday Inn hotel, tucked away.
Weston Mill Lane (29)	15	Informal	Informal roadside parking at end of Weston Mill Lane. Riverside paths, cycle route to city centre. Next to industrial estate.
Little Houghton (31)	2	Informal	Roadside parking in village, footpath and leafleted walk
Earls Barton bends car park (45)	**10**	**Formal**	**Earls Barton. Small car-park at a 90 degree bend along public right of way. Canoe porterage point**
Hardwater Mill (55)	4	Informal	Lay-by before bridge and public right of way, including the Nene Valley Way.
Summer Leys car park (63)	**40**	**Formal**	**Main car-park at Summer Leys Nature Reserve.**

Location (Map reference)	Parking Estimate	Access Point Type	Comments
Mary's Lane (65)	**5**	**Informal**	**Parking along road providing access to Summer Leys Nature Reserve on one side and to fishing lake on the other.**
Wellingborough Embankment (71)	40	Formal	Embankment car-park, with urban feel and visitor facilities.
Wellingborough Lakes 'The Mill' (75)	8	Formal	Private anglers car-park, accessed from industrial estate.
Ditchford Bridge (80)	0	Foot-only	Public right of way past haulage yard.
Ditchford Lakes & Meadows (81)	10	Formal	Opposite waterskiing club gate, with height restriction bar.
Northampton Road, Rushden (87)	0	Foot-only	Public right of way
King's Meadow Lane (Higham Ferrers) (92)	**0**	**Foot-only**	**Footpath accessed from end of Parker Way through housing estate. Bridge over A45 accesses lakes.**
Stanwick Fishing Lakes (94)	33	Formal	Gated private parking for fishing; capacity estimated from Google Earth
Stanwick Lakes Visitor Centre (96)	**200**	**Formal**	**Main car-park for Stanwick Lakes; gated with charge.**
Stanwick Lakes layby (100)	**4**	**Formal**	**Lay-by with access to Stanwick Lakes, no parking charge.**
Ringstead Grange (102)	10	Formal	Private gated car-park for anglers.
Kinewell Lake (106)	12	Formal	Kinewell Lake Nature Reserve, signposted as a Pocket Park.
Mill Lane, Islip (114)	4	Informal	End of Mill Lane, along Nene Valley Way
Meadow Lane car park, Thrapston (117)	30	Informal	Bumpy road leading to parking area and marked trails.
Titchmarsh LNR Car Park (122)	20	Formal	Titchmarsh Nature Reserve, parking along Lowick Lane.



Map 5: Survey locations (interviews & tally counts)

3.4 The standardised counts were conducted in four two hour sessions per day (07:30-09:30; 10:00-12:00; 12:30-14:30; 15:00-17:00[3]), providing eight hours of survey effort per day. Surveyors both maintained a count of people and also conducted face to face interviews: the results of the face to face interviews are presented in the next section. Surveys were carried out on one weekday and one weekend day, resulting in 16 survey hours per location (336 hours in total). This methodology allows for direct comparisons between visitor patterns across survey locations and provided the surveyor with regular breaks.

3.5 During each two hour session the interviewer recorded the tally counts of all people, adults, minors, dogs and groups. All visitors to each of the survey locations were recorded as either entering or leaving the site on a tally form for each two hour survey session.

3.6 Surveyors would stand at an entrance point to the site (or another agreed position) and record all adults, children, dogs and groups observed during the standardised survey time periods; visitor numbers were not recorded outside the standardised time slots.. The term 'group' in this instance reflects the total number of individuals in each party. The number of visitors who refused to complete a survey and those who had already been questioned were also recorded. Weather conditions and any unusual activities, for example road works, access problems or extreme weather conditions were noted. Each surveyor then provided an overview of the survey location at the end of the last session. At Stanwick Lakes, due to the size and level of activity, the tally simply reflects the number of people passing the surveyor at the corner of the car-park adjacent to the visitor centre

Car-park transects

3.7 Counts of parked cars were undertaken across the whole SPA and wider area. These counts were conducted as part of a series of driving transects: in total, 61 car parks were visited and for logistical reasons, these were split into three transect circuits (Map 6), each circuit being approximately 40km in distance and taking around 3 hours to complete. The car-parks are also listed in Appendix 1.

3.8 Over winter (November to March) ten transects were completed (i.e. each parking location was counted ten times). Five more transects were then completed over the spring fieldwork period. The time of day, day and route taken on each circuit were varied, ensuring that the coverage of transects included a range of times of day, weekdays, weekends and school holiday periods. Transects were carefully scheduled to ensure comparable coverage (in terms of time of day, weekend/weekday and weather) for each parking location. Due to weather conditions and flooding this did mean that on some days more than one transects was undertaken and transects were also split between days (see Table 3).

[3] Note that these times were extended to 07:00-09:00; 10:00-12:00; 13:00-15:00 and 17:00-19:00 for the spring/summer surveys.

Table 3: Car-park transect dates. Each transect was comprised of three circuits, sometimes done on successive days by the same surveyor, sometimes multiple circuits were undertaken on the same day using different surveyors. Note that multiple transects were undertaken on some dates.

Transect number	Day	Date started	Date finished
Winter			
1	Weekday	06/12/2012	07/12/2012
2	Weekend	12/01/2013	13/01/2013
3	Weekday	18/02/2013	19/02/2013
4	Weekday	18/02/2013	19/02/2013
5	Weekday	27/02/2013	01/03/2013
6	Weekday	27/02/2013	01/03/2013
7	Weekday	21/01/2013	23/01/2013
8	Weekday	06/02/2013	08/02/2013
9	Weekday	05/02/2013	07/02/2013
10	Weekend	05/02/2013	17/02/2013
Spring			
11	Weekday	22/05/2013	24/05/2013
12	Weekday	22/05/2013	24/05/2013
13	Weekend	04/05/2013	05/05/2013
14	Weekday	28/05/2013	30/05/2013
15	Weekday	28/05/2013	30/05/2013

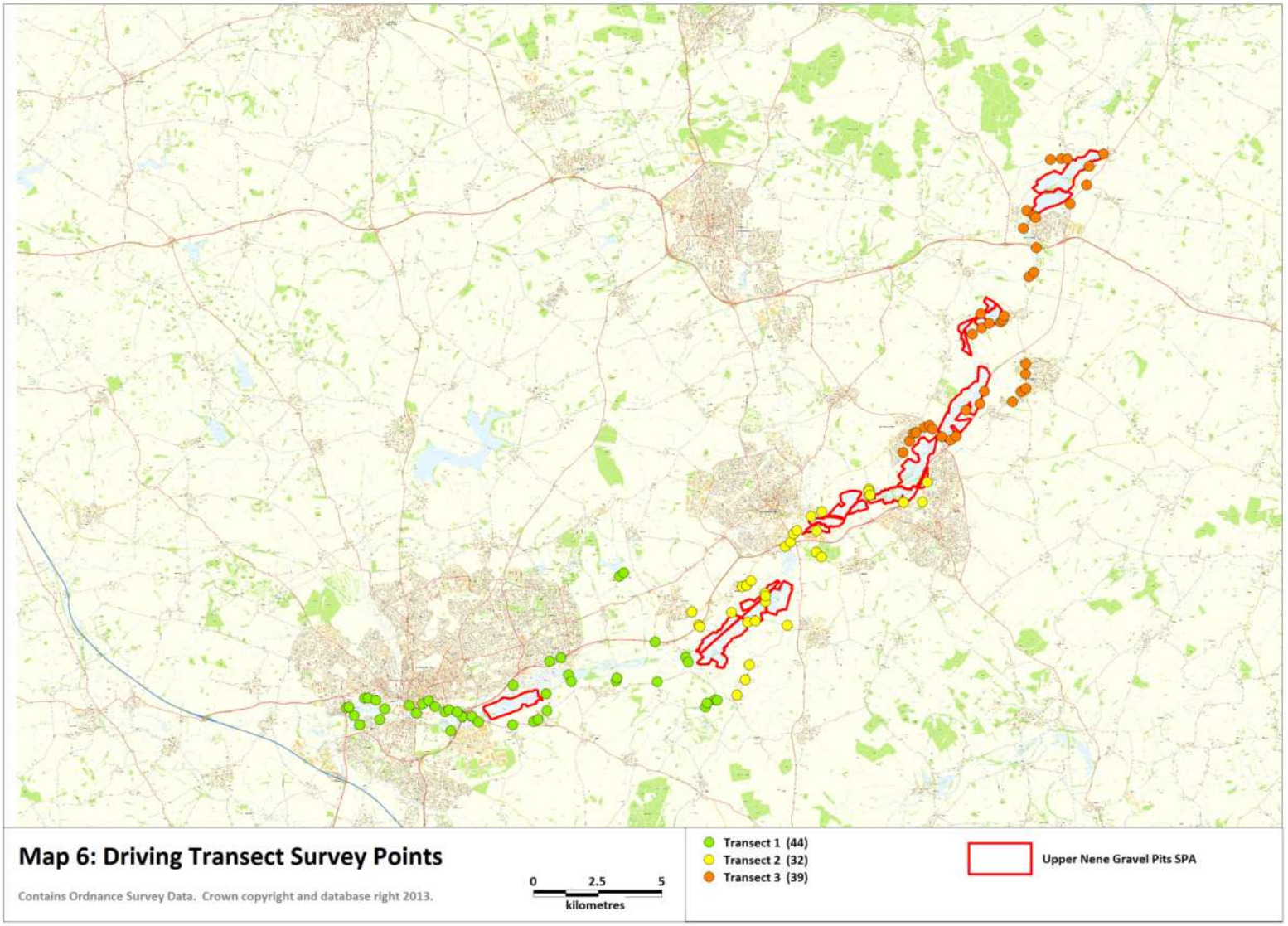
Automated counters

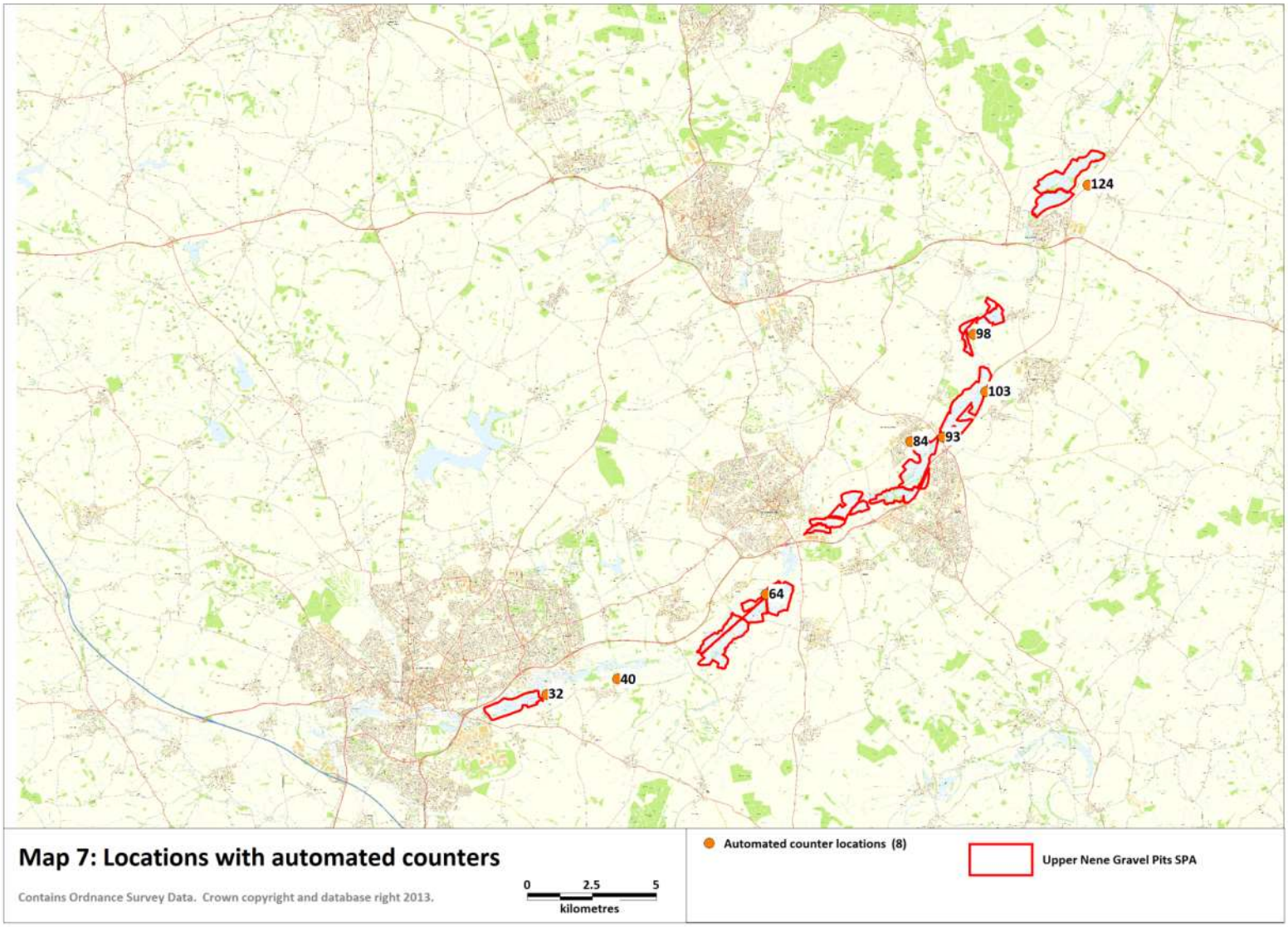
3.9 Automated beam counters (Trailmaster active infrared monitors [4]) were placed at eight locations for between one to three days over the winter fieldwork period and recorded each time the beam was 'broken'. Typically, the counters were tied to fence posts or trees, while remaining as inconspicuous as possible to avoid tampering with. Locations were selected to provide further information about visitor patterns in specific locations, for example paths not covered by face to face interviews, such as some foot-only access points not covered by driving transects (Table 4; Map 7). The number of beam breaks over the given period has been converted to an hourly rate.

[4] Trailmaster TM1050 active infrared trail monitors: http://www.alanaecology.com/acatalog/TM1050.pdf

Table 4: List of locations where automated counters were put in place over the winter survey period.

ID	Access type	Parking Capacity Estimate	Description
32	Informal	5	Public right of way along Mill Lane.
40	Informal	3	Small lane through village turning into private road and caravan park. Parking on verge and public right of way.
64	Informal	6	Doddington crossing.
84	Informal	3	Footpath access to floodplain near the end of Crouch Road
93	Informal	15	Entrance from scrap-yard. Access to Stanwick Lakes for free.
98	Informal	8	Parking and gate at end of road for Norththorne Marina. Access to Stanwick Lakes.
103	Foot-only	0	Public right of way.
124	Informal	2	Public right of way from road.


Map 6: Driving Transect Survey Points
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Transect 1 (44)
Transect 2 (32)
Transect 3 (39)
Upper Nene Gravel Pits SPA



Map 7: Locations with automated counters

Results

Tally Data

3.10 Over the 432 survey hours, 1107 groups were recorded entering at the survey locations. These groups comprised 2157 people and 758 dogs. These totals equate to 2.6 groups, 5.0 people and 1.8 dogs per hour. The ratio of dogs to people is 1 dog for every 2.8 people.

3.11 Of the overall totals, 695 groups (63%), 1227 adults (57%) and 579 dogs (76%) were counted during the winter period. The amount of time spent surveying was 336 hours (i.e. 78% of survey effort); the number of dogs counted during the winter was therefore roughly even, but the numbers of groups and people per hour over the winter was lower.

3.12 The tally count data is summarised in Table 5, which gives the total numbers of people and dogs counted entering and leaving each site over the winter and summer/spring periods. The winter tally count data (number of people counted entering each location during the 16 hours survey work at each location) are summarised in Map 8.

3.13 The busiest site overall, taking into account both winter and spring data, for visitor counts was the main car park at Stanwick Lakes (site 96), accounting for 24% of the total number of groups counted entering and leaving, and 26% of all adults recorded. Due to the large open nature of the site, it is likely that the tally counts for the main car park at Stanwick Lakes is an underestimate, due to the high volume of visitors and the limited capacity of each surveyor to accurately count all people travelling in and out of numerous access points whilst also performing interviews.

3.14 The main car park at Summer Leys Nature Reserve (site 63) was the second busiest with 20% of all groups and 22% of all adults recorded entering and leaving. The highest number of dogs was also recorded entering and leaving Summer Leys Nature Reserve (site 63), accounting for 20% of the total number of dogs counted over both survey periods. The highest number of cyclists was counted at the main car park of Stanwick Lakes (site 96), accounting for 64% of all cyclists recorded.

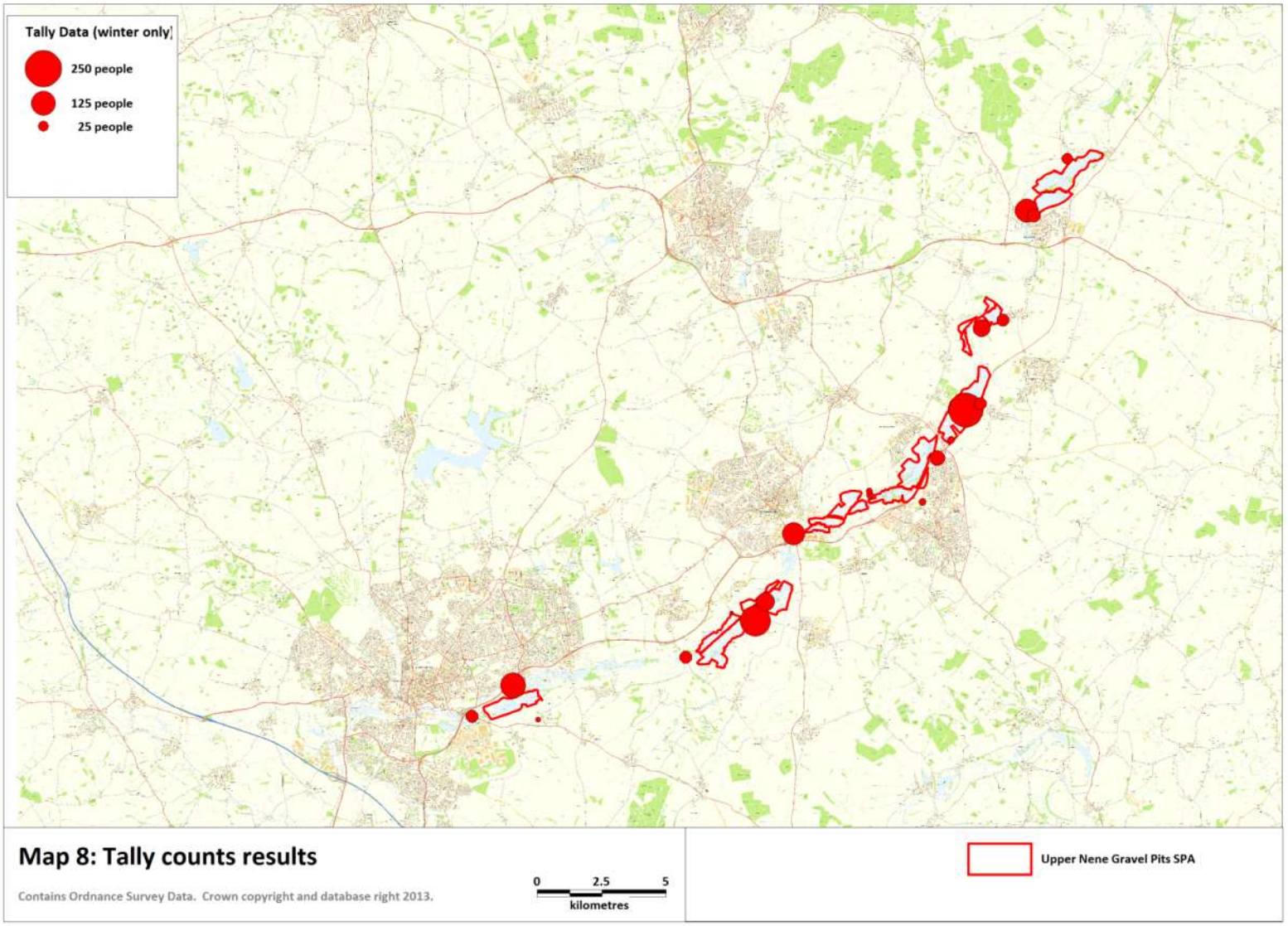
Table 5: Summary of visitor numbers at interview locations, entering (top) and leaving (bottom). Column headings give Groups (G), Adults (A), Minors (M), Dogs (D) and Cyclists (C). A single group could comprise one or more adults, children, cyclists and dogs.

Entering:

Site	Winter					Spring/Summer					Total				
	G	A	M	D	C	G	A	M	D	C	G	A	M	D	C
Bedford Road Holiday Inn (25)	25	33	1	17	1						25	33	1	17	1
Weston Mill Lane (29)	80	116	15	62	4						80	116	15	62	4
Little Houghton (31)	7	6	1	14							7	6	1	14	
Earls Barton bends car park (45)	29	36		33		19	28	4	18	1	48	64	4	51	1
Hardwater Mill (55)	3	3		2							3	3		2	
Summer Leys car park (63)	100	170	8	99	2	126	219	14	56	1	226	389	22	155	3
Mary's Lane (65)	40	66	5	24	1	38	67	2	28		78	133	7	52	1
Wellingborough Embankment (71)	60	87	22	24							60	87	22	24	
Wellingborough Lakes 'The Mill' (75)	1	1									1	1			
Ditchford Bridge (80)	11	12		8							11	12		8	
Ditchford Lakes & Meadows (81)	11	15		9							11	15		9	
Northampton Road, Rushden (87)	7	11	5	7	2						7	11	5	7	2
King's Meadow Lane (Higham Ferrers) (92)	23	43	8	23	8	28	40	1	22	5	51	83	9	45	13
Stanwick Fishing Lakes (94)	12	13									12	13			
Stanwick Lakes Visitor Centre (96)	88	156	68	56	40	141	277	164	21	22	229	433	232	77	62
Stanwick Lakes layby (100)	24	32	5	27	1	60	110	4	34	6	84	142	9	61	7
Ringstead Grange (102)	42	68	2	40	2						42	68	2	40	2
Kinewell Lake (106)	25	33	2	26							25	33	2	26	
Mill Lane, Islip (114)	72	101	12	74	2						72	101	12	74	2
Meadow Lane car park, Thrapston (117)	20	35	6	28	2						20	35	6	28	2
Titchmarsh LNR Car Park (122)	15	25	5	6	3						15	25	5	6	3
Total	**695**	**1062**	**165**	**579**	**68**	**412**	**741**	**189**	**179**	**35**	**1107**	**1803**	**354**	**758**	**103**

Leaving:

Site	Winter					Spring/Summer					Total				
	G	A	M	D	C	G	A	M	D	C	G	A	M	D	C
Bedford Road Holiday Inn (25)	26	31	4	15	4						26	31	4	15	4
Weston Mill Lane (29)	67	93	8	64	2						67	93	8	64	2
Little Houghton (31)	9	10	1	16							9	10	1	16	
Earls Barton bends car park (45)	23	35		34		19	34	1	22		42	69	1	56	
Hardwater Mill (55)	4	5		4							4	5		4	
Summer Leys car park (63)	85	138	5	91	2	112	187	11	38	1	197	325	16	129	3
Mary's Lane (65)	26	39		19		34	51	2	17		60	90	2	36	
Wellingborough Embankment (71)	31	50	11	16							31	50	11	16	
Wellingborough Lakes 'The Mill' (75)	1	1									1	1			
Ditchford Bridge (80)	9	10		9							9	10		9	
Ditchford Lakes & Meadows (81)	8	11		9							8	11		9	
Northampton Road, Rushden (87)	2	2		1							2	2		1	
King's Meadow Lane (Higham Ferrers) (92)	28	50	7	16	13	21	32		12	1	49	82	7	28	14
Stanwick Fishing Lakes (94)	16	19	2								16	19	2		
Stanwick Lakes Visitor Centre (96)	107	178	74	70	53	158	266	125	25	14	265	444	199	95	67
Stanwick Lakes layby (100)	14	24	5	10	1	31	48	2	17		45	72	7	27	1
Ringstead Grange (102)	34	48		40	3						34	48		40	3
Kinewell Lake (106)	23	28	2	22							23	28	2	22	
Mill Lane, Islip (114)	49	71	4	50	1						49	71	4	50	1
Meadow Lane car park, Thrapston (117)	15	34	3	25	3						15	34	3	25	3
Titchmarsh LNR Car Park (122)	13	19	1	7							13	19	1	7	
Total	**590**	**896**	**127**	**518**	**82**	**375**	**618**	**141**	**131**	**16**	**965**	**1514**	**268**	**649**	**98**


Tally Data (winter only)
250 people
125 people
25 people
Map 8: Tally counts results
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Upper Nene Gravel Pits SPA

Car-park Transects

3.15 Results of the car-park transects are summarised in Map 9 (total counts per location over the winter) and Map 10 (total counts per location for the spring).

3.16 Across all 15 transects, 3296 parked vehicles were counted. The total number of cars counted ranged from 112 to 423. The totals for each of the 15 transects are summarised in Table 6. The transects with the highest counts were both carried out on weekdays in the winter, with the highest count on weekdays in mid February. Comparing the totals for transects there were no significant differences comparing spring and winter (Mann-Whitney W=86.5; p=0.46) nor weekends and weekdays (Mann-Whitney W=85.5; p=0.15; but note the small sample size).

Table 6: Transect results

Transect	Day	Total Vehicles	Rank
Winter			
1	Weekday	214	7
2	Weekend	275	3
3	Weekday	256	4
4	Weekday	423	1
5	Weekday	179	11
6	Weekday	118	14
7	Weekday	184	10
8	Weekday	112	15
9	Weekday	356	2
10	Weekend	233	6
Spring			
11	Weekday	134	13
12	Weekday	167	12
13	Weekend	256	4
14	Weekday	192	9
15	Weekday	197	8

3.17 Stanwick Lakes main car-park was the busiest car-park on each transect. Across all transects 15% of the vehicles counted were at this single access-point. There were strong correlations between the transect results for individual car-parks between the spring and the winter and weekends and weekdays, indicating that the patterns recorded tended to be consistent regardless of day or spring/winter (Table 7). In other words car-parks that were busy at one time of year or day were also busy in the others, and vice-versa. Summary plots (Figure 2) suggest that one or two car-parks did seem markedly different between the seasons. In particular location 14 (Midsummer Meadow Car-park) stands out as having higher numbers of cars in the spring compared to the winter at weekends but on weekdays the mean number of cars was higher in the winter. This car-park is a pay and display car-park and located well inside Northampton. Location 41, the main car-park at Sywell Country Park was busier on winter weekends

compared to spring weekends. Location 95 (Stanwick Lakes Main Car-park) was busier on weekdays in the winter compared to weekdays in the spring. The other access point which was notable was 41 (Irchester Country Park main car-park) where winter weekends appeared to be much busier than spring weekends.

Table 7: Correlation matrix for car-park transect results by weekend and season. Table shows Pearson Correlation coefficients. All are significant (p<0.001 in all cases).

	Spring weekend	Spring weekday	Winter weekend
Spring weekday	0.748		
Winter weekend	0.686	0.884	
Winter weekday	0.971	0.748	0.655

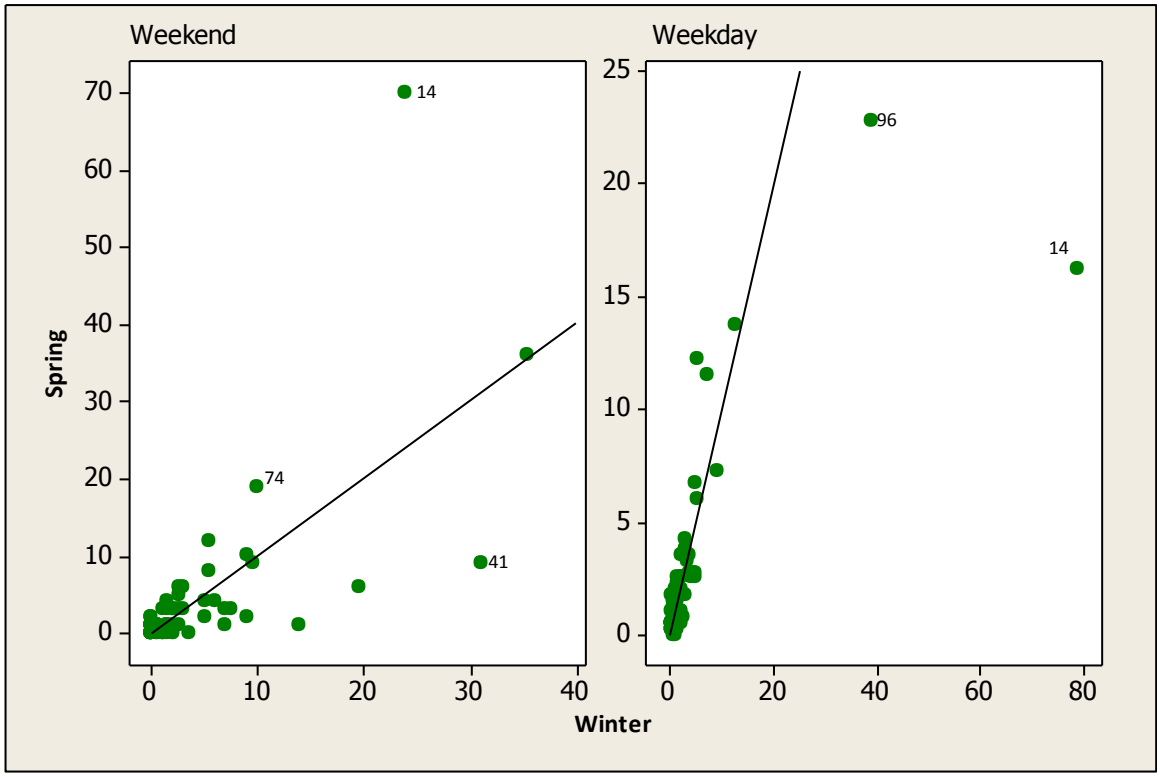


Figure 2: Mean total number of vehicles at car-parks in the spring and winter. Diagonal lines show 1:1 ratio (i.e. points on this line are ones where the count was identical in the spring and the winter; points above the line had were higher in the spring and below the line higher in the winter). Labels identify particular access points (see text).

Automated Counters

3.18 Automated counters were put in place at eight locations over the winter fieldwork period only; a total of 438 beam breaks were recorded over a total of 179 hours.

Table 8: Automated counter results. Total counted is the number of beam breaks. Assuming visitors return through the same access point this figure can potentially be halved.

Location Number	Details	Total counted	Number of hours in place	Date	Time put out	Date brought in	Time brought in
32	Informal parking. Public right of way down Mill Lane, close to industrial units.	20	12:24	05/12/2012	06:31	05/12/2012	18:55
40	Informal parkin. Small lane through	11	11:04	08/12/2012	06:41	09/12/20	17:45

	village, turns into private road and a caravan park.					12	
64	End of track at Doddington Crossing. Area to park and turn.	65	11:11	24/01/2013	06:44	24/01/2013	17:55
84	Access along footpath to floodplain near end of Crouch Road.	47	24:55	27/02/2013	18:10	28/02/2013	19:05
93	Turning by scrap-yard. Access to Stanwick Lakes, road loops back to Kettering Football Club	36	23:50	06/12/2012	06:54	07/12/2012	06:44
98	End of road, gated area and parking by Norththorne Marina. Access to Stanwick Lakes	132	24:10	01/03/2013	18:50	02/03/2013	19
103	Public right of way	84	59:00	28/11/2012	06:58	01/12/2012	17:58
124	Public right of way	43	12.22	26/1/2013	06:42	26/1/2013	19:04

Discussion

3.19 This section summarises the basic count data relating to visitor numbers. The approaches used are repeatable and provide baseline data as well as foundations for later parts of the report.

3.20 Counts of parked vehicles are a useful and effective approach to recording access, but only relate to a proportion of visitors (that arrive by car). In relatively remote areas, away from housing, most people would be expected to travel by car, but in areas close to settlements, a high proportion of visitors could arrive on foot. Counts of parked vehicles will also not necessarily reflect access directly onto the SPA as some car-parks provide access to other areas too.

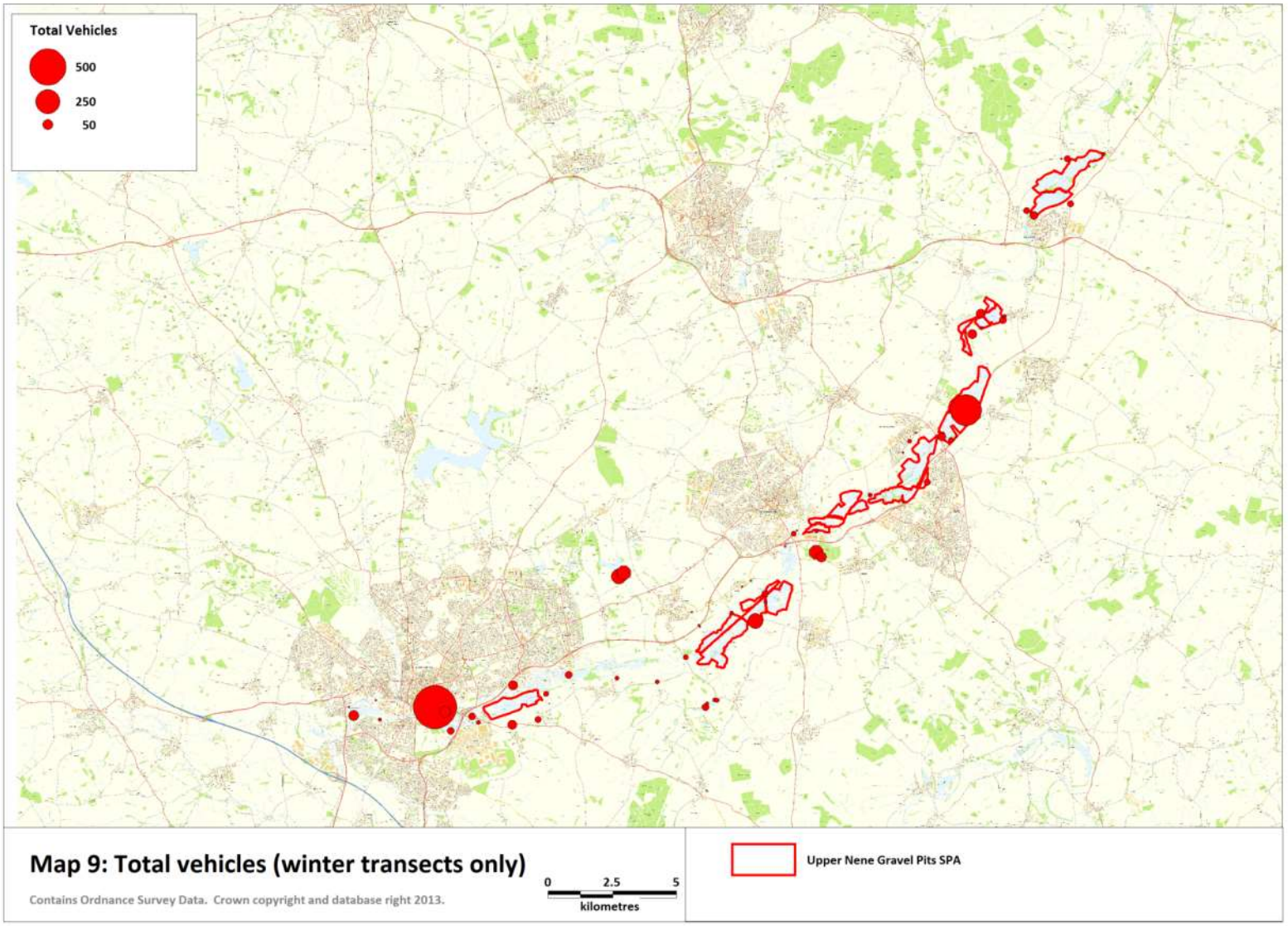
3.21 It is noteworthy that the highest counts were mid-week and in February, a perhaps unexpected result. Cold weather and flooding were features of the winter and it may be that the adverse weather conditions may have resulted in unusual access patterns. The dates with high car-park counts had particularly high counts at Stanwick Lakes; the number of cars at this location appears to vary and it accounts for much of the variation in the total counts.

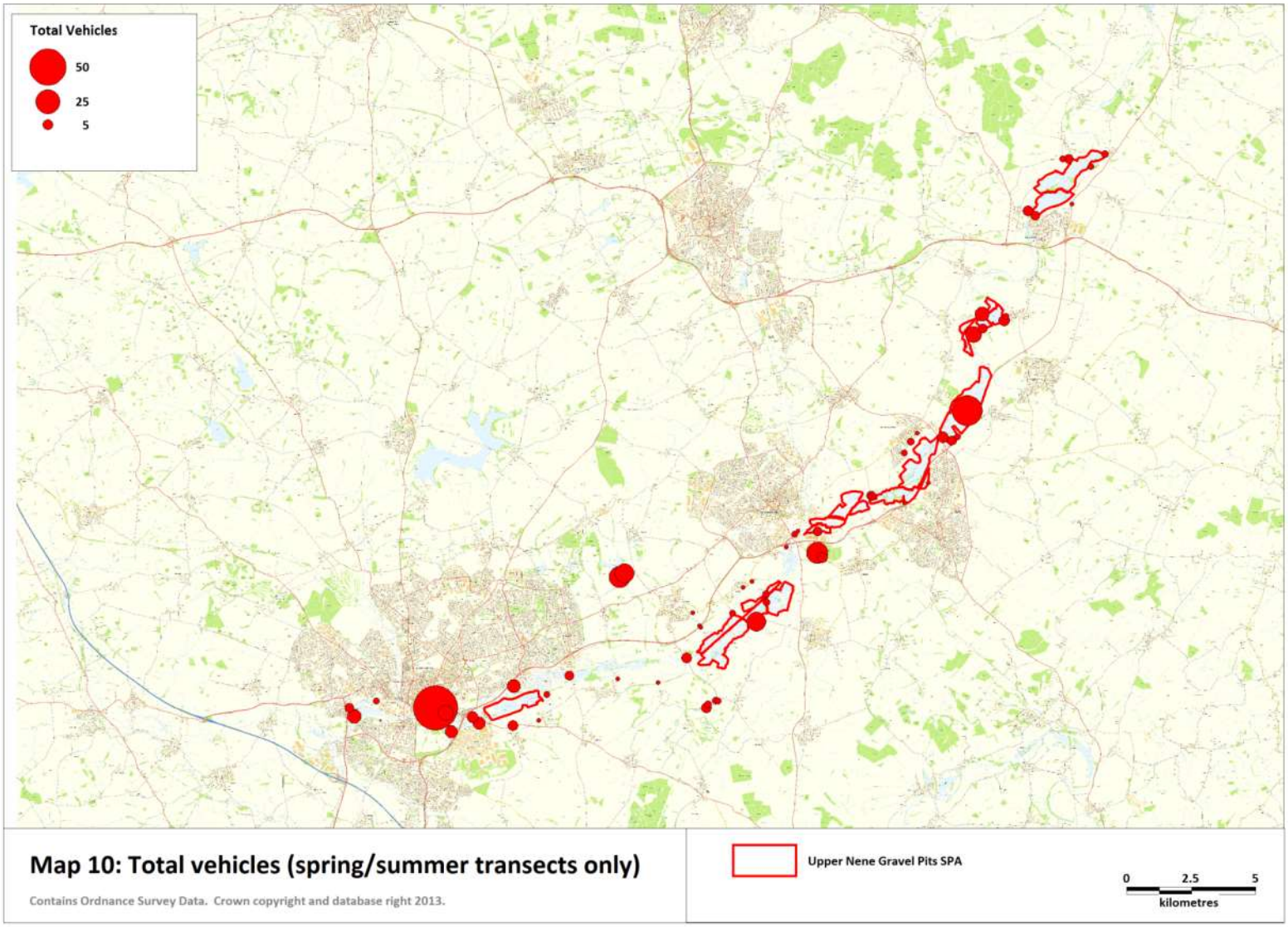
3.22 The tally counts are undertaken by direct observation and therefore accurately reflect visitor flows at precise locations, visible to the surveyor and were undertaken at a sample of access points. Automated counters provide additional useful information, but can be unreliable. The counters record the number of times an infra-red beam is broken: animals, branches in the wind and vehicles can all trigger the devices. The devices do not record direction, and therefore we have to assume that the number of breaks corresponds to twice the number of people entering (i.e. people entering and leaving via the same access point). Curious passer-bys can trigger the devices multiple times and it was clear two devices had been tampered with. The results should therefore be treated with some caution, but provide a useful indication of broad levels of use at particular locations.

Summary

Basic data on numbers of people at selected access points and the number of parked cars are presented. Direct counts of people at 21 surveyed access points show 2.6 groups and 1.8 dogs entering per hour. The ratio of dogs to people was 1 dog for every 2.8 people. Stanwick Lakes was by far the busiest location surveyed, with roughly a quarter of all the people counted.

The total number of parked cars counted across the SPA and adjacent areas ranged from 112 – 423 (15 transects). The highest counts of parked cars were on weekdays in February. Overall there was no significant difference in the number of parked cars present on weekdays compared to weekend days and on spring days compared to winter days.


Total Vehicles
500
250
50
Map 9: Total vehicles (winter transects only)
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Upper Nene Gravel Pits SPA



Map 10: Total vehicles (spring/summer transects only)

4. Face-face Interviews

Overview

4.1 This section describes the results from 939 face-face interviews, conducted with a random sample of visitors to 21 survey locations. Visitor survey work was conducted primarily over the winter but a subset of sites was also surveyed in the spring.

Methods

Face-face interviews (Winter)

4.2 Visitor surveys and counts were undertaken at 21 locations between 28th November 2012 and 3rd March 2013 (with no survey work carried out between 10th December 2012 and 6th January 2013 as it was assumed access patterns may be atypical over the Christmas period). Tally counts and surveys were undertaken at the same locations and the details of the survey points are therefore summarised in the previous section (see Table 2 and Map 5).

4.3 The visitor surveys comprised interviews with a randomly selected sample of visitors. The interviews were conducted within four two hour sessions per day (07:30-09:30; 10:00-12:00; 12:30-14:30; 15:00-17:00), providing eight hours of survey effort per day. Surveys were carried out on one weekday and one weekend day, resulting in 16 survey hours per location (336 hours in total). This methodology allows for direct comparisons between visitor patterns across survey locations and provided the surveyor with regular breaks.

4.4 During each session as many people as practicable were interviewed, with the surveyor targeting those groups leaving the site and approaching as many groups as possible. Once an interview was completed, the surveyor approached the next person/group seen. One person per group was selected for interview, randomly chosen by the interviewer.

4.5 The questionnaire (Appendix 2) was designed to gather multiple pieces of information from visitors relating to:

- Activities undertaken and reasons for choosing site
- Frequency and seasonality of visit
- Visitor profile
- Home postcode and whether a local resident or visiting the area
- Other locations frequented by visitors
- Knowledge of the designation of the site
- Route travelled within site

4.6 Information on the routes taken by visitors was gathered from each interview using paper maps or small hand-held GPS units that were handed out to the respondent at the start of their visit. In many cases it was not deemed possible to hand out GPS units

to visitors, for example if the respondent was not returning to the survey location or not returning within a reasonable timescale, in which case paper maps were used. The paper maps showed the path and road network surrounding each survey location and each surveyor had maps at different scales, with the appropriate map chosen for each interview. Each questionnaire was awarded a unique identification number, which was then cross-referenced to each individual route which were digitised as polylines or imported directly into the GIS from the GPS (MapInfo v10).

4.7 A standardised approach to interviewing was undertaken, with each surveyor wearing a high visibility jacket, carrying ID and placing a large poster in the window of their car to indicate that a visitor survey was underway. All surveyors were trained in the questionnaire and the interview procedure and stood at a point which allows for visitors entering and leaving to be clearly seen and approached. Respondents were selected at random and no unaccompanied minors were approached or interviewed. Surveyors were scheduled – as far as possible – to avoid days with constant heavy rain forecast; however it was necessary to carry out some survey work in the snow and rain due the persistently poor weather experienced over the winter period. Across all 2 hour survey periods, 80% were conducted with no precipitation at all and 3 survey sessions (1%) had rain for at least ¾ of the two hours.

Face-face interviews: (Spring)

4.8 Further fieldwork was also carried out between 4th May and 26th May 2013 at six locations that had previously been surveyed over the winter, targeting areas with a range of visitor numbers and areas with breeding bird interest. Survey work was scheduled to incorporate one of the bank holiday weekends and the school half term.

4.9 The timing of the spring/summer fieldwork differed to the winter in order to make the most of the available daylight; the survey hours were therefore extended to cover the periods of 07:00-09:00; 10:00-12:00; 13:00-15:00 and 17:00-19:00. Each location was surveyed for one weekday and one weekend day again, with 16 hours of survey effort employed at each survey point, totalling 96 hours.

4.10 The same questionnaire was used for the spring and winter fieldwork, with the addition of one question regarding the influence of flooding on access patterns. The additional question asked whether the flooding had affected use of the site during the winter and if so, how it was affected.

Visitor postcodes

4.11 Each interviewed visitor was asked to provide the full home postcode from where they had travelled. In some instances, respondents were unable or unwilling to provide their full postcode, but may have provided a partial postcode or town name instead. Postcodes were geocoded within the GIS (MapInfo Professional v10) using Postzon and code point data (Royal Mail Postcode Address File and Ordnance Survey Open data[5]). This allowed us to plot visitor origins using the centroid of the postcode area (accuracy

[5] Includes Ordnance survey geocoded postcodes up to May 2013.

of 1m), and allowed us to determine the straight-line ('Euclidean') distance travelled by each group of visitors.

Postcodes and visit rates in relation to distance

4.12 Within MapInfo, concentric bands ('buffers') were created within the GIS at 500m intervals around each survey locations, up to 20km. In total 40 buffers were therefore created around each survey location. For each individual buffer around each survey location we calculated the number of residential delivery points using the same postcode reference file that was used to geocode the postcodes. The numbers of visitor postcodes in each distance band around the site that they visited were also extracted using MapInfo.

4.13 The number of residential delivery points and visitor postcodes in different buffer distances surrounding each survey location was then used to show a visit rate in relation to the distance from the survey point (where the visitor group was interviewed). This was undertaken using the data from the winter surveys only. To calculate the visit rate we need to be able to consider the number of people per day. In total each location was surveyed for 16 hours (between November and March average number of daylight hours is 9.2[6]) and so the data need to be adjusted by the division of the survey hours by the number of daylight hours (16/9.2=1.74) giving an adjustment factor of 1.74. Only a sample of visitors was interviewed at each survey location. The tally data indicated that a total of 695 visitor groups were recorded entering each survey location in winter and of these 619 groups were interviewed and provided valid postcodes. We assumed that the visitors who provided postcodes were a random sample of all visiting groups, so to calculate total people per day we scaled the visitor postcode data up (by dividing the total number of groups recorded entering the survey locations by the number of valid postcodes = 695/619 = 1.12) by a factor of 1.12.

4.14 Visitor rate for a given 500m distance band (from access points) was then expressed as the number of groups visiting per day divided by the number of residential properties at the given distance band. So, as an example, if at a particular survey point once the adjustments had been made to account for day length and proportions of groups interviewed, an equivalent of 10 people were interviewed whose postcodes were between 1.5km and 2km away, and within that same radius there were 100 residential properties, then the visit rate would be 0.1 for that band. Visit rates were plotted in relation to distance as a mean across all survey points.

Data Presentation and Analysis

4.15 Data analysis was carried out using Minitab (v10). Box plots are used to graphically present data for different groups; the plots show the median (i.e. the mid-point, represented by a horizontal line), the interquartile range (i.e. 25-75% of the data, represented by a box) and the vertical lines show the upper and lower limits of the data, with outliers represented by asterisks. In some cases, outliers have been removed from the data in order to avoid skewing the results. When directly comparing results from

[6] http://projectbritain.com/weather/sunshine.htm

winter and spring/summer survey periods, only data from those locations surveyed in both periods have been included, rather than standardising all counts for survey effort from all locations.

4.16 Where direct comparisons are made between the spring and winter data then these are made using the data from the six survey locations where data were collected in both seasons.

Results: overview

4.17 Overall, 42 days of face to face interviews were conducted over the winter period of 28th November 2012 to 3rd March 2013 and a further 12 days between 4th May and 26th May 2013. In total, 939 groups were interviewed; 638 over the winter period and 301 over spring/summer. These interviewed groups totalled 1618 people (1030 in winter and 588 in spring/summer) and 636 dogs (477 in winter and 159 in spring/summer), the equivalent of one dog to every 2.5 people (Table 10).

4.18 The greatest proportion of interviews (15%) were carried out at site 96 (Stanwick Lakes main car park) and also at site 63 (Summer Leys Nature Reserve main car park); these sites also had the highest number of recorded groups entering or leaving the site, 494 and 423 respectively.

4.19 There was a significant correlation between the number of adult visitors to a location (tally data) and the number of interviews conducted (Pearson's correlation co-efficient, r=0.935, p=<0.001), which confirms that more interviews were conducted at sites with higher numbers of visitors.

4.20 The vast majority of visitors were visiting on a day visit from home (Table 9).

Table 9: Numbers (%) of interviewees on day visits from home, holidaymaking or other (question 1).

	Day visit from home	Day trip staying with friends/family	On holiday in the area and staying away from home	Other	Total
Winter	625 (98)	7 (1)	3 (0)	3 (0)	638 (100)
Spring	297 (99)	3 (1)	1 (0)	(0)	301 (100)
Total	**922 (98)**	**10 (1)**	**4 (0)**	**3 (0)**	**939 (100)**

Table 10: Summary of interview data by survey location.

	Winter			Spring/Summer			Total		
Interview location (ID, see map 5)	**Number of interviews**	**Number of visitors (in groups interviewed)**	**Number of dogs**	**Number of interviews**	**Number of visitors (in groups interviewed)**	**Number of dogs**	**Number of interviews**	**Number of visitors (in groups interviewed)**	**Number of dogs**
Bedford Road Holiday Inn (25)	26	40	18				26	40	18
Weston Mill Lane (29)	67	106	60				67	106	60
Little Houghton (31)	6	6	12				6	6	12
Earls Barton bends car park (45)	25	36	30	27	53	25	52	89	55
Hardwater Mill (55)	5	6	4				5	6	4
Summer Leys car park (63)	65	110	39	75	132	32	140	242	71
Mary's Lane (65)	34	54	18	35	62	19	69	116	37
Wellingborough Embankment (71)	38	64	22				38	64	22
Wellingborough Lakes 'The Mill' (75)	1	1					1	1	
Ditchford Bridge (80)	10	11	7				10	11	7
Ditchford Lakes & Meadows (81)	13	17	13				13	17	13
Northampton Road, Rushden (87)	8	17	8				8	17	8
King's Meadow Lane (Higham Ferrers) (92)	29	51	21	36	50	24	65	101	45
Stanwick Fishing Lakes (94)	24	31					24	31	
Stanwick Lakes Visitor Centre (96)	59	113	27	81	205	29	140	318	56
Stanwick Lakes layby (100)	34	57	28	47	86	30	81	143	58
Ringstead Grange (102)	43	78	38				43	78	38
Kinewell Lake (106)	28	42	29				28	42	29
Mill Lane, Islip (114)	71	103	66				71	103	66
Meadow Lane car park, Thrapston (117)	32	51	26				32	51	26
Titchmarsh LNR Car Park (122)	20	36	11				20	36	11
Total	**638**	**1030**	**477**	**301**	**588**	**159**	**939**	**1618**	**636**

Results: Group Size: people and dogs per group

4.21 The number of people in each group ranged from 1-8. Around half (51%) of groups were just one person. There was no significant difference in group size between the two seasons (Kruskal-Wallis; H=3.58, 1df, p=0.059).

4.22 Group size did vary between survey locations (Kruskal-Wallis; H=70.06, 20 df, p=<0.001), with Stanwick Lakes tending to have larger groups than other locations. This site is very popular with families due to the facilities present: a visitor centre and cafe, an adventure playground for children and multiple activities for all age groups, including craft classes.

4.23 From the 939 groups interviewed across both survey periods, 50% had one or more dogs with them and in total 636 dogs were counted. During the winter, just over half (55%) the interviewed groups had one or more dogs and in spring/summer 40% had one or more dogs (Table 11). Of those groups with dogs, the average number of dogs per group was 1.35 and the number distributed across all the groups equates to 0.68 dogs per group.

Table 11: Composition of dogs in interviewed groups.

Season	Interviewed Groups	Groups with dogs (%)	Number of dogs seen off lead (%)
Spring	301	121(40)	12(10)
Winter	638	351(55)	137(39)
Total	**939**	**472(50)**	**149(32)**

4.24 Overall, 32% of dogs were recorded as off the lead[7]. The highest number of dogs were recorded at site 63 (Summer Leys Nature Reserve) (11% of all dogs counted during the winter); only 1% of the total number of dogs recorded that were off the lead were here however (Table 12). Just over 10% of all dogs were recorded at Islip (site 114) with high numbers observed off the lead (4% of the total number of dogs). Only 1 dog was recorded off the lead at site 96 (Stanwick Lakes main car park), a site where all dogs are required to be on the lead. No dogs were recorded at sites 75 or 94, both private fishing lakes.

Table 12: Total number of dogs recorded in interviewed groups across the whole survey period at all survey locations.

Interview location (ID, see map 5)	Total number of dogs (%)	Total dogs off leads (%)
Bedford Road Holiday Inn (25)	18(3)	13(2)
Weston Mill Lane (29)	60(9)	13(2)
Little Houghton (31)	12(2)	6(1)
Earls Barton bends car park (45)	55(9)	18(3)
Hardwater Mill (55)	4(1)	
Summer Leys car park (63)	71(11)	4(1)
Mary's Lane (65)	37(6)	9(1)

[7] Note that surveyors simply recorded whether the dog was seen off the lead, i.e. at or around the survey location.

Interview location (ID, see map 5)	Total number of dogs (%)	Total dogs off leads (%)
Wellingborough Embankment (71)	22(3)	3(0.5)
Wellingborough Lakes 'The Mill' (75)	0	0
Ditchford Bridge (80)	7(1)	5(1)
Ditchford Lakes & Meadows (81)	13(2)	7(1)
Northampton Road, Rushden (87)	8(1)	1(0.2)
King's Meadow Lane (Higham Ferrers) (92)	45(7)	5(1)
Stanwick Fishing Lakes (94)	0	0
Stanwick Lakes Visitor Centre (96)	56(9)	1(0.2)
Stanwick Lakes layby (100)	58(9)	4(1)
Ringstead Grange (102)	38(6)	17(3)
Kinewell Lake (106)	29(5)	8(1)
Mill Lane, Islip (114)	66(10)	26(4)
Meadow Lane car park, Thrapston (117)	26(4)	3(0.5)
Titchmarsh LNR Car Park (122)	11(2)	6(1)
Total	**638(100)**	**149(23)**

Results: Activities

4.25 Visitors were asked to describe the main activity undertaken during their visit along with any other activities that they were carrying out that day[8]. In total, 939 main activities and 551 other activities were categorised by surveyors. Across all sites and survey periods, dog walking was the most common main activity (48% of interviewees) and walking was the next most commonly cited main activity.

4.26 At the six locations surveyed in both the winter and the spring, there were significant differences in the relative frequencies of main activities between the two survey periods (χ^2_5= 13.89, p=0.016). For the purpose of this test, activities were grouped into the following categories: dog walking, walking, jogging, cycling, wildlife watching and all other activities, to ensure sample sizes were high enough to permit the statistical analysis. During the winter a higher proportion of people interviewed were dog walking (48% of interviews during the winter compared to 36% in the spring). By contrast, the spring/summer interviews involved a higher proportion of interviews with those walking (38% compared to 33%) and those undertaking other activities (11% compared to 5%).

4.27 In total, 551 other activities were also recorded, secondary to the main activity cited. Overall, walking was the most common other activity, accounting for 36% of all responses, 17% of responses were related to enjoying the scenery and 12% were wildlife watching.

[8] Note that it is possible for people to be undertaking multiple activities, such as jogging and exercising the dog, or birdwatching and taking pictures.

4.28 Map 11 and 12 summarise the main activities carried out by interviewees. In Map 11 (winter) and 12 (spring) the shading and scales are identical and allow direct comparison between the winter and spring surveys. The area of the circles and segments in each reflects the number of interviewees undertaking the given main activity.

4.29 Activities for winter visitors only are summarised in Table 13 and Figure 3. Dog walking was the most common response, accounting for 53% of all responses, followed by walking at 26%. Dog walking was a recorded main activity at all but three survey locations, two of which (75, Wellingborough Lakes, 'The Mill' and 94, Stanwick Fishing Lakes), are private fishing areas.

4.30 Of those winter visitors who were dog walking as their primary activity, 99% travelled from home. The highest number of visitors stated dog walking was their main activity at site 114 in Islip, accounting for 70% of all visitors to that site and 15% of all recorded dog walkers across all sites. The highest numbers of winter interviewees who gave walking as their main activity were at site 96, the main car park of Stanwick Lakes, accounting for 46% of all recorded activities at that site and 16% of all walkers across all sites.

4.31 Wildlife watching comprised only a small proportion of the total listed main activities across all sites during the winter (6%); 43% of these were recorded at sites 63 (Summer Leys) and 65 (Mary's Lane). A further 4% of winter interviewees provided 'other' in response to the question of their main activity and were asked to elaborate where possible; numerous responses included: 'taking a short-cut', 'exercise', 'peace and quiet' or 'feeding wildlife' for example.

4.32 Fishing accounted for just 4% of interviewees' main activities in the winter, being carried out at only three of the 21 survey points (75 Wellingborough Lakes, 'The Mill', 94 Stanwick Fishing Lakes and 106 Kinewell Lake), all of which require permits for fishing. The fishing season starts in March and runs through till September, so lower numbers of fishermen would have been encountered during the winter fieldwork period than during the peak fishing season; therefore accurate assumptions about visitor rates to these sites across the whole year cannot be drawn. Survey Point 75, Wellingborough Lakes, 'The Mill' also restricts the number of anglers that can be on site at any time.

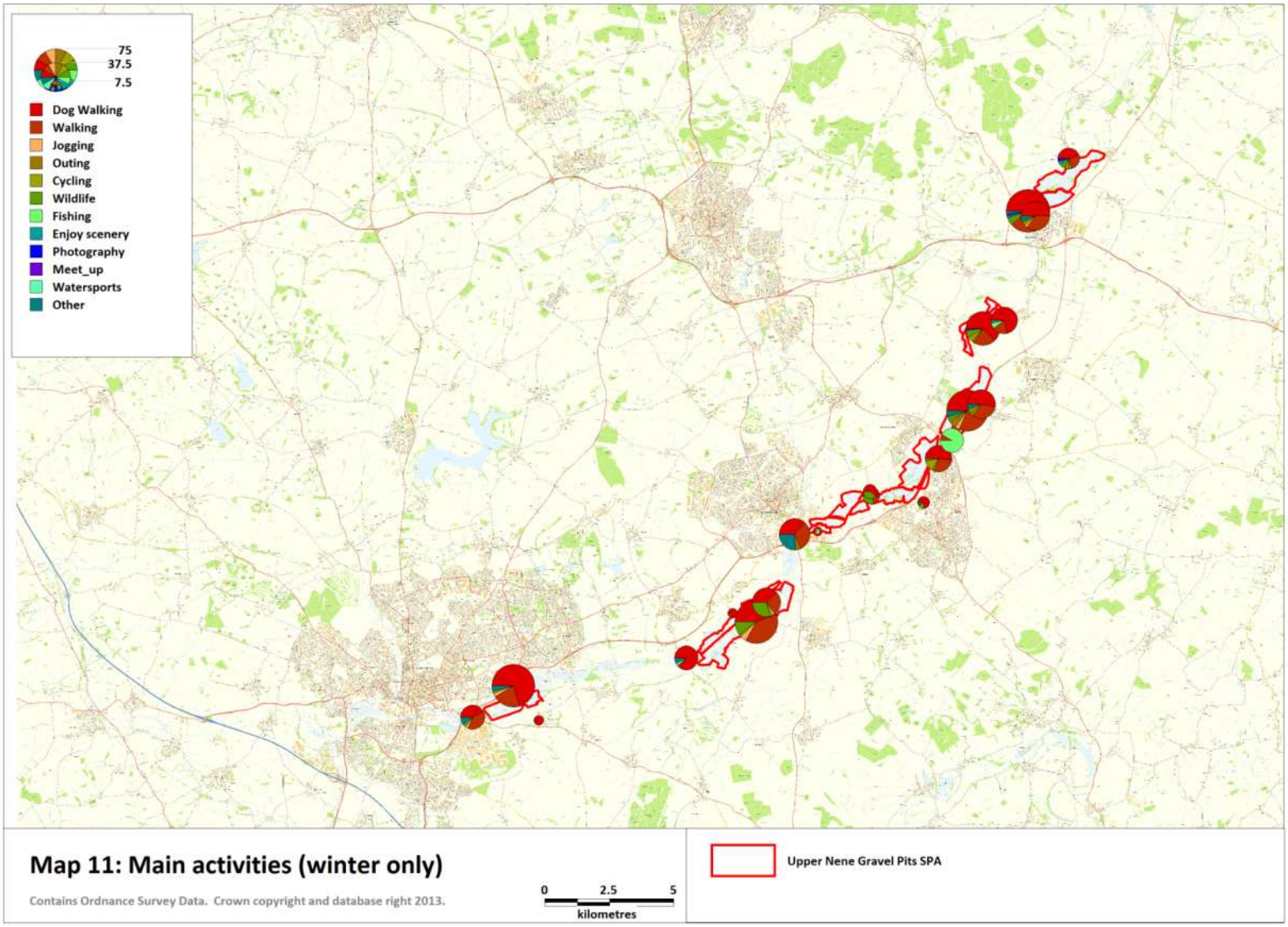
4.33 The 301 main activities carried out by interviewees in the spring survey period are displayed in Table 14. Walking was the most common response, accounting for 38% of all activities, closely followed by dog walking at 36%. A decline in the number of respondents citing dog walking was observed between winter and spring/summer, falling by 17%.

4.34 Of those visitors who were dog walking as their primary activity, 100% travelled from home. The highest proportion of visitors citing dog walking as their main activity at a particular site were at survey points 45 and 92 (56%). The highest numbers of visitors recorded as walking were at sites 63 (Summer Leys Nature Reserve), and 65 (Mary's

Lane), accounting for 45% of all walkers. This location provides a simple circular route with access to numerous bird hides; cycling is not permitted at this site. Nearly half (47%) of all respondents watching wildlife were at sites 63 (Summer Leys Nature Reserve), and 65 (Mary's Lane), a slight increase in number from the winter survey results.

4.35 Fishing was not carried out at any of the six sites surveyed in the spring; none of these sites are private anglers clubs or fisheries, therefore it is not surprising that fishing was not a primary activity at any site. A higher proportion of visitors cited that they were on an outing with their family in the spring/summer period, rising from 1% in winter to 8% in spring/summer; 75% of these were at site 96, the main car park of Stanwick Lakes. This site is well equipped to accommodate families, with a visitor centre, playground and a range of other activities.

4.36 A total of 264 other activities were recorded and categorised during the spring/summer fieldwork period. The most commonly cited other activity was walking, accounting for 34% of all responses. Other responses included enjoying the scenery (19%) and wildlife watching (10%)


75
37.5
7.5
Dog Walking
Walking
Jogging
Outing
Cycling
Wildlife
Fishing
Enjoy scenery
Photography
Meet_up
Watersports
Other
Map 11: Main activities (winter only)
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Upper Nene Gravel Pits SPA

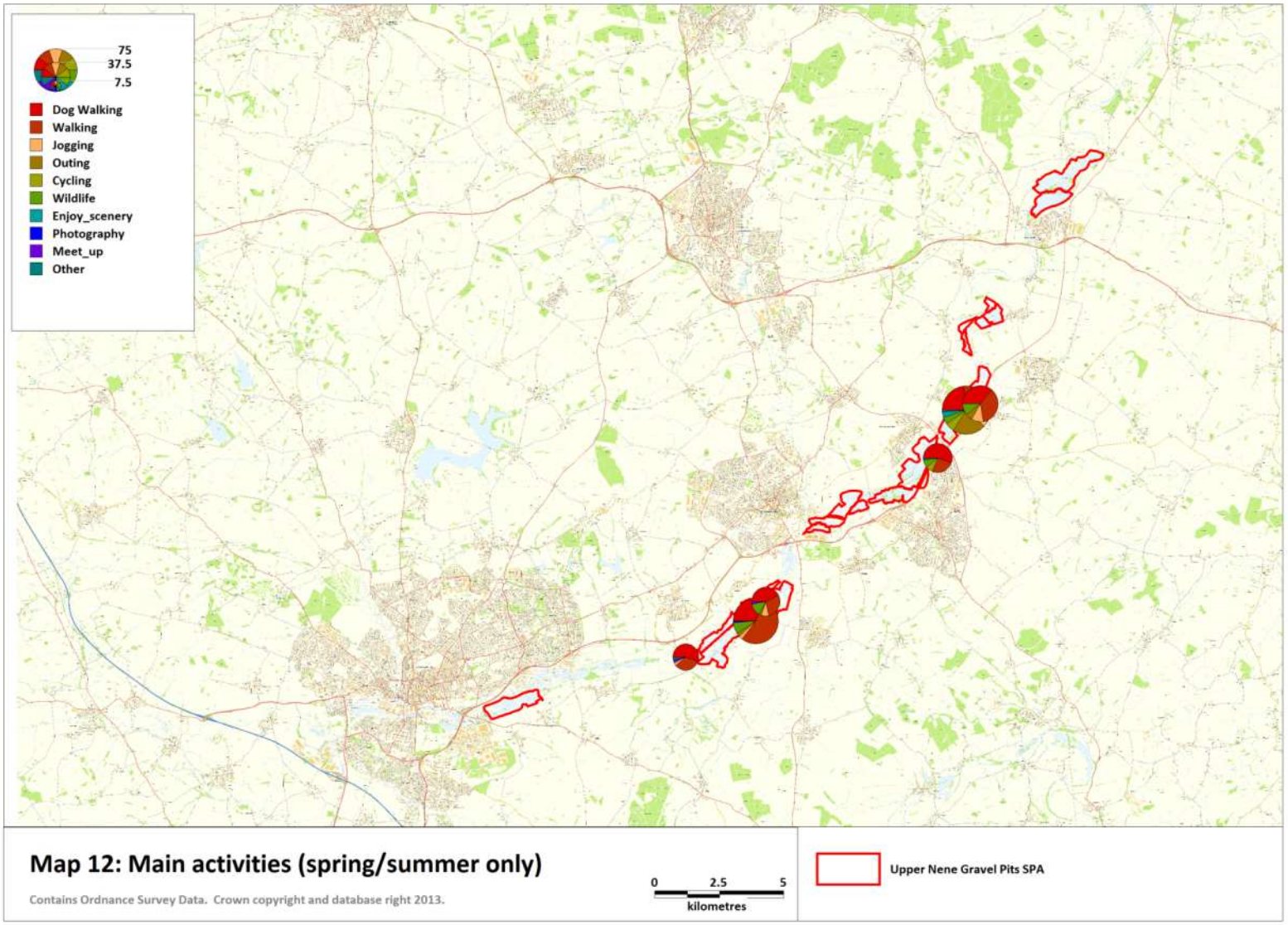

75
37.5
7.5
Dog Walking
Walking
Jogging
Outing
Cycling
Wildlife
Enjoy_scenery
Photography
Meet_up
Other
Map 12: Main activities (spring/summer only)
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Upper Nene Gravel Pits SPA

Table 13: Range of main activities undertaken at each site from interview responses of visitors during the winter survey period. Visitors selected only one main activity. The percentage response for each activity at each location is given in parentheses. The highest percentage for row is highlighted in grey.

Interview location (ID, see map 5)	Dog walking	Walking	Jogging	Outing with family	Cycling	Wildlife watching	Fishing	Enjoying scenery	Photography	Meeting up with friends	Water-sports	Other	Total
Bedford Road Holiday Inn (25)	11(42)	10(38)	1(4)		1(4)							3(12)	**26**
Weston Mill Lane (29)	47(70)	14(21)	2(3)		1(1)							3(4)	**67**
Little Houghton (31)	6(100)												**6**
Earls Barton bends car park (45)	21(84)	1(4)									1(4)	2(8)	**25**
Hardwater Mill (55)	4 (80)	1(20)											**5**
Summer Leys car park (63)	29(45)	25(38)	3(5)		1(2)	7(11)							**65**
Mary's Lane (65)	13(38)	9(26)	1(3)		1(3)	10(29)							**34**
Wellingborough Embankment (71)	14(37)	12(32)		2(5)								10(26)	**38**
Wellingborough Lakes 'The Mill' (75)							1(100)						**1**
Ditchford Bridge (80)	6(60)					4(40)							**10**
Ditchford Lakes & Meadows (81)	7(54)	2(15)				4(31)							**13**
Northampton Road, Rushden (87)	6(75)				1(13)							1(13)	**8**
King's Meadow Lane (Higham Ferrers) (92)	15(52)	8(28)		1(3)	4(14)	1(3)							**29**
Stanwick Fishing Lakes (94)		2(8)					22(92)						**24**
Stanwick Lakes Visitor Centre (96)	21(36)	27(46)	2(3)	3(5)	1(2)	2(3)						3(5)	**59**
Stanwick Lakes layby (100)	18(53)	11(32)			1(3)	2(6)						2(6)	**34**
Ringstead Grange (102)	27(63)	9(21)		1(2)	2(5)	3(7)				1(2)			**43**
Kinewell Lake (106)	20(71)	5(18)					2(7)	1(4)					**28**
Mill Lane, Islip (114)	50(70)	13(18)				4(6)		1(1)		1(1)		2(3)	**71**
Meadow Lane car park, Thrapston (117)	16(50)	11(34)	1(3)		1(3)	1(3)						2(6)	**32**
Titchmarsh LNR Car Park (122)	9(45)	5(25)		1(5)	1(5)	2(10)		1(5)	1(5)				**20**
Total	**340(53)**	**165(26)**	**10(2)**	**8(1)**	**15(2)**	**40(6)**	**25(4)**	**3(0.5)**	**1(0.2)**	**2(0.3)**	**1(0.2)**	**28(4)**	**638(100)**

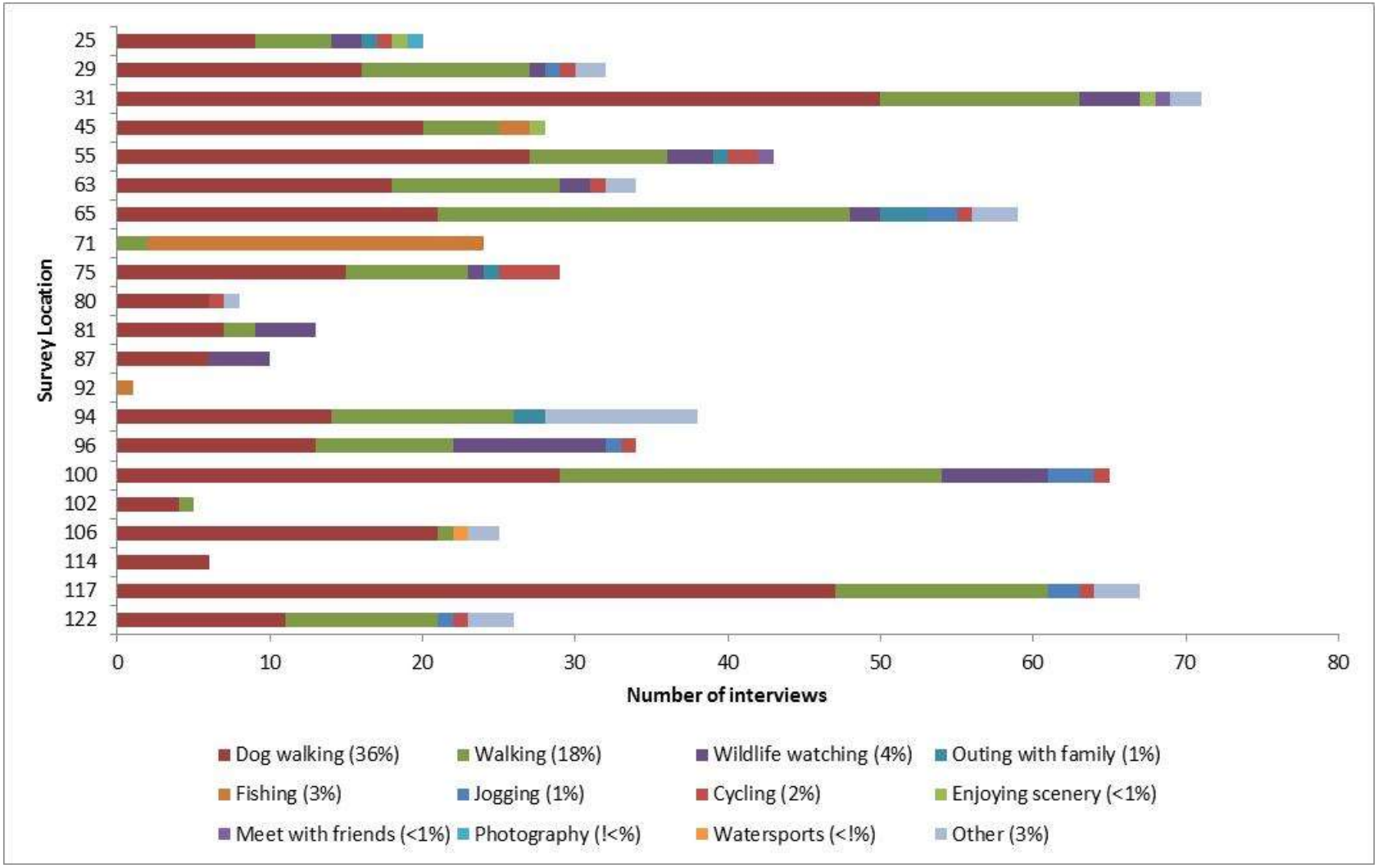


Figure 3: Main activities by survey location, winter only. Percentages give the overall percentage (across all sites) of interviewed groups undertaking the given activity.

Table 14: Range of main activities undertaken at each site from interview responses of visitors during the spring/summer survey period. Visitors selected only one main activity. The percentage response for each activity at each location is given in parentheses.

Interview location (ID, see map 5)	Dog walking	Walking	Jogging	Outing with family	Cycling	Wildlife watching	Enjoying scenery	Photography	Meeting up with friends	Other	Total
Earls Barton bends car park (45)	15(56)	9(33)	1(4)						1(4)	1(4)	**27**
Summer Leys car park (63)	22(29)	42(56)	2(3)	2(3)		6(8)		1(1)			**75**
Mary's Lane (65)	15(43)	10(29)	3(9)	1(3)		5(14)			1(3)		**35**
King's Meadow Lane (Higham Ferrers) (92)	20(56)	9(25)			3(8)	3(8)				1(3)	**36**
Stanwick Lakes Visitor Centre (96)	19(23)	28(35)	3(4)	18(22)	5(6)	4(5)	3(4)			1(1)	**81**
Stanwick Lakes layby (100)	17(36)	17(36)	5(11)	3(6)		5(11)					**47**
Total	**108(36)**	**115(38)**	**14(5)**	**24(8)**	**8(3)**	**23(8)**	**3(1)**	**1(0.3)**	**2(1)**	**3(1)**	**301(100)**

Results: Mode of Transport to Reach Site

4.37 When considering transportation methods across both survey periods for those sites surveyed in both winter and spring/summer, there was no significant difference between the types of transport used (χ^2_2= 0.78, p=0.678).

4.38 Across both survey periods, the most popular transportation method for accessing sites was by car or van (77%); 66% in winter and 81% in spring/summer (Table 15).

4.39 Across the whole survey period, 69% of those visitors coming from home travelled by car and 28% arrived to the site on foot. Of those visitors on holiday in the area or on a day trip away from home, 79% arrived by car and 21% arrived on foot. Only 2% of all visitors arrived by bicycle. Some sites were more easily accessible on foot than others, with some sites not in easy walking distance of significant levels of housing; for example, the car park for Summer Leys Nature Reserve is not in close walking distance to high numbers of houses, therefore it was to be expected that the majority of visitors would arrive by car.

4.40 In some cases, higher numbers of visitors arrived on foot than by car; for example at site 92 (Higham Ferrers), 75% of interviewed groups arrived on foot. This survey site is located close to a large housing development, providing easy access for many residents onto the lakes complex, as well as an easy cut through to and from the town of Irthlingborough.

Table 15: Modes of transport used to reach each site over winter and spring/summer. The percentage response for each mode of transport for each location is given in parentheses. The highest percentage for each given site and season is highlighted in grey.

Interview location (ID, see map 5)	Winter				Spring				
	Car/Van	Foot	Bicycle	Total	Car/Van	Foot	Bicycle	Other	Total
Bedford Road Holiday Inn (25)	17(65)	7(27)	2(8)	**26**					
Weston Mill Lane (29)	37(55)	29(43)	1(1)	**67**					
Little Houghton (31)	2(33)	4(67)		**6**					
Earls Barton bends car park (45)	18(72)	7(28)		**25**	14(52)	13(48)			**27**
Hardwater Mill (55)	5(100)			**5**					
Summer Leys car park (63)	64(98)		1(2)	**65**	74(99)	1(1)			**75**
Mary's Lane (65)	33(97)		1(3)	**34**	34(97)			1(3)	**35**
Wellingborough Embankment (71)	26(68)	12(32)		**38**					
Wellingborough Lakes 'The Mill' (75)	1(100)			**1**					
Ditchford Bridge (80)	10(100)			**10**					
Ditchford Lakes & Meadows (81)	13(100)			**13**					
Northampton Road, Rushden (87)		7(88)	1(13)	**8**					
King's Meadow Lane (Higham Ferrers) (92)	4(14)	21(72)	4(14)	**29**	5(14)	28(78)	3(8)		**36**
Stanwick Fishing Lakes (94)	24(100)			**24**					
Stanwick Lakes Visitor Centre (96)	51(86)	7(12)	1(2)	**59**	75(93)	3(4)	3(4)		**81**
Stanwick Lakes layby (100)	32(94)	1(3)	1(3)	**34**	42(89)	5(11)			**47**
Ringstead Grange (102)	27(63)	14(33)	2(5)	**43**					
Kinewell Lake (106)	19(68)	9(32)		**28**					
Mill Lane, Islip (114)	13(18)	58(82)		**71**					
Meadow Lane car park, Thrapston (117)	13(41)	18(56)	1(3)	**32**					
Titchmarsh LNR Car Park (122)	12(60)	6(30)	2(10)	**20**					
Total	**421(66)**	**200(31)**	**17(3)**	**638(100)**	**244(81)**	**50(17)**	**6(2)**	**1(0.3)**	**301(100)**

Results: Frequency of Visit

Visitors were asked how often they usually visited the survey location (question 4). In total, 937 interviewees answered this question and across the whole survey period 60% of interviewees responded that they visit the interview sites at least weekly (Table 16 and

4.41 Figure 4).

Table 16: Visit frequencies by survey period. Percentages are in parentheses.

Frequency	Winter	Spring	Whole survey period total
Daily	88(14)	20(7)	108(12)
Most days (180+ visits)	121(19)	37(12)	158(17)
1 to 3 times a week (40-180 visits)	200(31)	93(31)	293(31)
2 to 3 times per month (15-40 visits)	87(14)	62(21)	149(16)
Once a month (6-15 visits)	52(8)	53(18)	105(11)
Less than once a month (2-5 visits)	56(9)	19(6)	75(8)
Don't know / First visit	33(5)	16(5)	49(5)
Total	**637(100)**	**300(100)**	**937(100)**

There were significant differences between the spring and the summer in the frequency with which interviewees stated they visited (χ^2_6=13.51; p=0.036). Using the data from the six survey points with data from both seasons (

4.42 Figure 4), the number of people visiting regularly (most days or daily) were similar, however there were more people in the spring with people who visited only occasionally (two – three times per month or once a month).

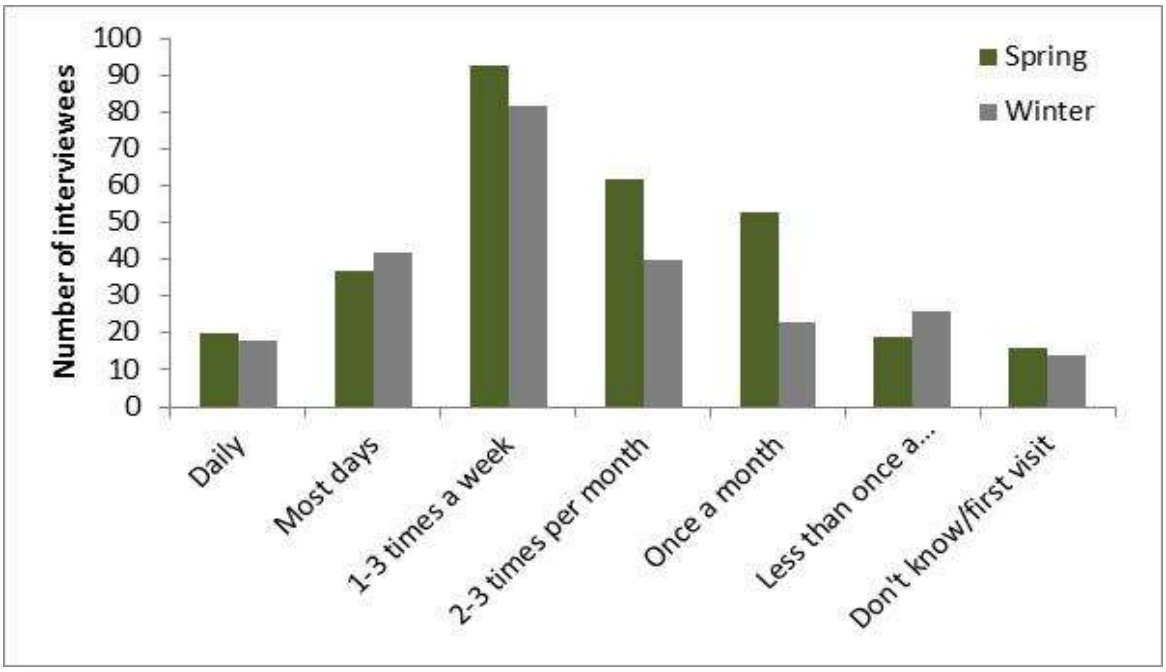


Figure 4: The percentage of visitors by their frequency of visit to all locations over winter and spring/summer.

Table 17: Frequency of visits per main activity and per season. Percentages for each activity are given in parentheses. The highest percentage for each given activity and season is highlighted in grey. Note winter part of the table includes data from all survey points.

	Winter								Spring							
Main activity	**Daily**	**Most days**	**1-3 times a week**	**2-3 times per month**	**Once a month**	**Less than once a month**	**Don't know/ first visit**	**Total**	**Daily**	**Most days**	**1-3 times a week**	**2-3 times per month**	**Once a month**	**Less than once a month**	**Don't know/ first visit**	**Total**
Dog walking	75(22)	94(28)	118(35)	30(9)	9(3)	9(3)	5(1)	**340**	14(13)	25(23)	43(40)	11(10)	7(7)	2(2)	5(5)	**107**
Walking	12(7)	19(12)	45(27)	26(16)	21(13)	24(15)	17(10)	**164**	3(3)	8(7)	35(30)	29(25)	23(20)	7(6)	10(9)	**115**
Jogging/Power walking	1(10)		5(50)	3(30)		1(10)		**10**	1(7)	4(29)	5(36)	3(21)	1(7)			**14**
Outing with family			2(25)		3(38)	3(38)		**8**			3(13)	7(29)	10(42)	4(17)		**24**
Cycling			5(33)	5(33)	3(20)	1(7)	1(7)	**15**	1(13)		1(13)	2(25)	2(25)	2(25)		**8**
Wildlife watching		1(3)	7(18)	11(28)	9(23)	8(20)	4(10)	**40**	1(4)		4(17)	8(35)	7(30)	2(9)	1(4)	**23**
Fishing		1(4)	5(20)	7(28)	4(16)	6(24)	2(8)	**25**								
Enjoying scenery				1(33)	1(33)		1(33)	**3**			1(33)	1(33)	1(33)			**3**
Photography			1(100)					**1**				1(100)				**1**
Meet up with friends							2(100)	**2**					2(100)			**2**
Water-sports						1(100)		**1**								
Other		6(21)	12(43)	4(14)	2(7)	3(11)	1(4)	**28**			1(33)			2(67)		**3**
Total	**88(14)**	**121(19)**	**200(31)**	**87(14)**	**52(8)**	**56(9)**	**33(5)**	**637**	**20(7)**	**37(12)**	**93(31)**	**62(21)**	**53(18)**	**19(6)**	**16(5)**	**300**

Results: Temporal Variation

4.43 Question 5 related to the time of day that interviewees tended to visit. Responses were categorised by the surveyor into six categories, and these could include multiple responses from each interviewee (in fact an average of 1.8 responses were recorded per interviewee). The preferred time of day to visit the area given by respondents at the six repeated survey sites differed significantly between the winter and spring/summer survey periods (χ^2_5= 19.515, p=0.002).

4.44 Over the whole survey period, the highest percentage of responses fell into the category of 'between 9am and 12' (23%) and the lowest 'after 5pm' (9%) (Table 18). Overall, the periods between 9am and 5pm were the most popular times of day to visit, which was similar in both winter and spring/summer. A higher number of visitors provided the answer 'no/don't know/first visit' in the spring/summer period (21%) compared to winter (14%). Although it may be expected that more people would visit later in the spring/summer due to the lighter evenings, there was only a 2% increase in visitors after 5pm from winter to spring/summer.

Table 18: The number (%) of responses given for each time of day category. Multiple responses could be recorded for each interview, percentages are based on the number of interviews rather than number of responses.

Time of visit	Winter	Spring	Whole survey period total
Before 9am	161 (25)	66 (22)	227 (24)
Between 9am and 12pm	291 (46)	98 (33)	389 (41)
Between 12pm and 3pm	242 (38)	97 (32)	339 (36)
Between 3pm and 5 pm	241 (38)	97 (32)	338 (36)
After 5pm	94 (15)	55 (18)	149 (16)
No/Don't Know/First Visit	174 (27)	112 (37)	286 (30)
Total	**1203**	**525**	**1728**

4.45 Visitors were asked whether the time of year influenced the frequency with which they visit the area; multiple responses were accepted and 1034 responses were recorded in total. The time of year that respondents visited the six repeated survey sites differed significantly between the winter and spring/summer periods (χ^2_5= 44.644, p=<0.001).

4.46 Overall, the visitor responses suggest that the majority are not influenced by the time of year, with 78% stating that they visit equally all year (Table 19).

Table 19: Responses to question 6, "Do you tend to visit this area at a particular time of year…?". Table gives winter (all sites) and spring results, percentages in parentheses. Percentages are calculated based on the number of interviews rather than the number of responses (multiple responses were recorded for some interviewees).

Time of visit	Winter	Spring	All
Spring	20 (3)	39 (13)	59 (6)
Summer	71 (11)	44 (15)	115 (12)
Autumn	15 (2)	19 (6)	34 (4)
Winter	31 (5)	4 (1)	35 (4)
Don't Know/First visit	43 (7)	16 (5)	59 (6)

Time of visit	Winter	Spring	All
Equally all year	495 (78)	237 (79)	732 (78)
Total	**1203**	**525**	**1728**

Time Spent on Site

4.47 Visitors were asked how long they had spent or intended to spend in the area on the day of their visit (question 3). Over the whole survey period, 50% of visitors stated that they spent less than one hour on site and, in total, 88% spent less than two hours in the area. Only 5% of visitors spent more than three hours at a site. There was a significant difference between the two survey periods for the six repeated sites in terms of how long respondents spent on site (χ^2_3=16.489, p=0.001).

4.48 The amount of time spent in an area varied according to the main activity being undertaken (Table 20). Dog walkers, for example, tended to spend less than two hours on site, with only 3% of dog walks lasting more than two hours over winter, and 1% in spring/summer. A similar pattern exists for walking, with the majority of walks lasting less than two hours. Those visitors who were fishing mostly spent more than three hours at a site (92%); this was recorded only in the winter survey period since no visitors were fishing at any of the six sites during the spring/summer.

4.49 The time spent on site, when considering each survey location, varied widely across all sites in winter and spring/summer (Table 21). At all but two locations, some visitors were recorded as spending less than one hour on site; the exceptions being sites 75 and 94, both of which provide access to private fishing lakes and at which many respondents spent over three hours.

Table 20: Time spent in areas based on main activity undertaken. Percentages are in parentheses. The highest percentage for each given activity and season is highlighted in grey.

	Winter					Spring				
Activity	**Less than 1 hour**	**1 - 2 hours**	**2 - 3 hours**	**More than 3 hours**	**Winter total**	**Less than 1 hour**	**1 - 2 hours**	**2 - 3 hours**	**More than 3 hours**	**Spring Total**
Dog walking	217(64)	111(33)	7(2)	5(1)	**340**	60(56)	47(44)	1(1)		**108**
Walking	77(47)	65(39)	16(10)	7(4)	**165**	44(38)	54(47)	12(10)	5(4)	**115**
Wildlife watching	4(10)	27(68)	5(13)	4(10)	**40**	6(26)	7(30)	9(39)	1(4)	**23**
Outing with family	5(63)	3(38)			**8**	4(17)	8(33)	10(42)	2(8)	**24**
Other	19(68)	8(29)	1(4)		**28**	3(100)				**3**
Fishing	1(4)	1(4)		23(92)	**25**					
Jogging / Power walking	8(80)	2(20)			**10**	8(57)	6(43)			**14**
Cycling	4(27)	8(53)	3(20)		**15**	5(63)		1(13)	2(25)	**8**
Enjoying scenery	1(33)		2(67)		**3**	1(33)	2(67)			**3**
Meet up with friends		1(50)	1(50)		**2**		2(100)			**2**
Photography	1(100)				**1**				1(100)	**1**
Water-sports		1(100)			**1**					
Total	**337(53)**	**227(36)**	**35(5)**	**39(6)**	**638**	**131(44)**	**126(42)**	**33(11)**	**11(4)**	**301**

Table 21: Time spent in each survey location. Percentages are in parentheses. The highest percentage for each given site and season is highlighted in grey.

	Winter					Spring				
Interview location (ID, see map 5)	**Less than 1 hour**	**1 - 2 hours**	**2 - 3 hours**	**More than 3 hours**	**Winter Total**	**Less than 1 hour**	**1 - 2 hours**	**2 - 3 hours**	**More than 3 hours**	**Spring Total**
Bedford Road Holiday Inn (25)	14(54)	11(42)	1(4)		**26**					
Weston Mill Lane (29)	43(64)	22(33)	2(3)		**67**					
Little Houghton (31)	5(83)	1(17)			**6**					
Earls Barton bends car park (45)	12(48)	12(48)	1(4)		**25**	12(44)	12(44)	2(7)	1(4)	**27**
Hardwater Mill (55)	3(60)	1(20)		1(20)	**5**					
Summer Leys car park (63)	40(62)	19(29)	3(5)	3(5)	**65**	40(53)	26(35)	6(8)	3(4)	**75**
Mary's Lane (65)	12(35)	16(47)	4(12)	2(6)	**34**	7(20)	24(69)	3(9)	1(3)	**35**
Wellingborough Embankment (71)	34(89)	3(8)		1(3)	**38**					
Wellingborough Lakes 'The Mill' (75)				1(100)	**1**					
Ditchford Bridge (80)	7(70)	3(30)			**10**					
Ditchford Lakes & Meadows (81)	6(46)	7(54)			**13**					
Northampton Road, Rushden (87)	5(63)	2(25)		1(13)	**8**					
King's Meadow Lane (Higham Ferrers) (92)	14(48)	10(34)	4(14)	1(3)	**29**	23(64)	12(33)	1(3)		**36**
Stanwick Fishing Lakes (94)		2(8)		22(92)	**24**					
Stanwick Lakes Visitor Centre (96)	22(37)	31(53)	4(7)	2(3)	**59**	27(33)	35(43)	15(19)	4(5)	**81**
Stanwick Lakes layby (100)	13(38)	17(50)	3(9)	1(3)	**34**	22(47)	17(36)	6(13)	2(4)	**47**
Ringstead Grange (102)	23(53)	15(35)	4(9)	1(2)	**43**					
Kinewell Lake (106)	13(46)	12(43)	2(7)	1(4)	**28**					
Mill Lane, Islip (114)	43(61)	24(34)	3(4)	1(1)	**71**					
Meadow Lane car park, Thrapston (117)	16(50)	12(38)	3(9)	1(3)	**32**					
Titchmarsh LNR Car Park (122)	12(60)	7(35)	1(5)		**20**					
Total	**337(53)**	**227(36)**	**35(5)**	**39(6)**	**638**	**131(44)**	**126(42)**	**33(11)**	**11(4)**	**301**

Results: Factors influencing choice of site

4.50 Question 8 asked interviewees to provide their reasons for choosing to visit a particular area, rather than another local site; one main reason was identified and multiple secondary reasons were possible. Responses were coded into 19 categories; the number of categories remained the same in the winter and spring/summer questionnaires. Of the 939 interviews, all respondents provided a main reason for choosing that specific site. Main reasons and secondary reasons are summarised in Table 22.

4.51 Close to home was the most frequent main reason given, (32% of interviewees). Quality of the site was the most commonly given overall reason (61% of interviewees), once accounting for those that gave this as a secondary reason. For those sites surveyed in both winter and spring/summer, there was a significant difference in the frequency of main reasons given for visiting a site between the two survey periods (χ^2_8=33.995, p=<0.001). Across the whole survey period, 32% of visitors stated that they visited the area because it was close to home and 23% for the quality of the area. In winter, 39% cited close to home as their main reason for visiting and 35% in spring/summer cited quality of the area (Table 22). In spring/summer, no visitors cited 'suitability in weather conditions', 'quiet with no traffic noise', 'ability to let dog off the lead' or 'not many people' as reasons.

4.52 Across the whole survey period, the most common reason given by dog walkers for visiting that area specifically was that it was close to home (44%). In total, 21% cited the quality of the area as the main reason (Table 23); fewer of visitors stated that they chose the site as it was good for their dog, or that the dog could be let off the lead (6% and 2% respectively); it appears that ease of access and convenience play a major role in choice of site. A third (33%) of walkers visited due to the quality of the area and 81% of visitors who stated wildlife watching as their primary activity chose the specific site due to their particular wildlife interest.

4.53 Of those respondents who were on a family outing, 50% stated that the particular facilities available at a site appealed, for example the visitor centre and playground available at Stanwick Lakes; the only site with such extensive visitor infrastructure. Of all the sites surveyed, Stanwick is the only one to offer a range of activities and facilities for various age groups while satisfying the needs of visitors who come to the area to undertake a variety of activities, from bird watching to family trips.

Table 22: Reasons for choosing interview location rather than another local site (question 8). Interviewees could give multiple responses, with one identified as 'main'. Table summarises all responses (%), percentages calculated based on number of interviews in each period rather than number of responses.

Reasons for choosing site	Main reason			Secondary/'Other' Reason			Combined		
	Winter	Spring	Whole survey period	Winter	Spring	Whole survey period	Winter	Spring	Whole survey period
Close to home	248 (39)	55 (18)	303 (32)	78 (12)	67 (22)	145 (15)	326 (51)	122 (41)	448 (48)
Quality of the area	107 (17)	106 (35)	213 (23)	251 (39)	109 (36)	360 (38)	358 (56)	215 (71)	573 (61)
Other	74 (12)	49 (16)	123 (13)	141 (22)	72 (24)	213 (23)	215 (34)	121 (40)	336 (36)
Particular wildlife interest	49 (8)	24 (8)	73 (8)	71 (11)	33 (11)	104 (11)	120 (19)	57 (19)	177 (19)
Particular facilities	18 (3)	15 (5)	33 (4)	15 (2)	6 (2)	21 (2)	33 (5)	21 (7)	54 (6)
Good for dog	23 (4)	7 (2)	30 (3)	10 (2)	48 (16)	156 (17)	33 (5)	55 (18)	186 (20)
Don't know/others chose	12 (2)	12 (4)	24 (3)	122 (19)	126 (42)	248 (26)	134 (21)	138 (46)	272 (29)
Habit/familiarity	16 (3)	8 (3)	24 (3)	3 (0)	3 (1)	6 (1)	19 (3)	11 (4)	30 (3)
Quick and easy travel route	19 (3)	4 (1)	23 (2)	36 (6)	44 (15)	80 (9)	55 (9)	48 (16)	103 (11)
Right place for activity	17 (3)	4 (1)	21 (2)	19 (3)	12 (4)	31 (3)	36 (6)	16 (5)	52 (6)
Good/easy parking	12 (2)	2 (1)	14 (1)	50 (8)	27 (9)	77 (8)	62 (10)	29 (10)	91 (10)
Choice of routes	7 (1)	5 (2)	12 (1)	65 (10)	37 (12)	102 (11)	72 (11)	42 (14)	114 (12)
Feels safe	3 (0)	8 (3)	11 (1)	53 (8)	33 (11)	86 (9)	56 (9)	41 (14)	97 (10)
Rural feel/wild landscape	9 (1)	1 (0)	10 (1)	12 (2)	35 (12)	164 (17)	21 (3)	36 (12)	174 (19)
Ability to let dog off lead	9 (1)	0 (0)	9 (1)	95 (15)	9 (3)	104 (11)	104 (16)	9 (3)	113 (12)
Suitability in weather conditions	7 (1)	0 (0)	7 (1)	21 (3)	4 (1)	25 (3)	28 (4)	4 (1)	32 (3)
Quiet, with no traffic noise	4 (1)	0 (0)	4 (0)	62 (10)	24 (8)	86 (9)	66 (10)	24 (8)	90 (10)
Not many people	3 (0)	0 (0)	3 (0)	40 (6)	13 (4)	53 (6)	43 (7)	13 (4)	56 (6)
Refreshments	1 (0)	1 (0)	2 (0)	16 (3)	13 (4)	29 (3)	17 (3)	14 (5)	31 (3)
Total	**638**	**301**	**939**	**1160**	**715**	**2090**	**1798**	**1016**	**3029**

Table 23: Main reason for visiting the Nene Valley rather than other local sites by activity, across the whole survey period. The percentage response for each category, per activity is given in parentheses. The most frequently cited reason for each activity is highlighted in grey.

Main Reason / Activity	Close to home	Quality of the area	Other	Particular wildlife interest	Particular facilities	Good for dog	Don't know/ others chose	Habit/ familiarity	Quick and easy travel route	Right place for activity	Good/ easy parking	Choice of routes	Feels safe	Rural feel/wild landscape	Let dog off lead	Total
Dog walking	196(44)	92(21)	50(11)		7(2)	28(6)	7(2)	16(4)	13(3)	2(0.5)	11(2)	5(1)	6(1)	4(1)	9(2)	**448**
Walking	74(26)	93(33)	54(19)	16(6)	5(2)	1(0.4)	8(3)	7(3)	5(2)	5(2)	3(1)	4(1)	1(0.4)	4(1)		**280**
Wildlife watching	2(3)	5(8)	2(3)	51(81)		1(2)	1(2)							1(2)		**63**
Outing with family	4(13)	4(13)	1(3)		16(50)		2(6)			2(6)			3(9)			**32**
Other	7(23)	2(6)	13(42)	2(6)	2(6)				1(3)	2(6)			1(3)	1(3)		**31**
Fishing	10(40)		5(20)		1(4)		1(4)	1(4)	2(8)	5(20)						**25**
Jogging/power walking	4(17)	10(42)	5(21)				1(4)		1(4)	2(8)		1(4)				**24**
Cycling	5(22)	4(17)	6(26)		2(9)				1(4)	3(13)		2(9)				**23**
Enjoy scenery		3(50)	1(17)	2(33)												**6**
Meet up with friends							4(100)									**4**
Photography	1(50)		1(50)													**2**
Water-sports			1(100)													**1**
Total	**303(32)**	**213(23)**	**139(15)**	**73(8)**	**33(4)**	**30(3)**	**24(3)**	**24(3)**	**23(2)**	**21(2)**	**14(1)**	**12(1)**	**11(1)**	**10(1)**	**9(1)**	**939**

Results: Other Locations Visited

4.55 In question 11, interviewees were asked to indicate whether they visit other local sites for the same purpose that they were visiting that day and which they visit most often. A list of 16 sites/areas were held by the surveyor and responses categorised accordingly.

4.56 A total of 1832 responses were provided to this question, across the whole survey period; 1464 responses were from the list provided in the questionnaire, the remainder were free text. Overall, Stanwick Lakes was the most popular location, accounting for 20% of responses.

4.57 Table 24 summarises the responses, by main activity; only those locations with five or more responses have been included; 116 locations were recorded. The most commonly cited site by dog walkers was Stanwick Lakes; one of several sites where dogs are required to be kept on leads. Pitsford Reservoir proved popular with those watching wildlife; 19% of visitors who listed Pitsford as another location to visit were watching wildlife.

Table 24: The other locations interviewees stated they visit and the main activity carried out on the day of the interview, giving number of responses (%). Only locations which had more than 5 responses are included in this table and those locations provided on the questionnaire are highlighted in bold, the remainder were provided in free text by the respondents. Grey shading indicates the two sites with the highest vales for each column.

Main activities	Dog walking	Walking	Jogging / Power walking	Outing with family	Cycling	Wildlife watching	Fishing	Enjoying scenery	Photography	Meet up with friends	Other	Total
Stanwick Gravel Pits	156 (19)	80 (13)	6 (13)	7 (11)	5 (15)	26 (17)	2 (4)		2 (29)	1 (33)	5 (11)	290 (16)
Sywell Country Park	96 (12)	86 (14)	4 (8)	8 (12)	1 (3)	20 (13)	1 (2)	2 (17)		1 (33)	8 (18)	227 (12)
Irchester Country Park	98 (12)	81 (13)	7 (15)	18 (28)	3 (9)	6 (4)	2 (4)				7 (16)	222 (12)
Pitsford Reservoir	54 (7)	71 (12)	4 (8)	3 (5)	4 (12)	33 (21)		3 (25)		1 (33)	3 (7)	176 (9)
Ringstead Gravel Pits	63 (8)	33 (5)	3 (6)	8 (12)	3 (9)	5 (3)	6 (11)					121 (7)
Earls Barton, Central	49 (6)	32 (5)	2 (4)	6 (9)		11 (7)	3 (5)				7 (16)	110 (6)
Thrapston Gravel Pits	27 (3)	44 (7)	3 (6)	5 (8)	3 (9)	15 (10)	2 (4)	1 (8)	1 (14)		6 (13)	107 (6)
Barnwell Country Park	40 (5)	26 (4)	1 (2)	2 (3)	2 (6)	1 (1)	5 (9)	1 (8)			2 (4)	80 (4)
Ditchford Gravel Pits, West	17 (2)	13 (2)	1 (2)	2 (3)		7 (5)	1 (2)	1 (8)	1 (14)			43 (2)
Earls Barton, West	19 (2)	15 (2)	1 (2)			4 (3)	3 (5)					42 (2)
Wadenhoe Area	20 (2)	12 (2)	2 (4)			2 (1)		1 (8)			2 (4)	39 (2)
Ditchford Gravel Pits, East	12 (1)	14 (2)	1 (2)	1 (2)		3 (2)	3 (5)	1 (8)	2 (29)		2 (4)	39 (2)
Earls Barton, East	12 (1)	6 (1)				1 (1)	3 (5)					22 (1)
Irthlingborough Lakes	8 (1)	6 (1)	1 (2)	1 (2)	1 (3)	1 (1)	4 (7)					22 (1)
Stortons Gravel Pits	5 (1)	5 (1)			2 (6)	4 (3)	2 (4)		1 (14)			19 (1)
Abington Park	14 (2)	3 (0)										17 (1)
Fermyn Woods	12 (1)	4 (1)	1 (2)									17 (1)
Clifford Hill Gravel Pits	3 (0)	6 (1)		1 (2)		3 (2)		1 (8)				14 (1)
Harold-Odell Country Park	3 (0)	10 (2)				1 (1)						14 (1)
Local streets, paths etc	8 (1)	4 (1)	2 (4)									14 (1)
Rutland Water		6 (1)			2 (6)	6 (4)						14 (1)
Cogenhoe	7 (1)	2 (0)	1 (2)								1 (2)	11 (1)
Grafham Water	3 (0)	5 (1)			1 (3)	1 (1)	1 (2)					11 (1)

Results: Visitor routes

4.58 A total of 863 visitor routes were digitised across the whole survey period; 92% of all interviews (939). The routes were mapped using polylines within the GIS and the total length of each route was calculated. All routes are shown in Map 13.

Length of routes by season and survey location

4.59 There was a significant seasonal difference in the length of routes for the six sites that were surveyed in both winter and spring/summer (Kruskal-Wallis H=5.3, df=1, p=0.021). At three of the six sites that were surveyed in the winter and the spring/summer, the median route length increased in the spring/summer when compared to the winter (sites 45, 92 and 100), stayed the same at two (63 and 65) and fell at one (96) (Figure 5). When surveyed in the summer, site 96 was surveyed during very hot weather, so the reduced route length is possibly a reflection of this.

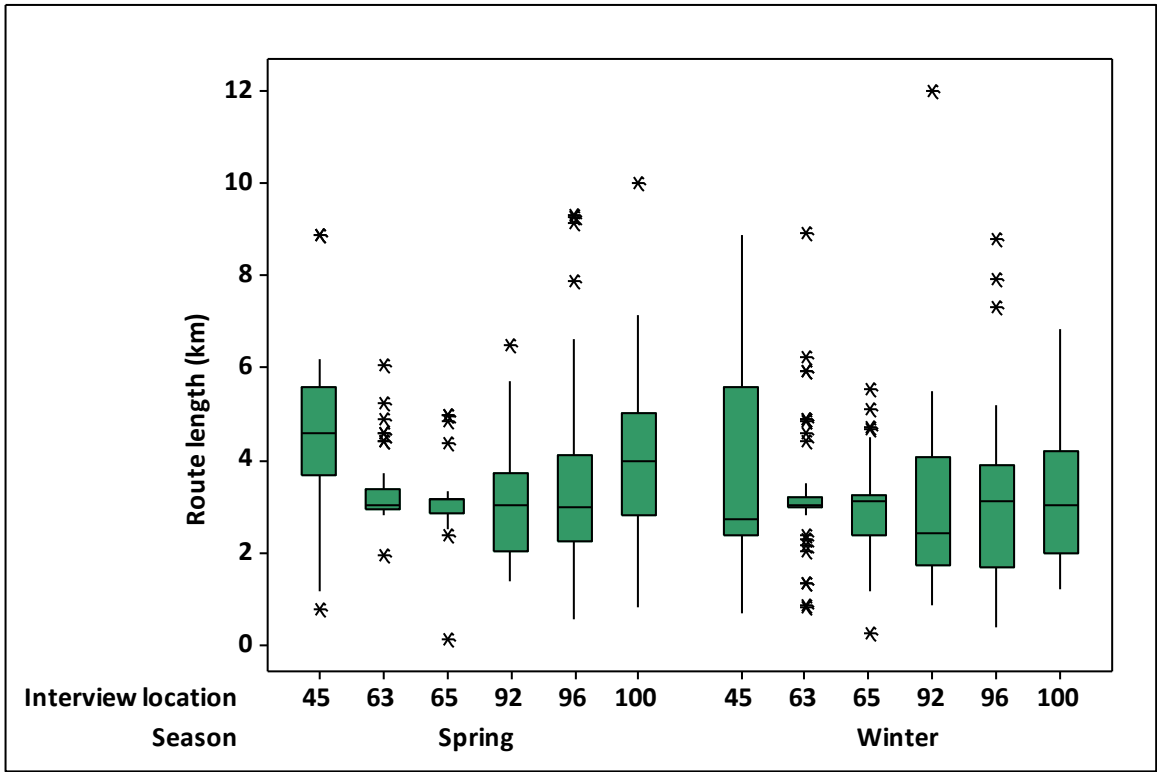


Figure 5: Route length (km) from visitors at each location surveyed in both winter and spring/summer. For notes on interpretation of this graph, see methods.

4.60 Route length varied greatly depending upon the survey location visited (Figure 6); for the routes collected over the winter fieldwork period, there was a significant difference between route lengths at different survey locations (Kruskal-Wallis H=138.77, df=20, p=<0.001).


Map 13: Routes taken by interviewees
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
2.5
5
kilometres
Summer and winter survey locations
Winter only survey locations
All routes

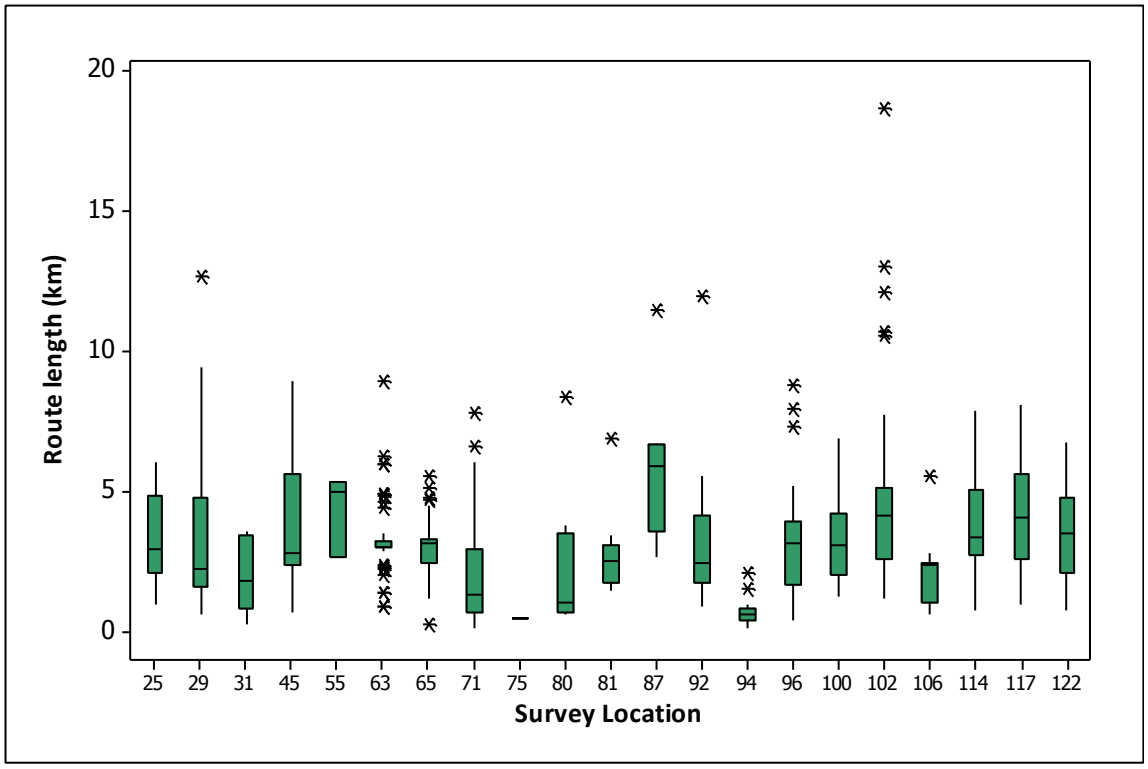


Figure 6: Route lengths (km) of visitors grouped by survey location for the winter fieldwork period only. For notes on interpretation of this graph, see methods.

Length of routes by activity

4.61 When considering all routes from the whole survey period, there was a significant difference in the length of routes when grouped by main activity (Kruskal-Wallis H=110.45, df=11, p=<0.001). In the winter, cyclists undertook the longest routes, with 50% covering at least 5.5km on their visit; the shortest routes were by those visitors who were fishing, with a median value of 0.6km, perhaps a reflection on the more sedentary nature of this activity compared to others. In the spring/summer period, those visitors who were enjoying the scenery undertook the longest routes, with 50% covering at least 4.1km (Table 25).

Table 25: Visitor route length (km) grouped by main activity.

Main Activity	Mean	Minimum	25%	Median	75%	Maximum	N
Winter							
Dog walking	3.1	0.2	1.9	2.8	4.1	13	318
Walking	3.6	0.4	2.1	3.2	4.7	12	143
Jogging/Power walking	4.3	1.3	1.7	4.9	5.9	8.9	9
Outing with family	2.3	0.8	1	2.1	3.5	4.9	8
Cycling	7.3	2.5	4	5.5	11.1	18.7	12
Wildlife watching	4.2	0.7	3.1	3.5	6.2	8.4	31
Fishing	0.6	0.1	0.4	0.6	0.7	2.4	25
Enjoying scenery	4.9	2.4		4.9		7.4	2
Photography	2.1	2.1		2.1		2.1	1
Meet up with friends	5.5	5.5		5.5		5.5	1
Other	2.5	0.1	0.9	2.6	3.7	8.1	27
All activities	**3.3**	**0.1**	**1.8**	**3.0**	**4.5**	**18.7**	**577**
Spring/Summer							
Dog walking	3.4	0.8	2.7	3.1	3.9	7.2	101
Walking	3.7	0.6	2.9	3	4.3	10	109
Jogging/Power walking	3.5	0.8	2.9	3.2	4.6	5.1	14
Outing with family	3.1	0.7	2.3	3	4.1	5.7	23
Cycling	5.1	1.4	1.7	3.8	9.1	9.3	7
Wildlife watching	3.7	0.1	3	3.3	4.4	6.5	23
Enjoying scenery	4.2	2.4	2.4	4.1	6.2	6.2	3
Photography	3.5	3.5		3.5		3.5	1
Meet up with friends	6	3.2		6		8.9	2
Other	2	1.4	1.4	1.6	3	3	3
All activities	**3.5**	**0.1**	**2.8**	**3.1**	**4.3**	**10.0**	**286**

4.62 For those sites that were visited in both winter and spring/summer, there was a significant difference in route length when grouped by activity (Kruskal-Wallis H=19.24, df=10, p=0.037). The shortest routes were just 0.1km, recorded at site 65 by a bird watcher and 94 by a fisherman in winter; the visit to site 65 (Summer Leys Nature Reserve) most likely reflects the very short distance between the survey point at an entrance gate and one of the main bird hides at this reserve. The longest route

recorded overall was by a cyclist surveyed at site 102 in the winter; the longest route in spring was also at site 102, this time the main activity undertaken was walking.

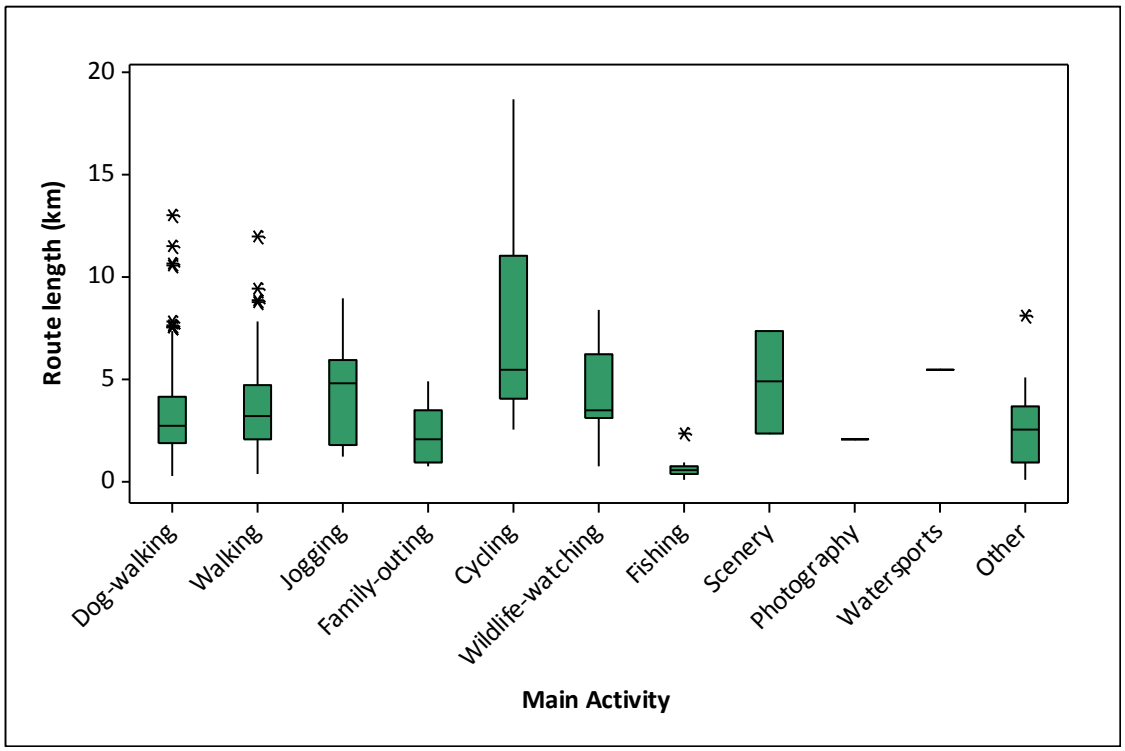


Figure 7: Route length (km) of visitors grouped by main activity during the winter fieldwork period only. For notes on interpretation of this graph, see methods.

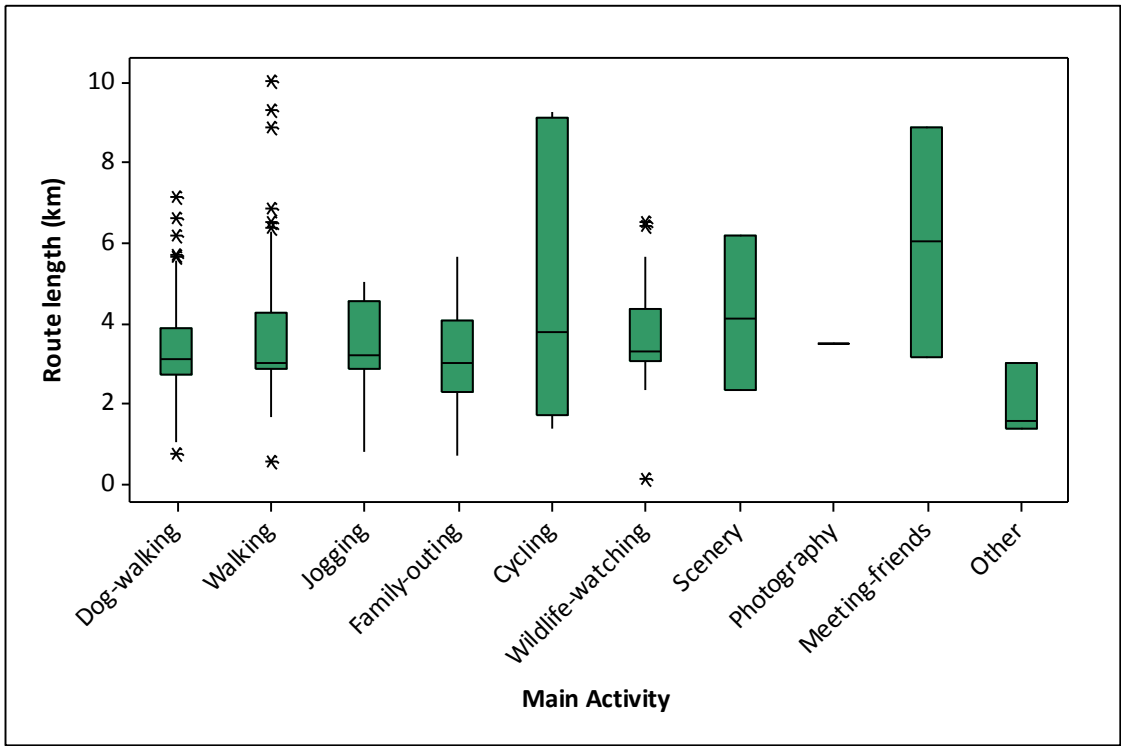


Figure 8: Route length (km) of visitors grouped by main activity during the spring/summer fieldwork period only. For notes on interpretation of this graph, see methods.

Factors influencing choice of route

4.63 Visitors were asked whether the route they had taken, or planned to take, that day was reflective of the usual route taken (question 9). In total, 929 responses were received to this question across the whole survey period and 46% stated they had taken (or would take), their normal route. A third of interviewees (33%) had no typical route, 19% took a route that was shorter than normal and 3% longer than normal. When considering the six sites that were surveyed in both winter and spring/summer, there was a significant difference in the frequencies of responses (χ^2_3=13.993, p=0.003); a higher number of visitors in winter for example were recorded as taking shorter routes compared to the expected frequency, most likely due to inclement weather.

4.64 Visitors were also asked what factors, if any, influenced their choice of route that day, multiple responses were possible and surveyors coded each response into one of twelve categories. In total 1125 responses were recorded, 715 in winter and 410 in spring. The two most common responses were 'previous knowledge' (29% of interviewees) and the weather (27% interviewees) (Table 26). In spring/summer, 50% of interviewees gave 'previous knowledge' as a factor, considerably more than the winter, when weather was more of a factor in the choice of route.

Table 26: Factors influencing route in each survey period. The percentage (in parentheses) are derived from number of interviews rather than number of responses.

Factors influencing route	Winter	Spring	Total
Previous knowledge	122(19)	152(50)	274(29)
Weather	191(30)	61(20)	252(27)
Time	99(16)	73(24)	172(18)
Other	124(19)	15(5)	139(15)
Activity undertaken	44(7)	26(9)	70(7)
Muddy tracks	59(9)	2(1)	61(6)
Group members (kids, less able)	17(3)	31(10)	48(5)
Followed marked trail	9(1)	22(7)	31(3)
Access to hides	18(3)	11(4)	29(3)
Daylight	17(3)	5(2)	22(2)
Other people	14(2)	8(3)	22(2)
Information about reserves, leaflets	1(0)	4(1)	5(1)
Total	**715**	**410**	**1125**

4.65 Across the whole survey period 27% of dog walkers and 31% of walkers stated that previous knowledge of the site influenced their route that day and 27% of dog walkers were affected by weather (Table 27). A quarter (25%) of visitors who were watching wildlife were influenced by access to hides and 80% of those fishing were affected by the weather.

Table 27: Factors influencing route choice and duration in each activity. Percentages (in parentheses) are derived from the number of interviews rather than the total number of responses.

Influential factors for each activity	Dog walking	Walking	Wildlife watching	Outing with family	Fishing	Other	Jogging/ power walking	Cycling	Photo-graphy	Enjoy scenery	Meet up with friends	Water-sports	Total
Previous knowledge	122 (27)	86 (31)	16 (25)	13 (41)	10 (40)	6 (19)	12 (50)	5 (22)	1 (50)	2 (33)	1 (25)		274 (29)
Weather	120 (27)	67 (24)	12 (19)	7 (22)	20 (80)	10 (32)	5 (21)	7 (30)	2 (100)	2 (33)			252 (27)
Time	91 (20)	51 (18)	7 (11)	6 (19)	5 (20)	4 (13)	4 (17)	4 (17)					172 (18)
Other	80 (18)	31 (11)	13 (21)	1 (3)	1 (4)	6 (19)	3 (13)	3 (13)				1 (100)	139 (15)
Activity undertaken	37 (8)	12 (4)	7 (11)	2 (6)	3 (12)	4 (13)	1 (4)	3 (13)			1 (25)		70 (7)
Muddy tracks	36 (8)	15 (5)	2 (3)	1 (3)		3 (10)	1 (4)	2 (9)	1 (50)	)			61 (6)
Group members (kids, less able)	10 (2)	11 (4)	1 (2)	22 (69)		2 (6)		1 (4)			1 (25)		48 (5)
Followed marked trail	10 (2)	9 (3)	4 (6)	3 (9)			2 (8)	3 (13)					31 (3)
Access to hides	2 (0)	10 (4)	16 (25)						1 (50)				29 (3)
Daylight	7 (2)	11 (4)	1 (2)		2 (8)				1 (50)				22 (2)
Other people	9 (2)	8 (3)		2 (6)			1 (4)	1 (4)			1 (25)		22 (2)
Information about reserves, leaflets	1 (0)	2 (1)		2 (6)									5 (1)
Total	**525**	**313**	**79**	**59**	**41**	**35**							**1125**

Impacts of winter flooding on routes

4.66 Persistently poor weather was experienced over the winter fieldwork period, and therefore an additional question (question 14) was included in the spring questionnaire, asking visitors whether their visitation patterns were altered due to the heavy rain and if yes, how so. Visitors whose visits were affected were then asked how, surveyors then categorised responses into one of five options; multiple options could be selected.

4.67 In total, 298 visitors answered this question and 62% stated that their visitation patterns were affected by the flooding over winter. 232 responses were categorised by surveyors and 36% stated that they took different routes over the winter and 32% visited different sites altogether (Table 28).

4.68 Respondents were also asked if they had any further comments about how the flooding affected their visits; 81 responses were recorded. Overall, 38% of comments were positive, relating to how the flooding was perhaps inconvenient, but did not affect the visitors in any significant way; 62% were negative, with many visitors having to change their normal routes, not travel or choose alternative locations with some more significant degree of disruption.

Table 28: Changes in visitation patterns of visitors surveyed in spring/summer as a result of winter flooding. Percentages are in parentheses.

How was visit affected?	Response totals
Used different routes	84(36)
Visited different sites	75(32)
Visited less frequently	41(18)
Didn't visit anywhere	30(13)
Undertook a different activity	2(1)
Total	**232(100)**

Results: Recognition of importance of the site for conservation

4.69 Visitors were asked whether they were aware that parts of the Nene Valley are important for the number of birds that spend the winter there and whether people were aware of the international designation of the area.

4.70 A total of 78% of interviewees were aware of the importance of the area for wintering birds (Table 29). 937 responses were received for the question about whether people were aware that parts of the Nene Valley have an international designation because of the birds that winter there; 24% of those who responded were aware of this designation.

Table 29: Knowledge of importance of the Nene Valley for wildlife conservation. Percentages are in parentheses.

	Knowledge of importance of area for conservation	Knowledge of international designation	Knowledge of name of designation
Yes	733(78)	229(24)	57(26)
No	202(22)	704(75)	165(74)
Unsure/Don't know	3(0.3)	4(0.4)	
Total	**938(100)**	**937(100)**	**222(100)**

4.71 Table 30 shows the results of each question broken down by the main activity carried out across the whole survey period. 81% of dog walkers were aware of the importance of the area in conservation terms, however only 16% were aware of its' international designation. 98% of those visitors who were wildlife watching were aware of the importance and 76% were also aware of the international designation; 56% of those who responded to the final question were also able to correctly identify the designation as an SPA. Overall it would appear that although the majority of visitors were aware of the importance of the area, far fewer were aware of the details of this and the international designation in place.

Table 30: Knowledge of respondents about the importance of the Nene Valley for conservation and its' international designation, based on the main activities carried out. Percentage responses for each activity are in parentheses for each of the three questions.

Activity	Knowledge of importance of area for conservation				Knowledge of international designation				Knowledge of name of designation		
	Yes	No	Unsure	Total	Yes	No	Unsure	Total	Yes	No	Total
Dog walking	361(81)	84(19)	2(0.4)	**447**	73(16)	371(83)	3(1)	**447**	8(11)	63(89)	**71**
Walking	211(75)	68(24)	1(0.4)	**280**	77(28)	202(72)		**279**	16(22)	56(78)	**72**
Jogging/power walking	17(71)	7(29)		**24**	4(17)	20(83)		**24**	1(25)	3(75)	**4**
Outing with family	22(69)	10(31)		**32**	4(13)	28(88)		**32**		4(100)	**4**
Cycling	11(48)	12(52)		**23**	3(13)	20(87)		**23**	1(33)	2(67)	**3**
Wildlife watching	62(98)	1(2)		**63**	48(76)	15(24)		**63**	27(56)	21(44)	**48**
Fishing	14(56)	11(44)		**25**	6(24)	18(72)	1(4)	**25**		6(100)	**6**
Enjoying scenery	5(83)	1(17)		**6**	2(33)	4(67)		**6**	1(50)	1(50)	**2**
Photography	2(100)			**2**	2(100)			**2**	1(50)	1(50)	**2**
Meet up with friends	1(25)	3(75)		**4**		4(100)		**4**			
Water-sports	1(100)			**1**		1(100)		**1**			
Other	26(84)	5(16)		**31**	10(32)	21(68)		**31**	2(20)	8(80)	**10**
Total	**733(78)**	**202(22)**	**3(0.3)**	**938**	**229(24)**	**704(75)**	**4(0.4)**	**937**	**57(26)**	**165(74)**	**222**

Results: Visitor postcodes and distance travelled to site

4.72 Home postcodes were used to identify the linear distance between interviewee's home and the location where interviewed. Of the 939 visitors interviewed, 911 provided a full home postcode and of these, 908 geo-coded. Of the 19 groups that did not provide a postcode, one was visiting the area from Germany and the remainder were local to the site or preferred not to provide any further information.

Visitor origins

4.73 Visitors originated from a wide range of locations. The two main settlements were Northampton (137 postcodes from the winter interviews fell within the settlement) and Wellingborough (88 postcodes from the winter interviews). Map 14 shows all visitor postcodes, while Map 15 those that are closer to the Nene Valley. Map 16 shows visitor postcodes in relation to frequency of visit with the different shading indicating how often the interviewee visits. We have highlighted the area within which frequent visitors (those that indicated they visited daily or most days) live with the convex hull[9] shown by a brown line. Map 17 is at the same scale as Map 16 and shows postcodes in relation to activity. We also list settlements and give a visit rate for each (based on the winter visitor survey results) in Appendix 3.

Distance from home postcode to survey point

4.74 The majority of visitors lived relatively close to the survey points. For all 908 postcodes gathered during the survey, the median distance to the interview location was 3.2km (mean =5.85km $\pm$ 0.31). Three-quarters of people lived within a radius of 7.5km from the survey point.

4.75 The median distance from home postcode to survey point in the spring was 4.34km, compared to 4.18km in the winter (for the same survey points). There was no statistically significant seasonal difference between the two seasons (Mann-Whitney W=77309, p=0.560).

4.76 Across the whole survey period there was a statistically significant difference in the distance travelled from the given postcode to the survey location between those visiting from home, on a day trip or 'other' (Kruskal-Wallis H=7.48, df=2, p=0.024). The highest median distance travelled to any of the survey locations was 7.6km to site 65, Summer Leys Nature Reserve and the lowest of 0.2km to site 31.

4.77 Across the whole survey period, the distance travelled by interviewees varied between sites (Figure 9). For the purpose of the graph below, data were excluded for three questionnaires to avoid skewing the results; one for site 75, which only had one completed survey across the whole survey period; also two entries were removed, one for site 25 and one for site 65, where visitors were recorded as travelling from home on a short trip, but had travelled in excess of 100km to reach the site.

[9] A convex hull is a line that goes round a series of points, equivalent to an elastic band that goes round a set of points such that all other points lie within or on the line.

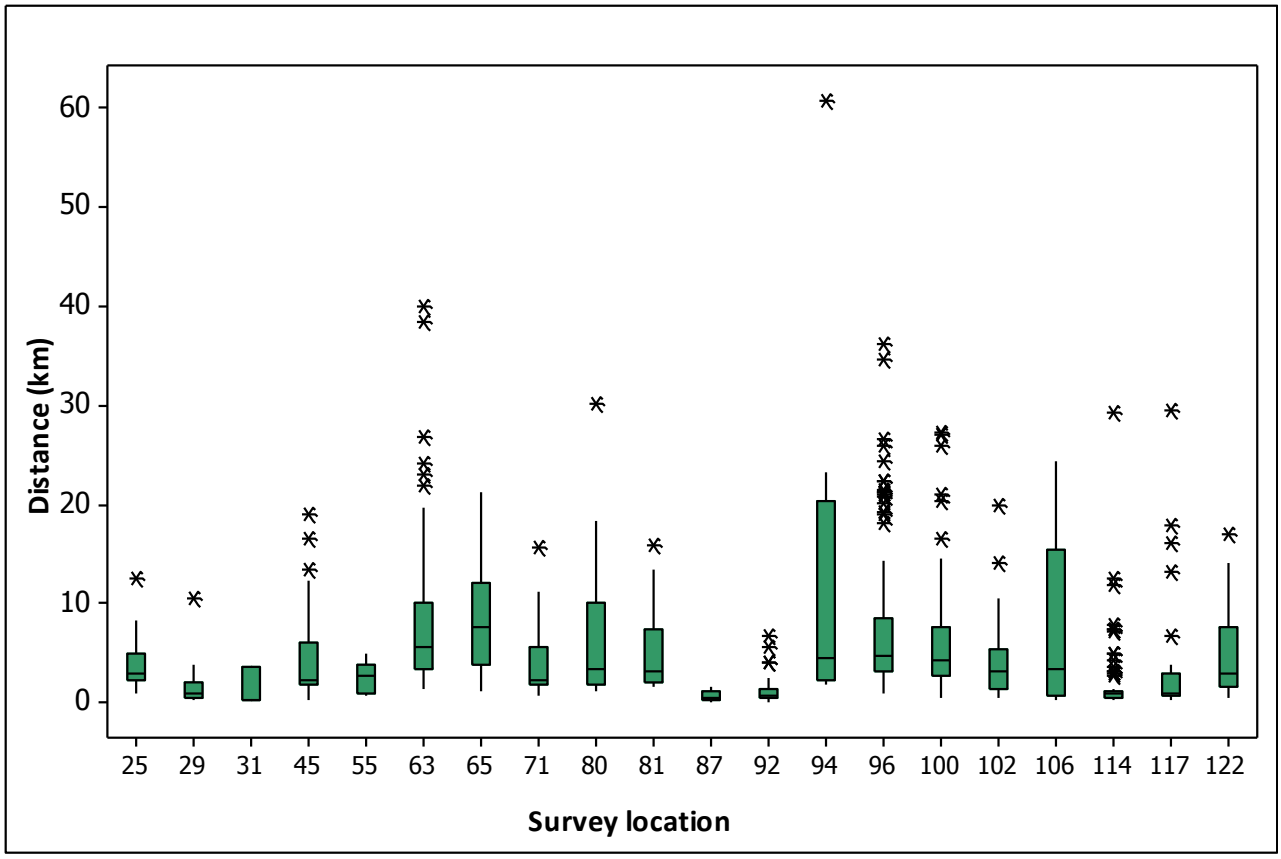
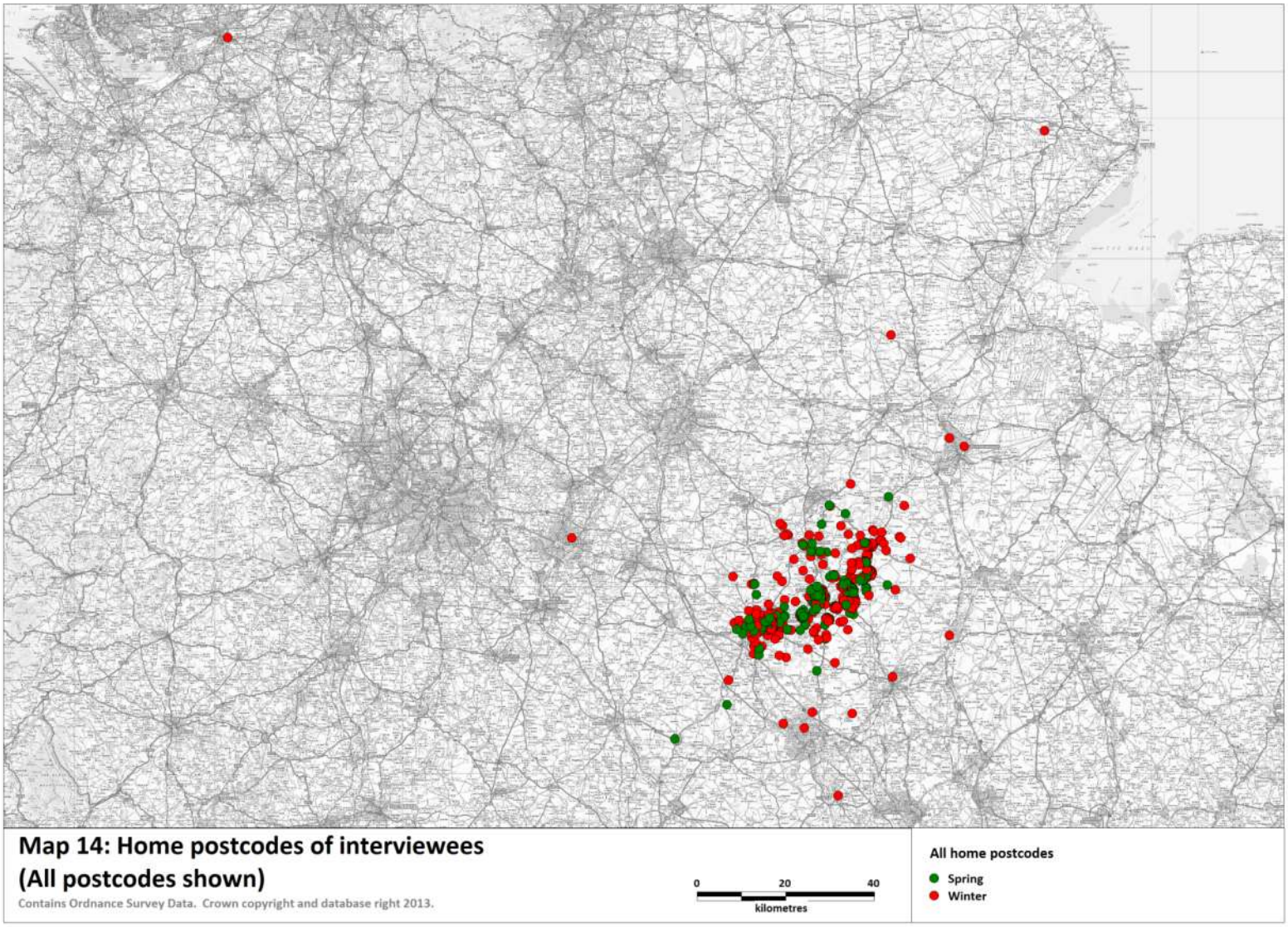
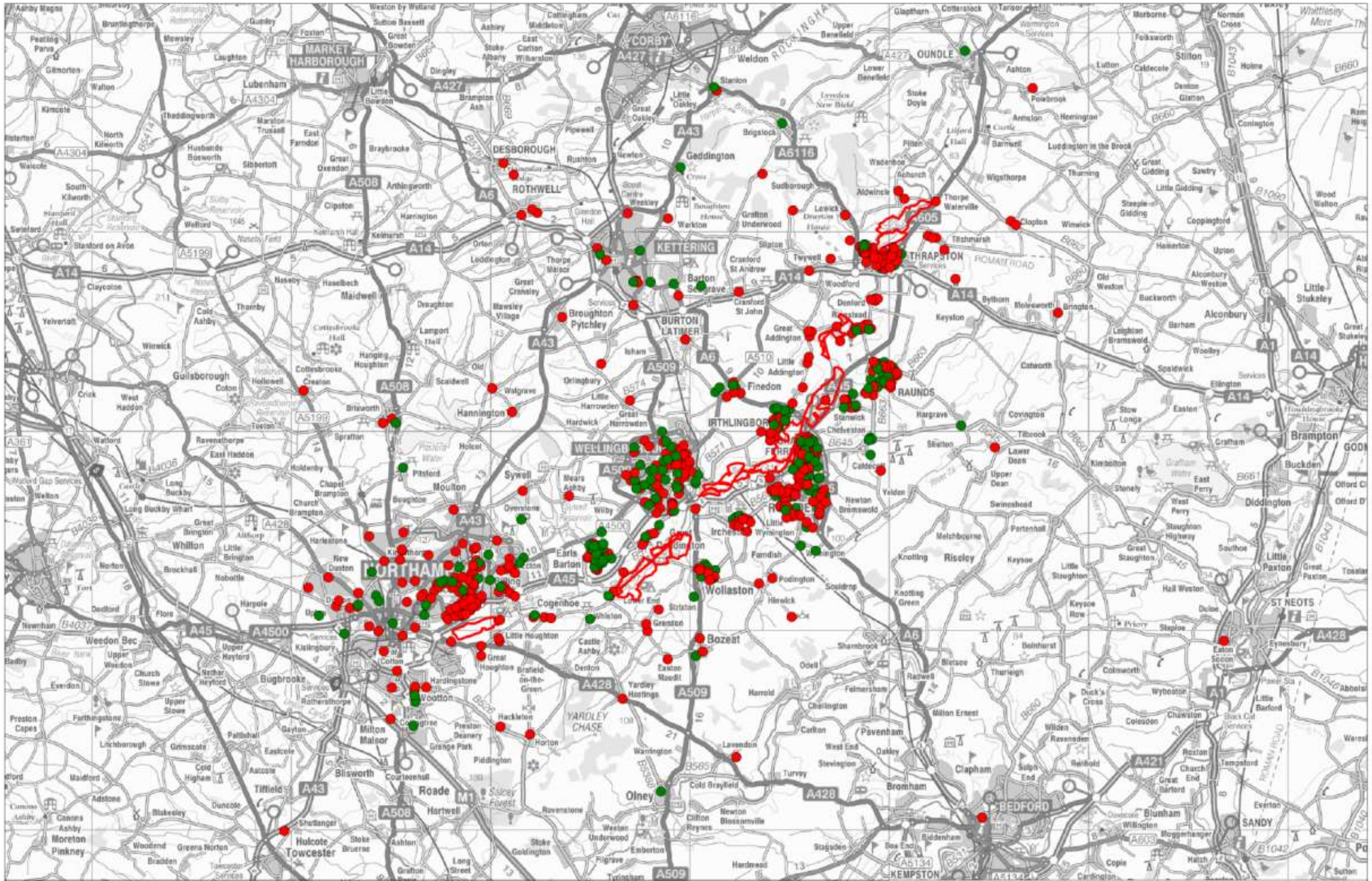


Figure 9: Linear distance (km) from home postcode to each survey location for interviews across the whole survey period. Data for those people undertaking day trips from home only. For notes on interpretation of this graph, see methods.



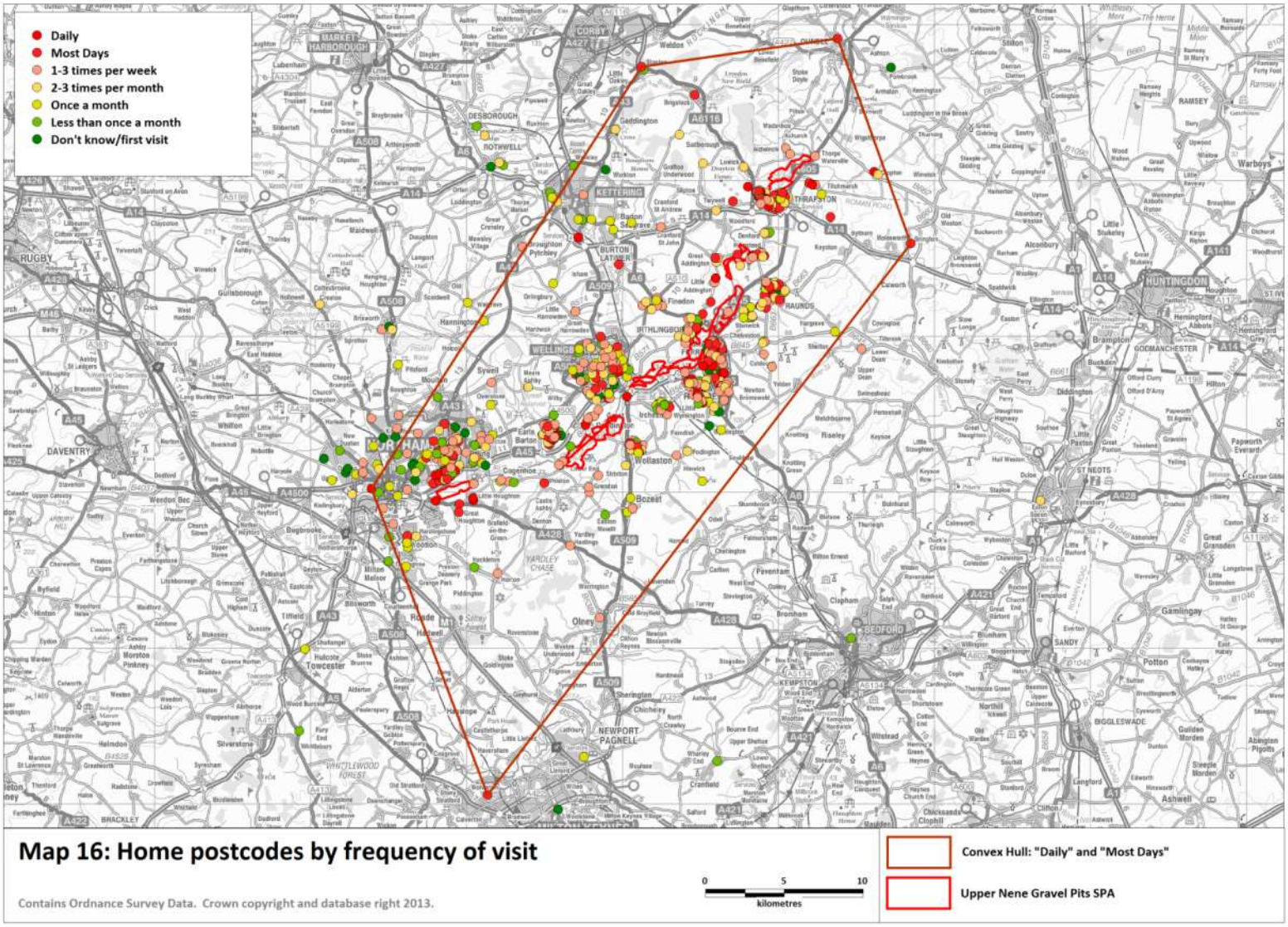
Map 14: Home postcodes of interviewees (All postcodes shown)

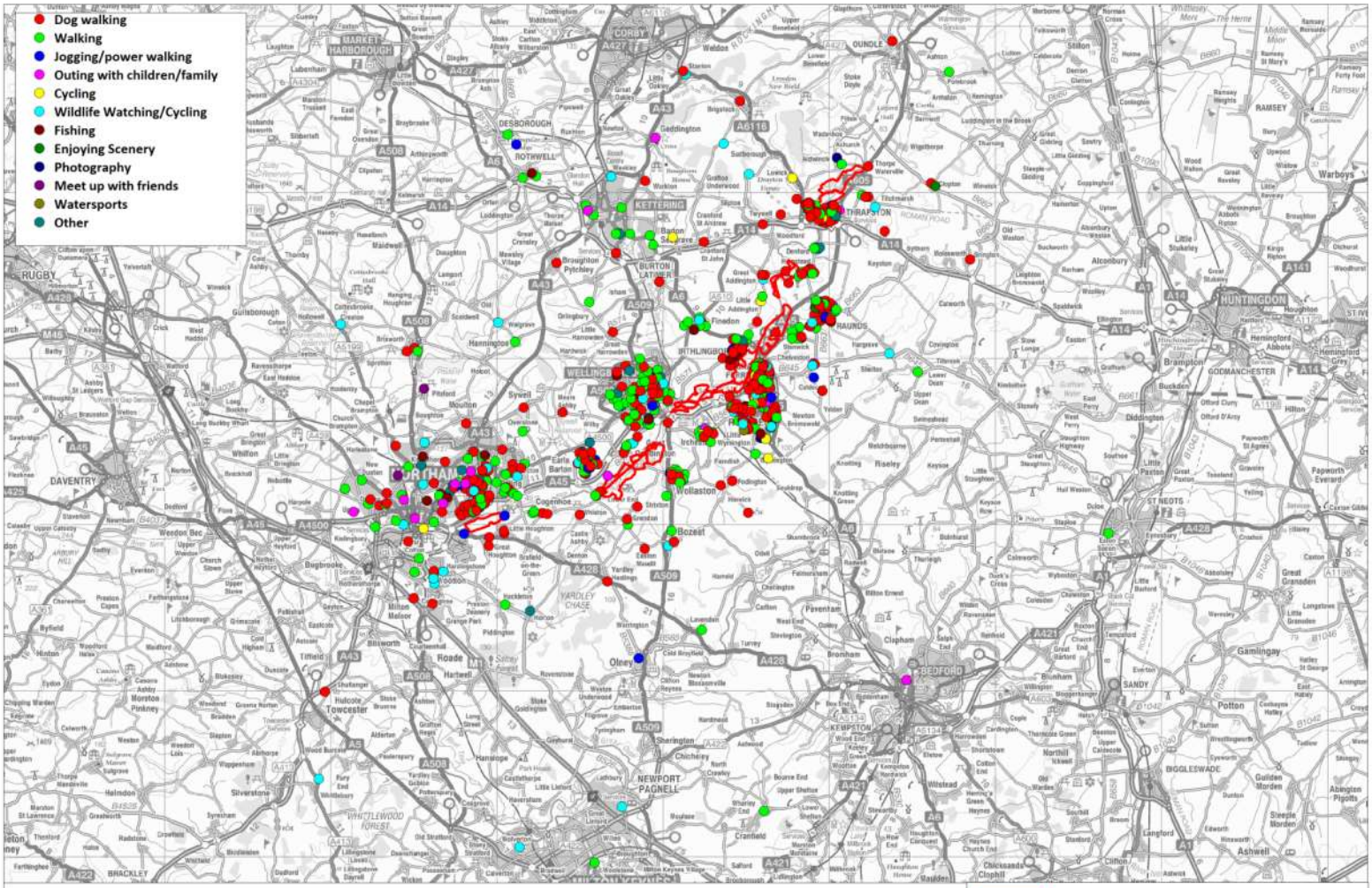


Map 15: Home postcodes of interviewees (area around SPA only)

0 5 10
kilometres

All home postcodes
- Spring
- Winter


Daily
Most Days
1-3 times per week
2-3 times per month
Once a month
Less than once a month
Don't know/first visit
Map 16: Home postcodes by frequency of visit
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
5
10
kilometres
Convex Hull: "Daily" and "Most Days"
Upper Nene Gravel Pits SPA


Dog walking
Walking
Jogging/power walking
Outing with children/family
Cycling
Wildlife Watching/Cycling
Fishing
Enjoying Scenery
Photography
Meet up with friends
Watersports
Other
Map 17: Home postcodes by activity
Contains Ordnance Survey Data. Crown copyright and database right 2013.
0
5
10
kilometres
Upper Nene Gravel Pits SPA

Distance and main activity undertaken

4.78 Visitors travelled varying distances depending upon the activity undertaken (Table 31). Half of those visitors who were dog walking as their main activity lived within 2.3km of the site at which they were interviewed, while half of those visitors who were meeting with friends lived within 22.1km of their chosen site. Visitors appear to be willing to travel further to sites which are better suited to their chosen activities.

4.79 Dog walkers and joggers lived closest to the site at which they were visiting, with median values of 2.3 and 2.9km respectively. Half of those visitors who were wildlife watching live within 9.5km of the site, with a maximum travel distance of 113.8km recorded to visit site 65, Summer Leys Nature Reserve. The highest recorded distance travelled was to site 25 by a walker who travelled 171.6km; half of all those who cited walking as their main activity, however, lived within 4km of their chosen site.

Table 31: Linear distance (km) from home postcode of interviewee to the survey location grouped by main activity undertaken across the whole survey period.

Main activity	Median	Minimum	Maximum	N
Dog walking	2.3	0.1	34.6	441
Walking	4.0	0.1	171.6	267
Jogging/power walking	2.9	0.4	19.3	24
Outing with family	5.4	0.1	28.1	29
Cycling	3.3	0.7	9.6	22
Wildlife watching	9.5	0.6	113.8	58
Fishing	4.5	1.8	60.7	25
Enjoying scenery	3.4	2.2	7.3	5
Photography	4.1	0.8	7.4	2
Meet up with friends	22.1	12.0	49.4	4
Water-sports	9.7	9.7	9.7	1
Other	3.1	0.1	15.0	30
All combined	3.3	0.1	171.6	908

Distance and transport mode

4.80 Figure 10 shows the distance between visitors' home postcodes and the interview location, categorised by transport mode. Visitors who arrived by car or van travelled greater distances than those who walked or arrived by bicycle. Two visitors who walked travelled long distances to reach a survey location, both travelling from home in the winter; the first walked 16.6km to site 106 and the second, who was dog walking travelled 12.3km to site 45.

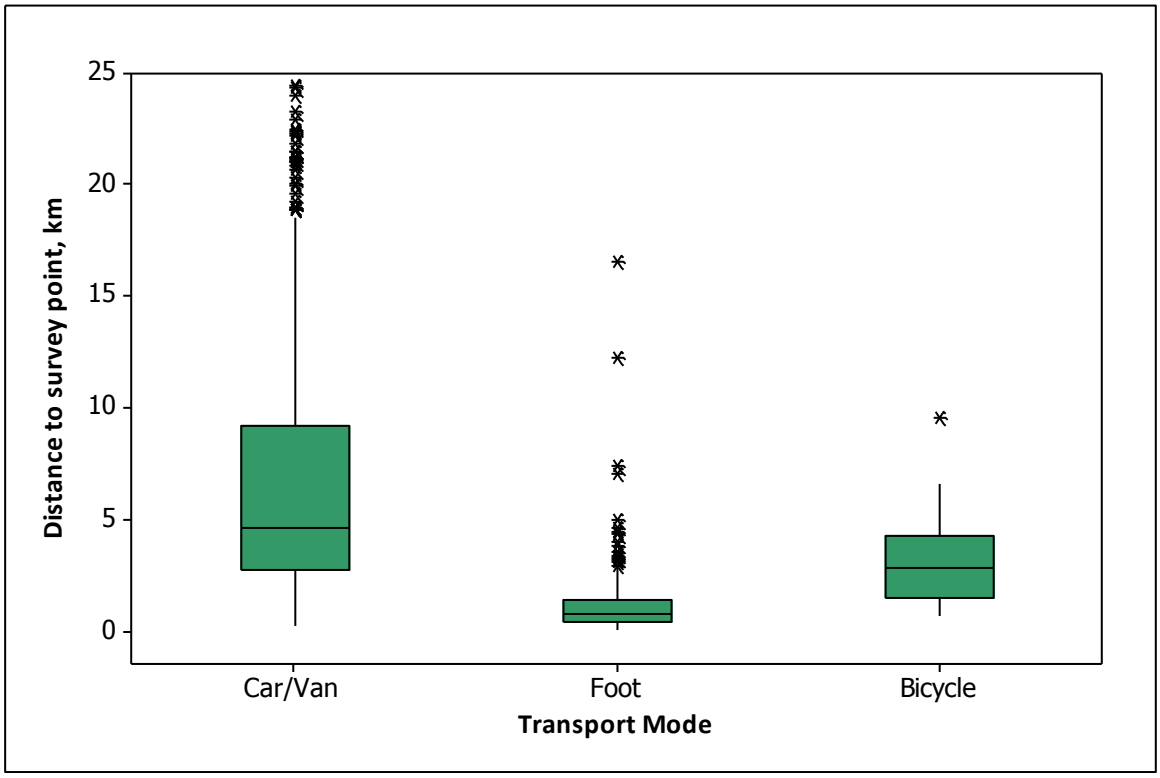


Figure 10: Linear distance (km) travelled from visitors' postcode to the survey location using different transport methods. 'Other' responses have been excluded due to a small sample size. Note y axis is truncated at 25km. For notes on interpretation of this graph, see methods.

4.81 Table 32 summarises the distances travelled to each survey location, based on the mode of transport used on the day of the survey. Values for 'other' responses have been excluded and absent values reflect small sample sizes. From Figure 13 and Figure 14 it can be seen that 50% of visitors that travelled to the survey location by car/van lived within 4.7km of the site and 50% of those who walked lived within 0.8km.In addition, 50% of those who cycled to a survey location lived within 2.9km of that site.

4.82 In Figure 11 we summarise the visitor rates in relation to distance. The plot shows the mean visitor rate across all access points for successive distance bands. The plot indicates that visitor rates decline rapidly with distance such that a relatively small proportion of people visit from distances beyond 3km of the surveyed access points. In Figure 11, visitor rate is calculated adjusted for daylight hours and using the tally data to give a value for the number of people visiting per distance band. In Figure 12 a similar plot is shown, this time in comparison to some other locations (all coastal) where Footprint Ecology has conducted visitor surveys in recent years. To allow direct comparison, the Y axis is ratio of interviews to houses within each distance band, and for each location the plots show the average ratio across all survey points. The axes are the same scale in each panel. It can be seen that the Upper Nene appears to draw a lower ratio of people than the other sites, particularly within distances 0-3500m.

4.83 Visit rates per settlement are also given in Appendix 3.

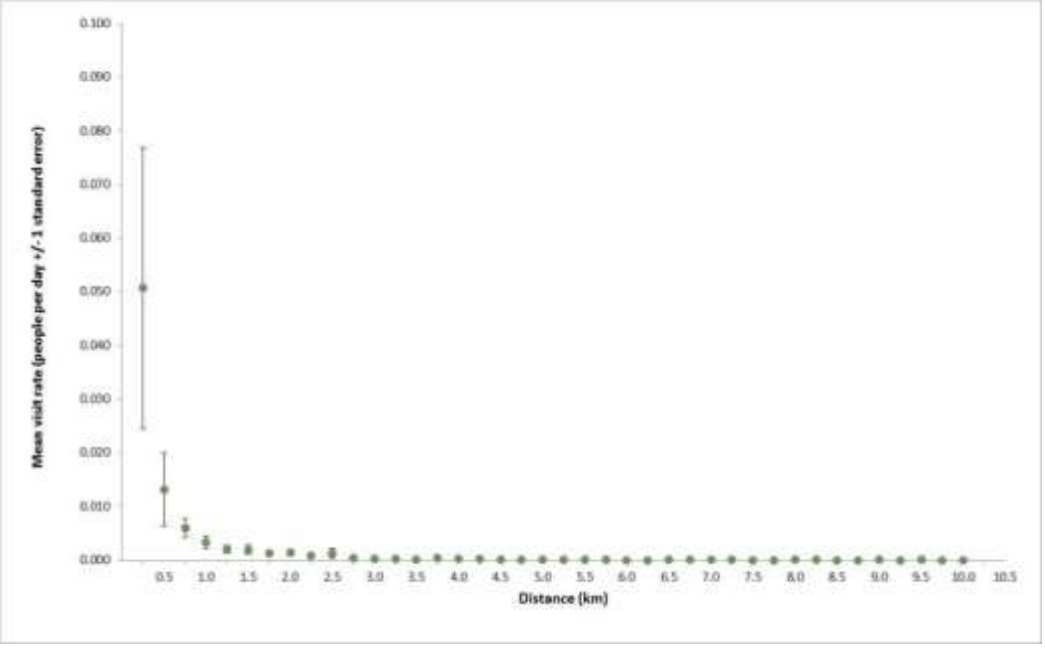


Figure 11: Mean visit rates in relation to distance from the access point. Plot shows mean rates (groups per day per house).

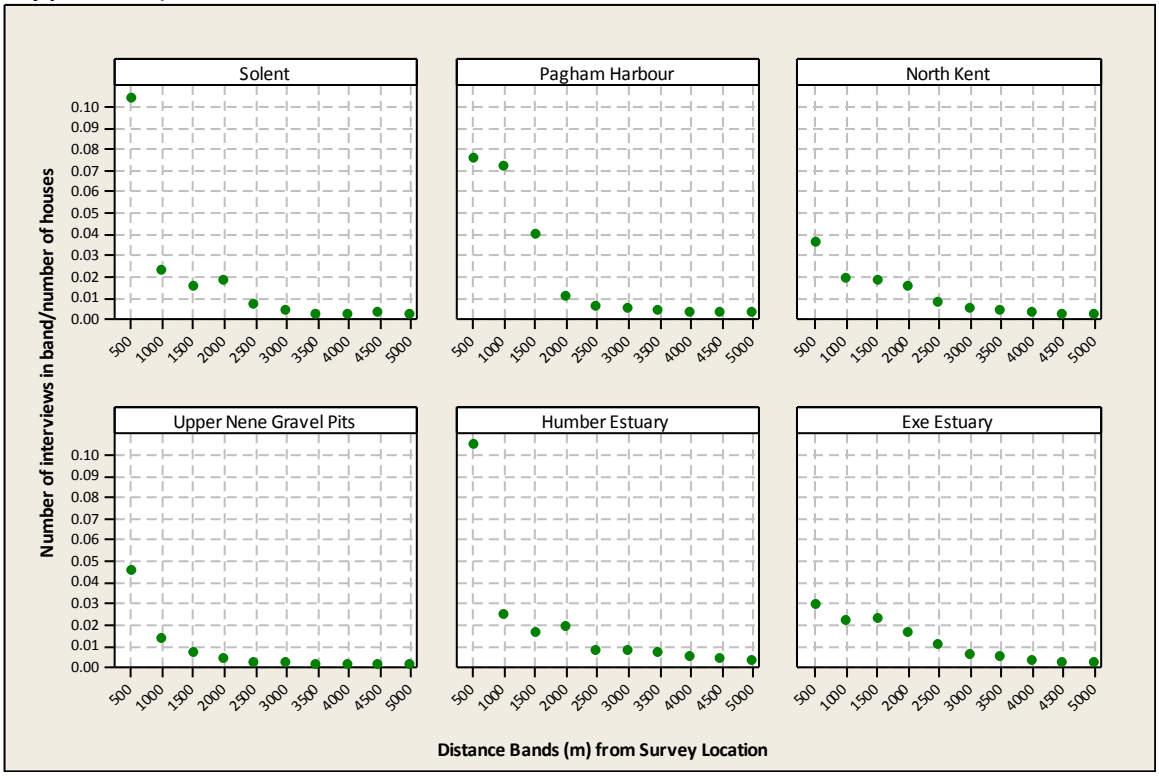


Figure 12: Comparison of 'visit rates' for different sites. Data held by Footprint Ecology[10] (Solent: 20 survey points, 745 geocoded postcodes; Exe Estuary: 8 survey points, 509 geocoded postcodes; Humber: 20 survey points, 466 geocoded postcodes; North Kent: 21 survey points, 513 geocoded postcodes; Pagham Harbour: 3 survey points, 114 geocoded postcodes).

[10] See Cruickshanks & Liley (2012), Fearnley *et al* (2010; 2011; 2012) and Liley *et al.* (2010)

Table 32: Summary of distances travelled (km) to each survey location according to mode of transport.

Survey location	Car/Van						Foot						Bicycle					
	25%	Med.	75%	Min	Max	N	25%	Med.	75%	Min	Max	N	25%	Med.	75%	Min	Max	N
25	2.78	4.08	6.45	0.93	171.6	18	0.917	1.501	3.328	0.43	4.674	6		2.393		2.392	2.393	2
29	0.955	1.676	2.409	0.387	10.62	37	0.478	0.6615	0.888	0.293	2.031	28		3.804		3.804	3.804	1
31		3.54		3.54	3.54	2	0.219	0.21902	0.244	0.219	0.252	4						
45	2.159	4.626	9.564	1.294	18.96	32	1.531	1.974	2.249	0.196	12.3	20						
55	0.896	2.791	3.833	0.619	4.84	5												
63	3.332	5.555	10.24	1.386	39.95	129		1.6123		1.612	1.612	1		3.616		3.616	3.616	1
65	3.85	7.77	13.43	1.12	113.8	66								3.559		3.559	3.559	1
71	1.928	3.169	6.483	1.025	15.73	25	0.643	1.048	2.097	0.643	5.052	11						
75		1.874		1.874	1.874	1												
80	1.93	3.37	10.02	1.21	30.13	10												
81	2.14	3.25	7.4	1.6	15.99	13												
87							0.285	0.583	0.644	0.116	1.519	7		1.305		1.305	1.305	1
92	1.38	4.13	6.79	1.32	13.71	7	0.369	0.5777	1.102	0.097	1.647	48	0.748	1.758	2.21	0.729	5.709	7
94	2.2	4.41	20.27	1.79	60.67	24												
96	3.315	5.317	9.418	0.983	36.16	120	1.114	1.934	3.575	1.017	7.461	10	1.932	3.254	4.883	1.564	5.353	4
100	2.984	4.921	7.64	0.582	28.12	73	1.927	2.488	2.933	0.727	3.333	6		4.876		4.876	4.876	1
102	3.05	5.23	9.38	1.13	49.45	25	1.012	1.329	1.532	0.554	4.538	14		6.98		4.35	9.61	2
106	2.36	4.02	17.01	0.27	24.41	19	0.39	0.6	4	0.18	16.63	9						
114	3.35	4.97	9.85	0.8	29.3	13	0.42	0.533	1.023	0.256	7.088	57						
117	1.12	7.12	17.46	0.59	41.65	12	0.469	0.8	1.012	0.27	3.842	17		6.626		6.626	6.626	1
122	2.68	6.46	11.76	0.82	17.04	10	1.04	1.661	2.933	0.419	2.933	5		1.88		0.82	2.93	2
ALL	**2.81**	**4.67**	**9.26**	**0.27**	**171.6**	**641**	**0.48**	**0.82**	**1.48**	**0.1**	**16.6**	**243**	**1.56**	**2.94**	**4.35**	**0.73**	**9.61**	**23**

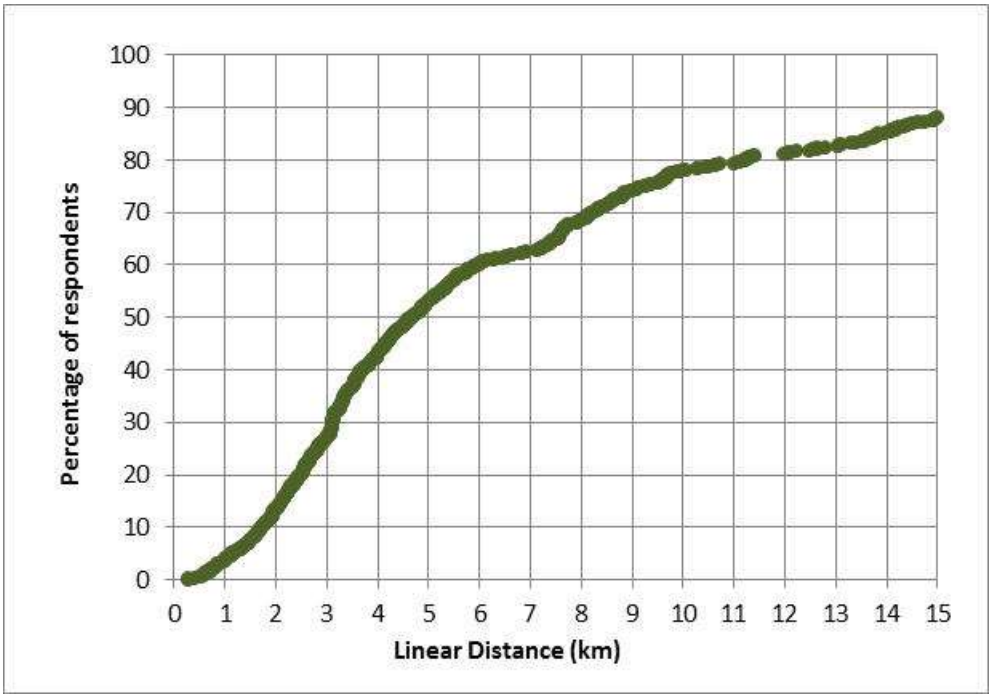


Figure 13: Cumulative frequency distribution of the linear distance (km) travelled by car from interviewed visitors from home postcode to survey location.

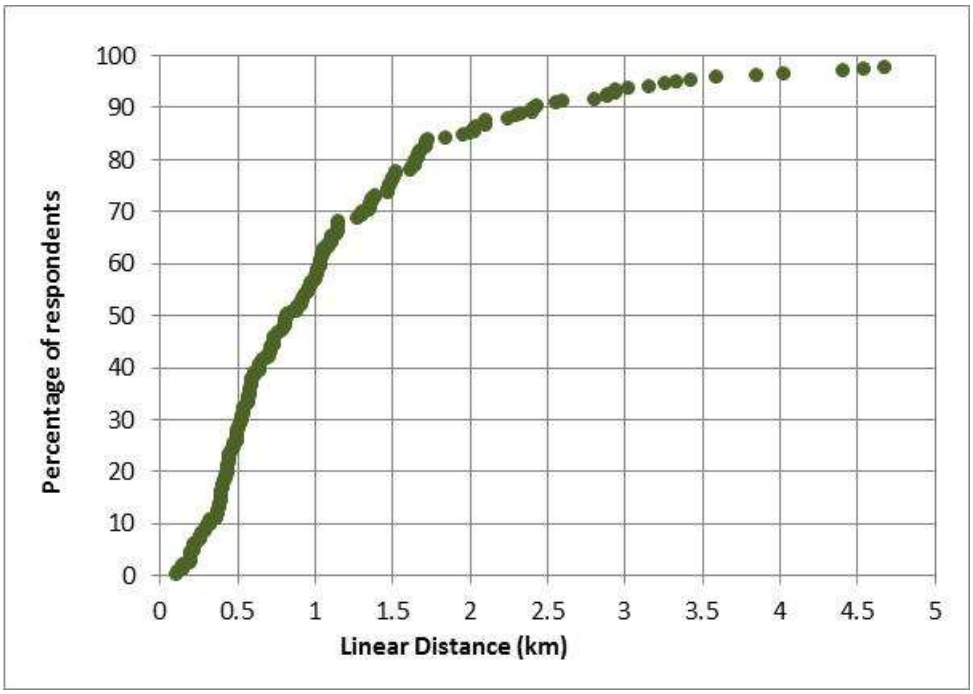


Figure 14: Cumulative frequency distribution of the linear distance (km) travelled on foot from interviewed visitors from home postcode to survey location.

Results: Visitor comments and suggestions

4.85 Visitors were given the opportunity to offer any further comments or suggestions about their visit to a site and access to the area. Across the whole survey period, 787 visitors provided additional comments; these comments were then categorised for analysis purposes into 30 summary categories to reflect the nature of the comments. 1119 responses were categorised from surveys across the whole survey period, with some visitors making numerous points in their comments; these are summarised in Table 33.

4.86 The majority of responses (38%) reflected generally positive feedback, including how attractive the area is, how much they enjoy visiting, good facilities, and safety.

4.87 Litter and dog fouling were of concern to some (5%). Just over one in ten (11%) of comments were directly related to access to sites; 9% of these were positive, showing that on the whole people were happy with access to the area. Of the 2% that were not happy with access, comments generally appeared to reflect issues with poor paths in bad weather or further management that is required. In total, 3% of comments reflection some dissatisfaction with car parking facilities; most of these were related to car parking charges or cleanliness issues. Other comments include those that could not be categorised, such as personal statements, along with requests for additional seating and safety issues with a traveller camp located close to site 71 (Wellingborough Embankment).

4.88 Overall, more comments related to perceived good management practices in the area (4%), while some believed that the quality of paths and surfaces needed to be addressed (3%). Some comments also related to wildlife, with 1% reflecting a perceived negative impact on wildlife, for example through disturbance.

Table 33: Summary of additional comments provided by respondents. Responses placed into one of 30 categories. Percentages are in parentheses.

Response Category	Response Total
General positive	400(38)
Access - positive	91(9)
Litter / Dog Mess	57(5)
Need dog bins	49(5)
Management - positive	42(4)
Surfaces / Paths - positive	41(4)
Surfaces / Paths - negative	36(3)
Car parks - negative	34(3)
Other	31(3)
Wildlife - positive	30(3)
First visit / New to area	25(2)
Dog walker comment - positive	20(2)
Don't develop / over-manage	17(2)
Access - negative	16(2)
Dog walker comment - negative	16(2)

Response Category	Response Total
Better interpretation needed	15(1)
Car parks - positive	15(1)
Clean	15(1)
Improve linkages	15(1)
Fishing - good for / positive	12(1)
Management - negative	11(1)
Wildlife - negative	11(1)
Flooding - problems / negative	10(1)
Too busy	10(1)
General negative	9(1)
Improve cycle paths	9(1)
Non-dog walker comment - negative	8(1)
Fishing - bad for / negative	2(0.2)
Noisy	2(0.2)
Total	**1049(100)**

4.89 Table 34 provides a breakdown of visitor comments based on the location at which they were interviewed, limited to the fifteen most popular categories. The highest number of comments were recorded at site 96 (Stanwick Lakes main car park) and the majority of comments were generally positive (46%). At site 63 (Summer Leys main car park) 38% of all comments were classed as generally positive. Litter and dog mess was the biggest issue at survey point 25 (Bedford Road Holiday Inn), with 29% of comments at the site reflecting this; 24% of comments at site 117 (Meadow Lane Car-park, Thrapston) requested dog bins. When broken down by main activity carried out, 44% of walkers and 36% of dog walkers provided generally positive comments about the area.

Table 34: Breakdown of comment categories; the table is limited to the top 15 categories. Percentages (derived from number of responses) are given in parentheses.

Interview location (ID, see map 5)	General positive	Access - positive	Litter / Dog Mess	Need dog bins	Management - positive	Surfaces / Paths - positive	Surfaces / Paths - negative	Car parks - negative	Other	Wildlife - positive	First visit / New to area	Dog walker comment - positive	Don't develop / over-manage	Access - negative	Dog walker comment - negative	Overall Total
Bedford Road Holiday Inn (25)	8(33)		7(29)	3(13)	1(4)			3(13)			1(4)					24
Weston Mill Lane (29)	19(25)	11(14)	19(25)	1(1)		2(3)	5(7)		2(3)		2(3)		1(1)	2(3)	1(1)	76
Little Houghton (31)												2(100)				2
Earls Barton bends car park (45)	17(29)	6(10)	12(21)	7(12)	1(2)	1(2)		5(9)	2(3)				3(5)	2(3)		58
Hardwater Mill (55)	3(100)															3
Summer Leys car park (63)	66(38)	27(15)	5(3)	8(5)	11(6)	5(3)	4(2)	1(1)	3(2)	8(5)	3(2)	4(2)	1(1)	2(1)	4(2)	175
Mary's Lane (65)	25(40)	1(2)		3(5)	3(5)	3(5)	4(6)	(	4(6)	6(10)	2(3)	1(2)	4(6)	1(2)		63
Wellingborough Embankment (71)	16(48)						4(12)	2(6)	3(9)			2(6)			1(3)	33
Wellingborough Lakes 'The Mill' (75)		1(50)														2
Ditchford Bridge (80)	4(27)						1(7)	4(27)		1(7)		1(7)		1(7)		15
Ditchford Lakes & Meadows (81)	3(33)							1(11)	2(22)				2(22)		1(11)	9
Northampton Road, Rushden (87)	3(33)		2(22)				2(22)		1(11)							9
King's Meadow Lane (Higham Ferrers) (92)	19(35)	1(2)	2(4)		4(7)	8(15)	2(4)			2(4)	4(7)	1(2)		1(2)	1(2)	54
Stanwick Fishing Lakes (94)	10(31)	4(13)	1(3)								1(3)			2(6)		32
Stanwick Lakes Visitor Centre (96)	81(46)	22(13)	1(1)	2(1)	11(6)	13(7)	1(1)	4(2)	6(3)	1(1)	3(2)	1(1)			2(1)	176
Stanwick Lakes layby (100)	39(43)	10(11)			2(2)	4(4)		12(13)	4(4)	3(3)		1(1)	1(1)	1(1)	4(4)	91
Ringstead Grange (102)	20(32)	2(3)	6(10)	7(11)	1(2)	1(2)	6(10)	1(2)	1(2)	2(3)	1(2)	2(3)	2(3)	1(2)	1(2)	63
Kinewell Lake (106)	10(31)	4(13)			2(6)	1(3)				2(6)	1(3)	1(3)				32
Mill Lane, Islip (114)	43(53)	1(1)	1(1)	10(12)	4(5)	2(2)	4(5)		1(1)	3(4)	2(2)	2(2)	3(4)			81
Meadow Lane car park, Thrapston (117)	7(24)	1(3)	1(3)	7(24)	1(3)			1(3)	1(3)		3(10)	1(3)		3(10)		29
Titchmarsh LNR Car Park (122)	7(32)			1(5)	1(5)	1(5)	3(14)		1(5)	2(9)	2(9)	1(5)			1(5)	22
Grand Total	400(38)	91(9)	57(5)	49(5)	42(4)	41(4)	36(3)	34(3)	31(3)	30(3)	25(2)	20(2)	17(2)	16(2)	16(2)	1049

Discussion

4.90 Visitor data is presented from nearly 1000 interviews over a range of months and different locations. This represents a large and comprehensive data set and for virtually all interviews there is spatial data describing the home postcode reflecting the visitor origin and routes taken.

4.91 The visitor survey results reflect predominantly local use by people living close to the Nene Valley. Visitors predominantly are undertaking typical 'local greenspace' activities such as dog walking, jogging etc. Proximity to home is a key reason for many visitors underpinning their choice of site.

4.92 There were some challenges during the winter as a result of flooding and cold weather. As far as possible survey effort was adjusted to avoid bad weather, however the weather will have inevitably reflected people's access patterns. The spring data provides some opportunities to check on the impact of flooding. For example, during the spring survey, 7% more visitors recorded their main activity as an 'outing with their family', potentially a reflection of the better weather and longer daylight hours.

4.93 We plot visit rates in relation to distance and the plot reveals relatively low visit rates from distances beyond 3km (Figure 11). These visit rates are essentially the number of person visits made per household (at a given distance) per day to an access point. The decline in visit rate with distance appears to be particularly steep compared to some other sites (Liley, D, Jackson, D & Underhill-Day, J C 2005; Clarke *et al.* 2006; Liley 2013). In Figure 12 we show some coastal examples and direct comparison is possible. It would seem that the Upper Nene Gravel Pits attract fewer visits per house (particularly within 0-3500m) compared to the other sites and that the decline in visitor rates with distance is steeper on the Upper Nene Gravel Pits than the other sites. This would suggest that the draw of the Upper Nene is particularly local.

4.94 The visitor rate curve provides a means to predict how new housing in an area may result in changes in access levels. In order to determine how visitor rates might change it would be necessary to work out how many access points were within each distance band and the mean rate at that distance used to derive an estimate for each access point.

4.95 The visit rate curve suggests that 100 houses, built within 500m of a given access point would relate to around 5 person visits per day to that access point. The same number of houses at 2km would relate to 0.34 visits per day – in other words the visit rate at 2km is a 15th of that at 500m (or 100 houses at 500m is equivalent (in terms of visit rates) to 1500 houses at 2km). At 5km from the access point, around 4000 houses would generate the same visitor rate as 100 houses within 500m. These visit rates are summarised in Table 35.

Table 35: Visit rates in relation to housing at different distances from an access point, derived using the data shown in Figure 11

	Distance from access point			
	500m	**1km**	**2km**	**5km**
Visit rate (people per day) from 100 houses	5.1	1.3	0.3	0.1
Ratio		3.9	15.0	40.1

Summary

Key results from the face-face interviews are:

- 939 interviews were conducted (638 during the winter; 301 during the spring)
- The majority (98%) of visitors were on a short visit from their home
- Group size for interviewed groups ranged from 1-8; 51% of interviewees were visiting on their own. Stanwick Lakes was notable in that group size tended to be larger here.
- Half of the 939 interviewees had dogs with them (636 dogs in total)
- Across all sites and survey periods, dog walking was the most common main activity (48% of interviewees).
- During the winter a higher proportion of people interviewed were dog walking (48% of interviews during the winter compared to 36% in the spring at the 6 locations surveyed in both seasons).
- Over the winter the main activities given by interviewees were: dog walking (53%), walking (26%).
- Most (77%) interviewees had arrived by car to the survey point.
- Most interviewees were frequent visitors (60% indicated that they visited at least once a week).
- Most visits were short: 50% of visitors stated that they spent less than one hour on site and, in total, 88% spent less than two hours at the survey location.
- The quality of the site was the most common reason for choice of site (61% interviewees), but was not the most common 'main' reason'; 32% interviewees gave proximity to home as the main factor underpinning their choice of site. Proximity to home seemed particularly important for dog walkers (44%) and those fishing (40%).
- A total of 863 visitor routes were collected, either through lines on paper maps during the interview or via GPS units which were given out.
- There were significant differences between sites in the lengths of routes taken by visitors. There were also differences between activities. The mean route length for dog walkers was 3.1km. For cyclists the average route was 7.3km while those fishing tended to have the shortest routes (0.6km average).
- At three of the six sites that were surveyed in the winter and the spring/summer, the median route length increased in the spring/summer when compared to the winter (sites 45, 92 and 100), stayed the same at two (63 and 65) and fell at one (96).
- A relatively high proportion (78% of interviewees) indicated that they were aware of the importance of the area for wintering birds. Around a quarter (24%) of all interviewees responded that they were aware of the international importance of the area for nature conservation.
- 908 postcodes were mapped reflecting the home postcodes of visitors. The two main settlements were Northampton (137 postcodes from the winter interviews fell within the settlement) and Wellingborough (88 postcodes from the winter interviews).
- Dog walkers and joggers lived closest to the site at which they were visiting, with median values of 2.3 and 2.9km respectively
- Visitor rates (visits per household) declined rapidly with distance such that a relatively small proportion of people visit from distances beyond 3km of the surveyed access points.

5. Scaling up the Data: Footfall within and around the SPA

Overview

5.1 In this section we use the visitor data to generate an estimate of total visitor numbers per day and we model the spatial distribution of people within and around the SPA.

Methods

Predictions of visitor numbers

5.2 For visitors arriving by foot we used the data from locations with count data (winter tally data) to generate a regression equation between the hourly visitor rate and the number of residential properties within 500m, 800m, 1000m and 1500m. These distances were selected to provide a range of distances and reflected the data gathered from the interviews. The largest, 1500m, approximates to the 75% percentile for those who were interviewed and arrived on foot (75% accounting for group size, for all visitors, summer and winter arriving on foot, was 1490m). Half of all foot visitors (accounting for group size) lived within 880m, and therefore the 500m, 800m and 1000m buffers were appropriate choices. The estimates of foot visitor rates were checked using the automated counter data.

5.3 For visitors arriving by car we used the car-park transect data from the winter period to give a mean value (number of cars) for each access point with parking. The visitor survey results (length of visit and group size) for people arriving by car were then used to scale up the number of cars to the number of people at each access point. This value for the number of people was adjusted to account for people arriving by other forms of transport (i.e. other than on foot or by car).

5.4 The visitor totals were used to generate a GIS layer that showed visitor density – i.e. visitor footfall – over the study area. The visitor model is based on a grid (100m cells) overlaid across the SPA and surrounding area (see section 2 for more details) and for each grid cell we have derived a prediction of a comparable visitor rate (i.e. footfall through the cell).

5.5 The predictions for each cell were generated by using the predictions of visitor numbers to each access point and the route data generated from the interviews. Within the GIS all cells that touched the path network were identified and a matrix was derived whereby the travel distance (along the path network) for each cell to each access point was recorded (using the Routefinder software add-on for MapInfo). We then used the actual route data to determine, across all surveyed access points, how the number of people declined with distance from the access point. This frequency distribution was derived by combining all the route data (all activities, all access points across both summer and winter) and extracting the total distance travelled. The value for each route was divided by 2 (i.e. assuming all visitors return to the starting point) and the proportion of visitors reaching distance x (100m intervals) plotted. This frequency distribution was then applied to the predicted total number of visitors for each access point and the matrix showing the distance of each cell to each access point. Where

there were multiple cells at a given distance from an access point, the apportioned visitors were split equally between those cells. Values (number of people per hour) were thereby calculated for each cell from each access point and these values totalled for each cell to give the number of people, per day, for each 100m cell. This total was then doubled as we assumed each party returned to the same access point.

Estimates of Overall Visitor Numbers

Foot visitors

5.6 The number of people interviewed during the winter who had arrived on foot at each access points showed a significant relationship to the amount of nearby housing (Figure 15). There was relatively little difference between the four bands as to which gave the best fit (linear regression, highest R^2); however the R^2 was marginally higher using the number of houses within 500m.

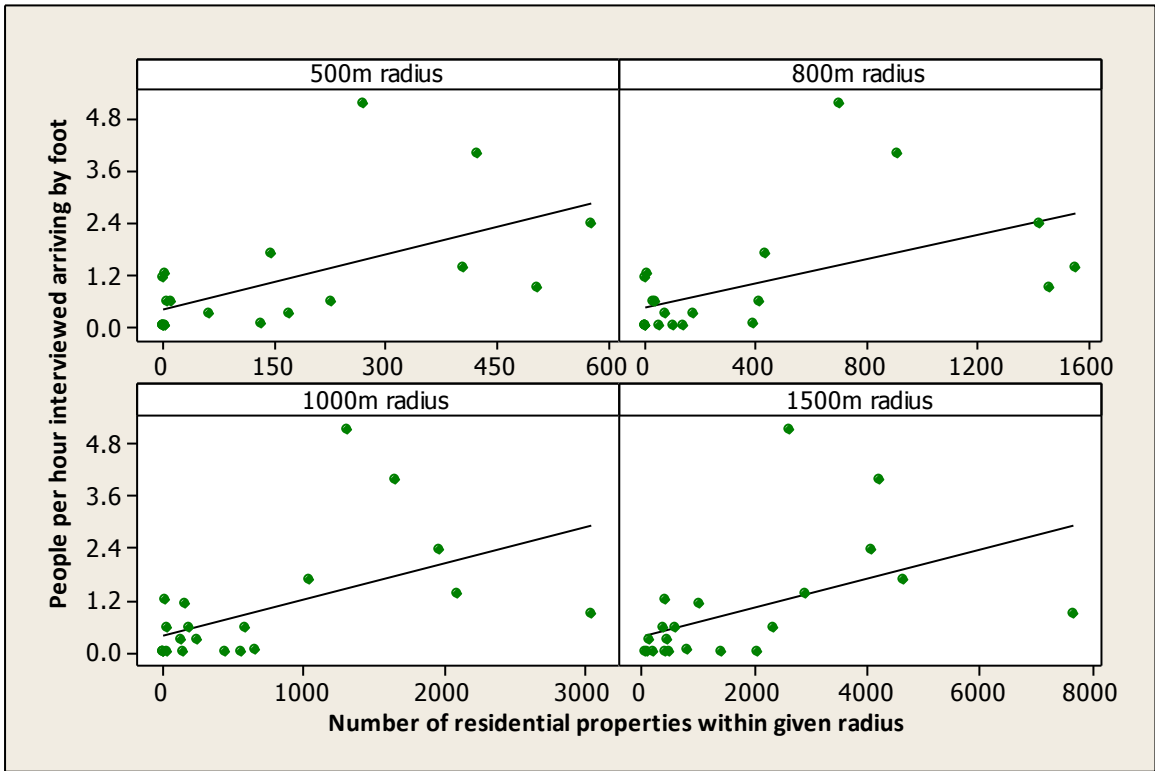


Figure 15: Number of people (per hour) arriving on foot in relation to number of houses in given radius of access point. The number of people is derived from the tally data, adjusted using the interview data to give the proportion arriving on foot. The regression equation for the 500m radius is: y=0.0042x+0.3856 (R^2 =0.33) and for the 1500m radius it is y=0.0003x+0.3695 (R^2 =0.24). 21 survey points.

5.7 In order to check which gave the best predictions of visitor rates we compared predictions derived from the four regression equations with the automated counter results. Automated counter data were available from eight different locations, and we extracted the number of 'hits' per hour (divided by 2, on the assumption that people entered and left via the same point). The comparison is difficult as the counters were tampered with at two locations and it is difficult therefore to know how accurate the

readings were. We also did not calibrate the counters[11], which were only in place for relatively short periods at quiet locations. Overall the eight counters were recording 99 people per day (assuming a 9 hour day). The predicted rate was closest using the 500m buffer – and predicted 79 people per day in total for the same locations. This comparison does not take into account any weekend/weekday adjustment or adjustment for when the automated counters were set out, but the two seem close enough at least to indicate that the scale of the predictions using the 500m housing is adequate.

5.8 We therefore used the amount of housing within 500m of each access point to predict the number of visitors on foot. Using this equation, applied to access points around the SPA, we estimate 1068 visitors per day (9 hour day) during the winter.

Car visitors

5.9 From the visitor survey data, the typical car occupancy was 1.67 (calculated based on 422 interviews conducted with people arriving by car, accounting for group size this involved 708 people). Similarly it is possible to estimate how long people arriving by car typically spend 'on site'. A total of 422 interviewees had arrived by car. Cross-referencing to the amount of time they indicated were spent on site (and assuming 'less than one hour' is equivalent to 30 minutes; '1-2 hours' is equivalent to 1.5 hours; '2-3 hours' is equivalent to 2.5 hours and 'more than 3 hours' is equivalent to 4 hours), the total amount of time would be 537 hours. Therefore each car is typically present for 1.27 hours.

5.10 Assuming nine hours of daylight, then we can extrapolate the average number of cars in the transects by 7.09 to give a total of cars per day and multiply this figure by 1.67 to account for group size. Therefore a mean of one car for a given car-park on the parking transects is estimated to\be 11.84 people. Using the vehicle count data we estimate the number of visitor arriving by car per day is 1310 people.

Other visitors

5.11 A very small number of people arrived by other forms of transport (bicycle). In total 17 (2.7%) of interviewed groups (and 2.4% of people, once accounting for group size) arrived by bicycle during the winter. In order to scale up for people arriving by bicycle, given the relatively small number involved, we simply increased the number of people estimated (on foot and by car) by 2.4%. This indicates a total visitor rate – people per day in the winter visiting by bicycle – of 71.

[11] Calibration would involve observation to check how accurately the counters were reading – at different locations counters may pick up children, dogs, large groups etc. differently depending on the angles and heights used

Overall totals

5.12 Our daily rates (people per day) equate to a total of total of 2448 people (Table 36).

Table 36: Daily visitor rates.

	People per day
Car	1310
Foot	1068
Other	71
Total	2448

5.13 Map 18 shows access points used in the model and the number of people (per day) estimated to come through each. The totals for single access points are mostly quite small. Around a third (35 out of the 92 included in the model) were estimated to have 10 or less people through them per day. Only two locations we estimate to have over 100 person visits per day (Figure 16), and the main car-park at Stanwick Lakes is estimated to be the busiest access point, with 469 person visits a day. Over all access points combined we estimate 2448 person visits per day in the winter.

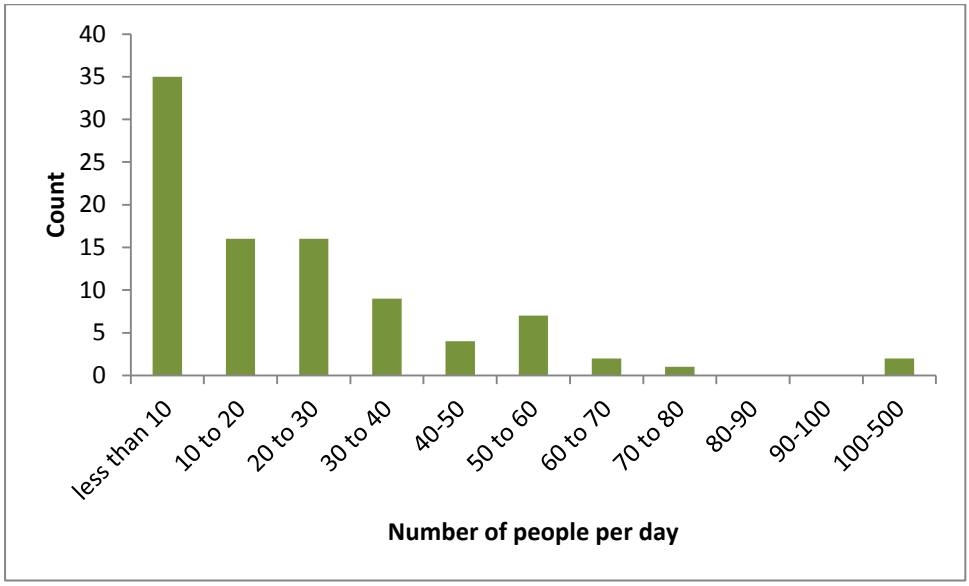


Figure 16: Number of access points categorised according to number of people (person visits) using them each day.

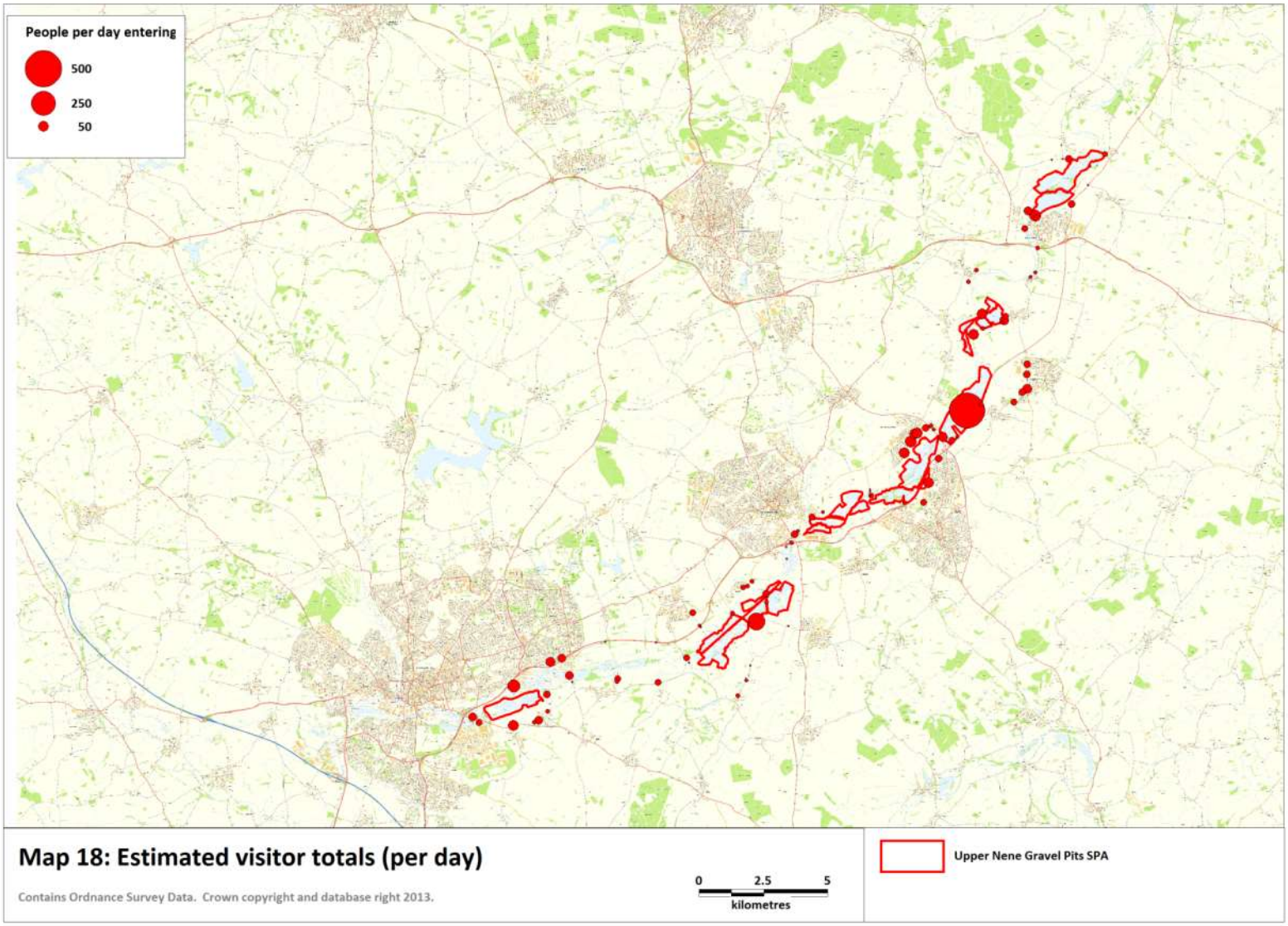
Spatial Distribution of Visitors within the SPA

5.14 We summarise the spatial distribution of people within the site in Map 19, which shows people per day per grid cell. The darkest green shading indicates grid cells where we predict the levels of access per day to be less than 50 people per day. The darkest red colour reflects cells with predicted access levels above 450 people per day.

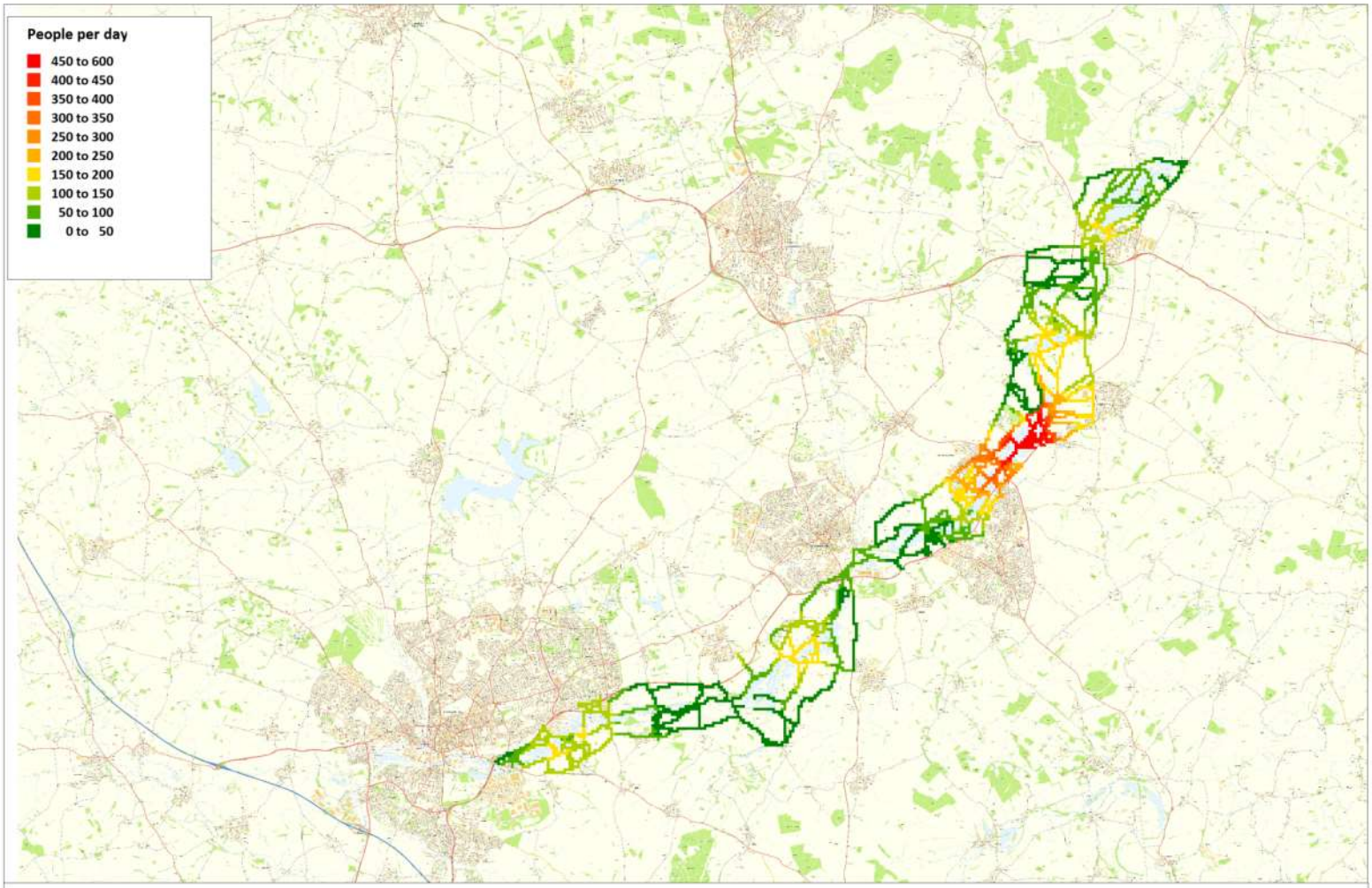
5.15 One area stands out in particular within the map: it can be seen that the busiest area is between Higham Ferrers and Irthlingborough, running north to the main Stanwick Lakes area and towards Raunds. High visitor numbers in this area originate from the main Stanwick Lakes car-park and then also from numerous other access points, including a

number that are foot only. It appears that there is a real focus of visitor levels in this area.

5.16 Other 'busy' areas are around Summer Leys, the edge of Northampton and at Thrapston.



Map 18: Estimated visitor totals (per day)



Map 19: Estimated visitor levels within & around the SPA

Discussion

5.17 In this section we have generated a model of visitor numbers within and around the SPA, allowing us to map visitor pressure across the whole area. Such an approach provides an overview at a strategic level and allows direct comparison between different areas as to the level of recreational use. We estimate around 2884 visitors per day during the day to the focal area covered in the model.

5.18 This would scale up to just under 900,000 visits per annum. We are cautious of such scaling up as there are a range of different ways that it could be done and the survey design was not intended to generate an overall annual visit total. A particular caveat in the scaling is that it is based on a single daily rate – we have not calculated a separate rate in the model for weekends or weekdays. Our analysis does support this as there seems to be relatively little variation between weekdays and weekends and between the winter and the spring (see para 3.16).

Assumptions within the model

5.19 In interpreting the model outputs it is important to be aware of the following assumptions which were made:

- We used an average dwell-time for all car-borne visitors. Some visitors (such as those fishing) may visit for very long periods and these will be focussed at particular locations.
- We assumed visitors would 'disperse' from all access points in the same way. At some locations (for example those with a particular network of marked routes, or locations used entirely by people fishing) people will not necessarily disperse in a 'standard' way away from the access point.
- Visitor numbers arriving by car were based on transect data, and some of the transects coincided with a period of heavy flooding, which will have changed the locations people used.
- We used the relationship between number of people interviewed and number of houses nearby to predict visitors on foot to each access point. This didn't provide a particularly strong fit. Other factors, such as types of housing, the number of alternative access points, range of routes and facilities etc. may account for some of the additional variation between access points that we recorded. The flooding may also have affected use by people on foot as nearly two-thirds of visitors in the spring indicated that the flooding had affected their use of the site over the winter (see para 4.67).
- We assumed all paths and minor roads had the same probability of use. Surfaced paths, raised paths, those leading to particular viewpoints etc. will be more likely to be favoured.
- We did not try to predict access on the water – access by those in canoes and other boats is not included in the modelled distribution of access (while the number of people arriving by boat is likely to be very small, especially in winter, some boats and other activities do occur on the water).
- We assumed all visitors stay on the path network.

- The path network does not include all desire lines, de facto access routes, informal paths etc.

The Potential to Use the Model alongside bird data

5.20 This report focuses on access patterns and an understanding of the distribution of people within and around the SPA, rather than a specific ecological study focussed on disturbance. The results of the work do however relate to the SPA and the need to secure long-term sustainable management of the site. With respect to disturbance, there are a clear ecological studies that have shown that the distribution of waterbirds on gravel pits can be related to the distribution of people (Tydeman 1977, 1978; Fox *et al.* 1994). There is also a wider body of literature that addresses disturbance and its impacts for waterfowl and waders (e.g. Gill, Sutherland & Watkinson 1996; Beale & Monaghan 2004; Kirby *et al.* 2004; Stillman *et al.* 2007; Lowen *et al.* 2008; Møller 2008). The visitor model therefore provides a foundation for considering the long term management of access in the area and the potential to relate bird distribution and people distribution.

5.21 Bird data for the SPA are summarised by Brayshaw (2004). There is therefore the potential to now directly relate access and people data. We have not done this within this report because the existing bird data are relatively dated (major changes have taken place at Stanwick Lakes since 2004 for example). There would also be a need to collect very detailed bird data and habitat data. A range of factors will be influencing the distribution of birds, such as habitat quality or prey abundance, and it will be necessary to have information on these factors. Birds may choose different locations to feed roost, and therefore behavioural data will be required. Birds may even use certain areas at night. Such factors may change over time. In order to fully understand the distribution of birds in relation to visitor patterns it is necessary to incorporate a range of other data. Complex analysis is therefore necessary, incorporating data on birds, habitat, resources (such as prey) and people from a single year in a multi-variate analysis (see O'Connell *et al.* 2007 for discussion). Such analyses must relate to the ecological requirements of the species concerned and the potential mechanisms by which disturbance may operate. Such analysis is beyond the scope of this report.

Summary

We have generated a visitor model which shows the spatial distribution of visitor numbers to the whole SPA and surrounding parts of the Upper Nene Valley. We estimate around 2884 visitors per day during the day to the focal area covered in the model, very approximately equivalent to around 900,000 visits per annum.

The spatial model shows the busiest area is between Higham Ferrers and Irthlingborough, running north to the main Stanwick Lakes area and towards Raunds. High visitor numbers in this area originate from the main Stanwick Lakes car-park and then also from numerous other access points, including a number that are foot only. It appears that there is a real focus of visitor levels in this area. Other 'busy' areas are around Summer Leys, the edge of Northampton and at Thrapston.

The spatial model provides a strategic overview of visitor intensity across the SPA and has the potential to be used in a range of ways, including the informing of long term sustainable management of access within and around the SPA.

6. Recommendations and Implications for Management

Introduction

6.1 This report provides a detailed analysis of visitor use of the Nene Valley, and in this section we consider options to manage visitor access to ensure it is sustainable and does not cause harm to the SPA. Rather than setting out a precise list of detailed actions, we provide more general recommendations that include measures to be applied both within and outside the SPA. The measures are intended to inform a long term and coordinated approach to maintaining the ecological interest of the SPA, having had full regard for current visitor patterns and use of the site.

SPA designation and implications

6.2 Protection and appropriate management of the newly classified SPA is one of the key priorities for the Nature Improvement Area, because as noted in earlier sections of this report, the responsibilities, duties and objectives for the SPA are set out within European legislation. The overriding principles of the European Directives that relate to European sites are the establishment, maintenance, restoration and protection of a coherent network of sites that secures the favourable conservation status of the habitats and species of European importance, listed in the Directives. The legislation requires Member States to restore where existing issues persist, maintain interest features to ensure they achieve favourable conservation status and protect interest features from impacts that may affect the ecological integrity of a site.

6.3 Significant emphasis on restoration in the legislation indicates that it is intended that Member States should seek to resolve any existing issues that are preventing the achievement of favourable conservation status. Throughout the Habitats Directive, most notable in the introductory Articles 1 and 2, wherever the duty to maintain is referred to, the words 'or restore' are typically added, for example Article 2(2) requires that measures taken are designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest. Rectifying existing issues that are leading or have lead to the deterioration of a European site is therefore a reoccurring duty throughout the Directive.

6.4 Article 6(2) of the Habitats Directive requires Member States to take appropriate steps to avoid the deterioration of European sites in terms of the natural habitats for which a site may be designated, the habitat of species as well as the disturbance of the species for which the areas have been designated, as well as maintaining features at a site level where they are fully contributing to favourable conservation status across their natural range. As noted above, the requirement to maintain European site interest is a reoccurring theme throughout the various Articles of the Habitats Directive. A similarly worded duty is expressed in the Birds Directive at Article 4(4). Putting appropriate measures in place, to ensure the continued and long term contribution of a site to the favourable conservation status of the habitats and species for which it is designated or classified is therefore anticipated in order to meet this duty.

6.5 Article 6(3) of the Habitats Directive, from which Regulation 61 of the Habitats Regulations is transposed, refers to the protection of European sites from new plans and projects that are proposed, to either be authorised by a competent authority or to be implemented by a competent authority themselves. Here there are strict tests to be met, with a competent authority only able to undertake or permit a plan or project where they can ascertain that such a proposal would not adversely affect site integrity, alone or in-combination with other plans or projects. In the context of this SPA, as with the Thames Basin Heaths and others, a potential problem is the incremental increase of recreational pressure deriving from numerous small developments (housing and/or active recreation proposals) that in themselves may not have a significant effect. Small developments, over a wide area and multiple local authority boundaries may have an impact in-combination, and in such cases can the assessment and solutions need to be sought at a strategic level. Strategic approaches can significantly reduce the burden of individual assessment, and have the benefit of identifying and bringing forward coordinated mitigation that can be far more effective than a piecemeal approach.

6.6 In light of the above, a strategic approach to the long term management of visitor pressure within the Nene Valley is likely to be needed to restore, maintain and protect the ecological interest of the Upper Nene Valley Gravel Pits SPA. The approach includes gathering evidence to identify current recreation related impacts and site sensitivities, and then using that evidence to predict the nature of potential future impacts. This then in turn informs the types of measures necessary to deal with current recreational pressure and the development of measures to prevent further impacts from occurring; importantly this is done by using the evidence gathered to ensure that the measures are fit for purpose. These therefore cover the restore and maintain duties.

6.7 The final aspect is the protective duties of Article 6(3). It is suggested that the evidence gathered here could also now be used to consider the need for a strategic approach to avoiding and mitigating for any potential impact that may arise from future plans and projects, and if needed, how such a scheme might be established. This may be particularly relevant given the major growth planned in the vicinity of the SPA, notably at Northampton and Wellingborough.

6.8 In the absence of such an approach, current impacts remain unresolved and appropriate measures to maintain the site are not implemented. The site is put at risk, as damage is not predicted, and any future action then becomes remedial rather than preventative. A lack of forward thinking to ensure a consistent approach to the consideration of new plans or projects misses the opportunity to provide information to steer new plans and projects and put in place larger scale or coordinated measures, and the opportunity to potentially minimise the time and resources required for case by case individual assessment.

Options to Reduce Disturbance

6.9 We set out a summary list of possible options in Table 37. These options range from soft measures and proactive work with local residents, to enforcement.

Table 37: Broad overview of ways to reduce disturbance to birds at wetland sites

	Management option	Description
1. Habitat Management		
1a	New habitat creation for birds	Creation of new habitat in areas away from parts of the site with recreation pressure (see also zoning). Examples may include creation of islands for roosts or enhanced areas for feeding.
1b	Habitat management	Habitat enhancement may create new breeding/roosting/feeding sites, potentially in areas away from sources disturbance. Equally, habitat management in areas subject to disturbance may help mitigate localised impacts.
2. Planning & Off-site Measures		
2a	Locate development away from sensitive sites	Much recreational use of sites is local, for example from people living within a short drive or walk of sites. Focussing development away from nature conservation sites is a way to reduce the long term future pressures of increased recreation from development.
2b	Management of visitor flows and access on adjacent land (outside European site)	Planting, screening, careful routing, provision of access infrastructure (boardwalks, marked paths, steps etc) around the periphery and outside European sites can influence how people access sites.
2c	Provision of new greenspace sites where access is promoted and encouraged	New green infrastructure, sited away from designated sites, has the potential to draw users away from designated sites. Such sites need to be tailored to provide a viable and attractive alternative destination, matching the draw of the relevant designated site or providing a near equivalent recreational experience in a more convenient location.
2d	Provision of designated access points for water sports	Provision of public slipways, trailer & vehicle access to shore etc in predetermined locations where boat access is likely to be away from nature conservation interest.
2e	Enhance access in areas away from designated sites	At a reasonably strategic level it should be possible to encourage people to change access patterns by enhancing access provision at less sensitive sites and not enhancing provision at sensitive locations. Users can be encouraged to locations through the provision of attractions/facilities such as toilets, food, improved walking surfaces, hides etc. Demand can be managed through modification of parking fees and parking capacities, restriction of on-road parking, wardening etc. As such there are parallels with 3e and also the approach is similar to 2d.
3. On-site Access Management		
3a	Restrict/ prevent access to some areas within the site	Potential to restrict access at particular locations (roost sites). Temporary fencing, barriers, diversions etc. all possible.
3b	Provide dedicated fenced dog exercise areas	Allowing dogs off leads etc. in particular locations that are not sensitive for nature conservation or other reasons may increase their attractiveness to dog walkers. Links to 2e.
3c	Zoning (spatial or temporal)	Designated areas for particular activities. Often zones are set out in a code of conduct and prevention of use for the areas outside the zones is enforced through byelaws. We refer to zoning therefore as positive spaces where users are welcomed,

	Management option	Description
		as opposed to the exclusion zones described in 3a. Zoning can be spatial or temporal (for example zones may operate during particular times, such as the over-winter period)
3d	Infrastructure to screen, hide or protect the nature conservation interest	Screens, hides, embankments etc. are commonly used to direct visitors along particular routes and screen people from birds or other features vulnerable to disturbance. Such infrastructure can also provide enhanced viewing facilities and opportunities for people to get close to wildlife without causing disturbance. Path design can enhance the extent to which people stray or roam from the path. Boardwalks etc. can protect vulnerable habitats.
3e	Management of car-parking	Car-park spaces can be redistributed around a site, parking closed in some areas, parking fees modified (e.g. encouraging people not to stay too long) or a permit system be instigated to limit use of car-parks.
3f	Path design and management	Surfacing, path clearance and other relatively subtle measures may influence how people move around a site and which routes they select.
4. Education and Communication to Public/Users		
4a	Signs and interpretation and leaflets	Provision of informative and restrictive signs, and interpretive boards. Directions to alternative less sensitive sites. General information on the conservation interest to highlight nature conservation interest/importance.
4b	Codes of Conduct	Guidance on how to behave to minimise impacts is promoted at a range of sites, through websites, leaflets, interpretation etc. These are sometimes enforced by byelaws and other control measures (see section 5).
4c	Wardening	In addition to an enforcement role (see 5d below), wardens can provide a valuable educational role, showing visitors wildlife etc.
4d	Provision of information off-site to local residents and users.	Local media, newspapers etc can provide means to highlight conservation importance of sites and encourage responsible access. Educational events, provision of items for local TV/other media. Information can be made available in local shops, tourist centres etc. Potential to promote non-designated sites, for example through web / leaflets listing, for example, dog friendly sites. Can include school visits and working with children.
4e	Contact with relevant local clubs	Agreed codes of conduct (see 4b) and self-policing can be set up with individual groups and provide a means of ensuring users are aware of how to act responsibly.
5. Enforcement		
5a	Covenants regarding keeping of pets in new developments	Covenants prohibiting the keeping of cats and / or dogs. Unlikely to be enforceable or practical in the long-term.
5b	Legal enforcement	Byelaws can be established by a range of bodies including local authorities, the MOD, National Trust, Parish Councils etc. Other options include special nature conservation orders, dog control orders or prosecution under SSSI legislation. Enforcement can apply to speed limits (e.g. on water), where people go and how they behave. Dog control orders involve a range of options such as dogs on leads only, on leads when asked, no fouling and no dogs at all.
5c	Wardening	Wardens have both educational (see 4c above) and

	Management option	Description
		enforcement roles. With respect to the later, wardens can provide direct contact and intervene when they observe particular activities (such as dogs off the lead on mudflats). The ability of a warden to control disturbing activities is clearly related to whether control measures are in place, and their nature. The more specific and statutory in nature the control, the greater the potential for enforcement by a warden. The Wildlife Trusts do have a volunteer system of community 'walking' wardens in place at some sites in the Upper Nene Valley.
5d	Limiting visitor numbers	Visitor numbers capped, for example through tickets, permits or a similar system.

Consideration of Particular Options in Relation to the Upper Nene Valley

6.10 Recreational disturbance has the potential to affect wetland in a range of different ways, for example:

- Physiological impacts, such as increased stress (Regel & Putz 1997; Weimerskirch *et al.* 2002; Walker, Dee Boersma & Wingfield 2006; Thiel *et al.* 2011).
- Redistribution of birds in response to the presence of people. Redistribution can be short-term – response to individual disturbance events – or more chronic, with birds simply avoiding using otherwise suitable habitat (Cryer *et al.* 1987; Gill 1996; Burton *et al.* 2002; Burton, Rehfisch & Clark 2002).
- Reduced intake rate of food as a response to disturbance, and birds having to feed in areas with poorer available food resources (Fitzpatrick & Bouchez 1998; Stillman & Goss-Custard 2002; Bright *et al.* 2003; Thomas, Kvitek & Bretz 2003; Yasué 2005).
- Increased energy expenditure as a result of birds reacting to disturbance by flying to different areas to feed and being flushed while feeding and roosting (Stock & Hofeditz 1997; Nolet et al. 2002). Disturbance may also increase stress levels/heart rate etc, which may also have consequences for energy expenditure.

6.11 On a single site, localised disturbance in a small part of the site for a small amount of time is unlikely to result in a likely significant effect, as birds are highly mobile, and on a large site there will be nearby options where birds can feed. Switching to such locations within a site might take seconds, and the impact from a single brief event will therefore be negligible.

6.12 However, more chronic disturbance, regularly affecting larger parts of sites, will have more serious effects. Notably, disturbance can be considered as similar to habitat loss (Sutherland 1996) or even worse because the flushing has energetic costs that would not be incurred if the habitat was simply not available to the birds at all (West *et al.* 2002). Thinking of disturbance purely in terms of habitat loss, it follows that if the area available to the birds is reduced, birds are forced to redistribute and it is possible they will end up feeding in locations with reduced amounts of food and possibly more competition and interference from other birds due to the reduced amount of space. They may also be forced to forage in areas which are more exposed to the weather, where they are at

greater risk from predators, or where they are further from roost sites. The ability of the site to support a given number of birds is therefore compromised.

6.13 The impact of disturbance is not easy to quantify when increased mortality is not yet apparent or a marked drop in numbers (that can be linked directly to disturbance) recorded. Of course, individual birds may well be able to compensate by modifying their behaviour (Swennen, Leopold & Bruijn 1989), for example feeding for longer (Urfi, Goss-Custard & Lev. Dit Durell 1996), feeding at night (Burger & Gochfeld 1991; McNeil, Drapeau & Goss-Custard 1992) or temporarily switching to other sites. In such cases the birds may still survive, but with increased pressure put on the system it is likely to be more vulnerable in the long-term, and the 'slack' in the system greatly reduced. There is evidence that bird breeding success and migration patterns are linked to the quality of the wintering sites (Gill *et al.* 2001) so gradual deterioration on wintering sites might link to reduced breeding success, or even to reduced numbers of birds able to migrate back to the breeding grounds at the end of each winter. Such changes will only be apparent over long time periods and may not necessarily be apparent at all if other factors are also suppressing bird numbers at a particular site. Changes in access levels at sites will usually be gradual, and there is unlikely to be any sudden influx of visitors at a given moment in time.

6.14 In the Nene Valley the challenge is therefore to ensure the SPA interest is not compromised by a gradual change in access. The visitor model shows that access is particularly focussed around Stanwick Lakes - essentially between Irthlingborough and Raunds – and this area is clearly the busiest in terms of recreation. Outside this area relatively high levels of access also occur at Thrapston, around Summer Leys/Doddington and at the south of the SPA around the edge of Northampton.

6.15 As a long term strategy, the impacts of disturbance will be minimised if access is concentrated (and well managed) in particular areas, rather than evenly spread. Furthermore, if access levels are anticipated to increase gradually over time, it is likely to be better (in terms of disturbance) if the increases are at already busy sites rather than areas with low levels of access becoming busy. In order to ensure disturbance impacts are minimised in the future, we therefore suggest the following broad aims:

- Avoid residential development in locations so close to the SPA that increased disturbance would probably result regardless of other mitigation measures.
- Draw access away from the SPA to other areas within the NIA
- Ensure existing busy sites within the SPA (such as Stanwick Lakes) continue to draw visitors who wish to visit the SPA, and that infrastructure, visitor engagement etc. is focussed at such locations.
- Away from the honeypots, access should be low key, not promoted, and measures put in place to ensure access levels remain low (for example through limiting parking).

6.16 In the rest of this section we consider how such aims might be achieved.

6.17 **Habitat management measures** could include the creation of islands and changes to shorelines to create longer shorelines with more vegetation. Islands have the potential

to provide safe resting places and also screen birds from access on the shore. Floating rafts are relatively inexpensive and easy to create, but will have little benefit for much of the SPA interest. Larger, vegetated islands will have the potential to screen birds and potentially enhance foraging, however the creation of such features retrospectively is likely to be difficult and expensive to deliver. Management of habitat outside the SPA with the aim of providing compensation for impacts of disturbance within the SPA would not necessarily be compliant with the Habitat Regulations, as the requirement is first to avoid and reduce problems in the designated site.

6.18 **Ensuring development does not take place around sensitive sites** avoids issues relating to the impacts of new development. There are now precedents around the UK where SPA and SAC sites have a development exclusion zone clearly set out within overarching plans. A distance of 900m has already been proposed around the Upper Nene Valley Gravel Pits SPA and this has been refined to a distance of 250m[12]. These distances are however based on sightlines for the birds, rather than visitor origins. With respect to access, postcode data (see Map 16) suggests that frequent visitors to the area originate from an area that encompasses most of Northampton, Wellingborough, some of Kettering and that extends nearly as far as Corby. Cross reference to Figure 11 would suggest that development within 3km of an access point would result in increased levels of access to the SPA. Development exclusions zones – if the only mechanism in place to control access levels to the Upper Nene Valley Gravel Pits SPA - would therefore need to be at considerable distances to ensure no net change in access. Given that local authorities are at different stages in their relevant plans and large areas of major conurbations, such as Northampton, would be affected, such zones are likely to be impractical. There is potential merit, however in ensuring no further development directly adjacent to access points onto the SPA. Half of all visitors interviewed that arrived on foot lived 800m or less away from the interview point and around a third lived within 500m (see Figure 14); these figures indicate the scale of zone that would need to be established to make any kind of difference in terms of access.

6.19 The provision of **additional green infrastructure** is a potentially appealing solution to resolving disturbance impacts. By providing additional space for visitors, it would seem intuitive that an area can support more recreation. In terms of visitors to the Nene Gravel Pits, alternative sites are most likely to work for types of access that are not dependent on particular water features – for example visitors who are simply drawn to sites because it is the nearest open space to their home, or because it is a convenient place to walk the dog and let the dog off a lead. Given the high cost of purchasing land and securing management in perpetuity, additional green infrastructure is not necessarily an easy solution. Sites should therefore be very carefully selected, targeted and planned. Cross-reference to the visitor data indicates that a typical dog walk for people visiting the SPA is around 3km and that 75% of dog walks were 4.1km or less.

[12] Set out in the Upper Nene Gravel Pits SPA Technical Paper (2012), to inform the West Northamptonshire Joint Core Strategy.

Providing green infrastructure of a size suitable to accommodate such routes indicates the scale of the challenge as considerable land areas would be necessary.

6.20 Opportunities for green infrastructure delivery may come forward through existing sites (potentially already in local authority or county council ownership) which could be enhanced to provide access or directly linked to individual, large developments.

6.21 Rather than provide new green infrastructure there is potential within the wider NIA area to further **draw visitors to existing green infrastructure** sites just outside the SPA. There are a number of sites within the NIA that are outside the SPA, and could perhaps be promoted more and enhanced to draw visitors that might otherwise visit the SPA. For example Midsummer Meadows, Pitsford Reservoir, Irchester Country Park, Barnwell Country Park, Sywell Country Park and Hunsbury Hill Country Park have existing access infrastructure and are in appropriate locations. We recommend dialogue with the site managers at these locations and consideration given to the additional resources, infrastructure and opportunities the sites might provide to draw access away from the SPA.

6.22 The car-park transects included some sites outside the SPA. The data shows that sites such as Sywell Country Park (305 cars counted from 15 visits, both car-parks) and Irchester Country Park (202 cars counted from 15 visits, both car-parks) are less busy than Stanwick Lakes (509 vehicles counted in the main car-park over the 15 visits). The three sites do have broadly similar facilities, for example Sywell Country Park has a small café/kiosk, marked routes, bird hides, BBQ areas, children's play area etc. In the long term it might be possible to enhance sites such as Sywell, Irchester to create a comparable draw and profile to Stanwick Lakes.

6.23 Within the SPA, **on-site measures** are relatively easy to implement, effective and relatively low cost. There are a range of management measures which would be relatively easy to implement and potentially low-cost, but they are mostly quite local and site specific. As such they work best to resolve issues in particular locations, enhance access in particular places and be carefully targeted. They all require some work 'on the ground', working with local landowners, rights of way officers and other relevant stakeholders, and as such could be considered as a series of individual small, discrete projects:

- Seasonal closure of paths
- Paths rerouted away from lake edges
- Screening (e.g. reed screens, banks or simply allowing vegetation to grow up)
- Path management to draw visitors along particular paths

6.24 These kinds of approaches have merit, but require careful planning and design. Many can be targeted to resolve particular issues at sites or be tailored to particular access types. For example low screening or low fencing at particular locations may provide opportunities to keep dogs away from key areas for birds. These kinds of measures can be targeted as resources allow and as issues arise.

6.25 **Management of parking** (reducing/redistributing spaces/closing parking locations/review of charging) is a means of managing access over a wide area. Reviewing the main reasons given by interviewees for choosing particular locations close to home was cited by 32%. Provision of parking in locations close to where people live therefore has the potential to shape access patterns. Good easy parking was a reason 6% of respondents selected particular locations (it was the main factor driving choice for 2%). Changes to car-parks can take place both around the SPA and further afield. For example increasing/implementing parking charges simultaneously within the SPA and reducing/removing parking charges at locations away from the SPA is likely to reduce visitor levels in the SPA. The GIS layers of parking locations derived as part of this work will provide a good foundation to review parking at a strategic level. An important element is the need to ensure a consistent approach across local authorities and others responsible for parking.

6.26 In mapping car-parking we identified 27 locations around the SPA with informal parking, for example un-surfaced lay-bys or roadsides. Looking at our estimates of parking capacity, these locations account for around 22% of the parking locations available to visitors. Reducing the number of these informal parking locations is likely to be a good way of ensuring access in the future is not spread across the SPA but focussed at locations where it is possible to engage with visitors. Areas where this approach could be effective include around Great Doddington (where closure of informal parking would focus access at Summer Leys where it is potentially easier to 'manage') and around Irthlingborough/Stanwick.

6.27 **Zoning** is widely used to separate activities and provide dedicated areas for wildlife, watersports, fishing and other potentially conflicting activities. Zones are already established at some locations within the NIA, such as Pitsford Reservoir. Zoning is positive in that it creates a dedicated space for users, but zones require some careful consideration and consultation in order to get right. Within the SPA it is likely to be effective only where there is potential to focus activities and there not to be disturbance impact; and this may be difficult. Temporal zones are in place at some sites within the NIA, for example at Stanwick Lakes.

6.28 **Education initiatives**, such as interpretation, guided walks, wardening, school visits, community events etc., are widely undertaken at many countryside sites and enhance people's visits to sites and their understanding of the local area. Such approaches are proactive, rather than reactive, but unlikely to solve problems in the short term and depend largely on the audience and style of communication. In general, therefore, education and awareness raising measures are likely to have wider conservation benefits, but there is relatively little evidence that such measures on their own will bring about rapid changes in people's behaviour and reduce disturbance. Good communication is however likely to be important when linked to other measures, to ensure visitors understand issues and to ensure clear guidance for people on where to go, how to behave etc.

6.29 Around three-quarters of interviewees (78%) claimed that they were aware that the Nene Valley is important for wintering birds (question 13, see Table 29). This would suggest that there is already a reasonably good awareness of the nature conservation importance of the area. Of the main activities cyclists and families were two groups which seemed to have less awareness of the importance compared to other groups (see Table 30).

6.30 One clear step in terms of communication is ensuring visitors are aware of the potential for their presence to have an impact on wildlife and how to minimise such impacts. Voluntary **codes of conduct** provide a means of clearly conveying such messages, for example about where to undertake different activities and how to behave.

6.31 Dog walkers are the main user group in terms of volume and these users may have a particular impact in terms of disturbance. Initiatives aimed at dog walkers could include engagement with users to highlight particular locations where dog walkers are welcomed and where there may be particular issues. Clear messages for dog walkers – for example where dogs are required to be on leads or where dogs should be prevented from accessing the water would ideally be consistently communicated at all sites.

6.32 **Wardens** appear twice in Table 37, as wardens out 'on-site' can have an engagement role (talking to visitors, showing people wildlife, explaining issues etc.) and/or an enforcement role. Establishing a warden presence is relatively easy to implement, but employment costs over a long-period are high. If wardens have an enforcement role, then there is a need for clear guidance to users and legislative support to provide the scope for enforcement.

6.33 There are staff already on the ground at sites such as Stanwick Lakes, but there could be scope for a roaming warden presence with a visitor engagement role. There is published evidence of the effectiveness of wardening in reducing disturbance, for example in resolving impacts from access for breeding terns (Medeiros *et al.* 2007).

6.34 A range of **legal mechanisms** are relevant. Byelaws can be applied in a range of situations and dog control orders provide a range of options for fines to be levied to dog owners (for example requiring dogs to be on leads; requiring dog owners to put their dogs on leads when asked etc.). In general these measures require a little time to set up – involving consultation, evidence gathering etc – and (not surprisingly) can be unpopular. Users need to be made aware of any changes and some way of monitoring, checking and enforcing (such as wardens, see above) is required. Measures relating to enforcement are therefore ones which have a high likelihood of success, but require some time to set up and establish. Legal mechanisms such as dog control orders and byelaws are elements that should follow after other (more positive) measures have been implemented and have failed. Monitoring is clearly fundamental to justify and target such approaches.

6.35 Capping visitor numbers is problematical. Permits or similar systems are used in other countries (see Newsome, Moore & Dowling 2002 for details and a review), and occasionally within the UK. In general, however, the approach is applicable to

wilderness areas or sensitive nature reserves and has largely lost favour within the UK. Rather than giving out permits, limiting parking spaces at certain locations may be more effective.

Summary

In order to ensure disturbance impacts are minimised in the future, we suggest the following broad aims:

- Avoid residential development in locations so close to the SPA that increased disturbance would probably result regardless of other mitigation measures.
- Draw access away from the SPA to other areas within the NIA
- Ensure existing busy sites within the SPA (such as Stanwick Lakes) continue to draw visitors who wish to visit the SPA, and that infrastructure, visitor engagement etc. is focussed at such locations.
- Away from the honeypots, access should be low key, not promoted, and measures put in place to ensure access levels remain low (for example through limiting parking).

We suggest management options which could achieve these aims, and in particular highlight:

- Changes to parking, reducing the number of informal parking spaces/locations
- Reviewing parking charges at sites away from the SPA such as nearby Country Parks
- Enhancement of sites away from the SPA through new infrastructure and visitor facilities
- Localised access management measures within the SPA such as screening, allowing vegetation to develop to hide access, routing paths away from shorelines etc.
- Visitor engagement at key sites through increased ranger/warden presence
- Clear codes of conduct for visitors

7. References

Alessa, L., Bennett, S.M. & Kliskey, A.D. (2003) Effects of knowledge, personal attribution and perception of ecosystem health on depreciative behaviors in the intertidal zone of Pacific Rim National Park and Reserve. *Journal of Environmental Management*, **68**, 207–218.

Beale, C.M. & Monaghan, P. (2004) Behavioural responses to human disturbance: a matter of choice? *Anim. Behav.*, **68**, 1065–1069.

Brayshaw, S. (2004) *Biodiversity Survey and Conservation Assessment of the Upper Nene Valley Gravel Pits in Relation to Possible SPA, Ramsar Site and SSSI Designation*. English Nature.

Bright, A., Reynolds, G.R., Innes, J. & Waas, J.R. (2003) Effects of motorised boat passes on the time budgets of New Zealand dabchick, Poliocephalus rufopectus. *Wildl. Res.*, **30**, 237–244.

Burger, J. & Gochfeld, M. (1991) Human Activity Influence and Diurnal and Nocturnal Foraging of Sanderlings (Calidris alba). *Condor*, **93**, 259–265.

Burton, N.H.K., Armitage, M.J.S., Musgrove, A.J. & Rehfisch, M.M. (2002) Impacts of man-made landscape features on numbers of estuarine waterbirds at low tide. *Environ. Manage.*, **30**, 857–864.

Burton, N.H., Rehfisch, M.M. & Clark, N.A. (2002) Impacts of disturbance from construction work on the densities and feeding behavior of waterbirds using the intertidal mudflats of Cardiff Bay, UK. *Environ Manage*, **30**, 865–71.

Clarke, R.T., Liley, D., Underhill-Day, J.C. & Rose, R.J. (2006) *Visitor Access Patterns on the Dorset Heaths*. English Nature.

Clarke, R.T., Sharp, J. & Liley, D. (2008) *Access Patterns in South-East Dorset. The Dorset Household Survey: Consequences for Future Housing and Greenspace Provision.* Footprint Ecology / Poole Borough Council.

Cruickshanks, K. & Liley, D. (2012) *Pagham Harbour Visitor Surveys*. Footprint Ecology.

Cryer, M., Linley, N.W., Ward, R.M., Stratford, J.O. & Randerson, P.F. (1987) Disturbance of overwintering wildfowl by anglers at two reservoir sites in South Wales. *Bird Study*, **34**, 191–199.

Fearnley, H., Clarke, R.T. & Liley, D. (2010) *The Solent Disturbance and Mitigation Project. Phase II. On-Site Visitor Survey Results from the Solent Region*. Footprint Ecology/Solent Forum.

Fearnley, H. & Liley, D. (2011) *North Kent Visitor Survey Results*. Footprint Ecology / Greening the Gateway.

Fearnley, H., Liley, D. & Cruickshanks, K. (2012) *Results of the Recreational Visitor Surveys across the Humber Estuary*. Footprint Ecology.

Fitzpatrick, S. & Bouchez, B. (1998) Effects of recreational disturbance on the foraging behaviour of waders on a rocky beach. *Bird Study*, **45**, 157–171.

Fox, A.D., Jones, T.A., Singleton, R. & Agnew, A.D.Q. (1994) Food supply and the effects of recreational disturbance on the abundance and distribution of wintering Pochard on a gravel pit complex in southern Britain. *Hydrobiologia*.

Gill, J.A. (1996) Habitat choice in wintering pink-footed geese:quantifying the constraints determining winter site use. *Journal of Applied Ecology*, **33**, 884–892.

Gill, J.A., Norris, K., Potts, P.M., Gunnarsson, T.G., Atkinson, P.W. & Sutherland, W.J. (2001) The buffer effect and large-scale population regulation in migratory birds. *Nature*, **412**, 436–438.

Gill, J.A., Sutherland, W.J. & Watkinson, A.R. (1996) A Method to Quantify the Effects of Human Disturbance on Animal Populations. *Journal of Applied Ecology*, **33**, 786–792.

Kirby, J., Davidson, N., Giles, N., Owen, M. & Spray, C. (2004) *Waterbirds and Wetland Recreation Handbook*. Wildfowl and Wetlands Trust, Slimbridge, Gloustershire.

Liley, D. (2008) *Development and the North Norfolk Coast: Scoping Document on the Issues Relating to Access*. Footprint Ecology / RSPB / Norfolk Coast Partnership.

Liley, D. (2013) *Cannock Chase SAC Visitor Survey*.

Liley, D. & Clarke, R. (2006) *Predicting Visitor Numbers to the Thames Basin Heaths.* Footprint Ecology / CEH.

Liley, D., Fearnley, H. & Cruickshanks, K. (2010) *Exe Visitor Survey, 2010*. Footprint Ecology / Teignbridge District Council.

Liley, D. & Sutherland, W.J. (2007) Predicting the population consequences of human disturbance for Ringed Plovers Charadrius hiaticula: a game theory approach. *Ibis*, **149**, 82–94.

Liley, D, Jackson, D & Underhill-Day, J C. (2005) *Visitor Access on the Thames Basin Heaths*. Unpublished report to English nature, Footprint Ecology, Wareham Dorset.

Lowen, J., Liley, D., Underhill-Day, J. & Whitehouse, A.T. (2008) Access and Nature Conservation Reconciliation: supplementary guidance for England.

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

McNeil, R., Drapeau, P. & Goss-Custard, J.D. (1992) The occurrence and adaptive significance of nocturnal habitats in waterfowl. *Biological Reviews*, **67**, 381–419.

Medeiros, R., Ramosa, J.A., Paivaa, V.H., Almeidac, A., Pedroa, P. & Antunes, S. (2007) Signage reduces the impact of human disturbance on little tern nesting success in Portugal. *Biological Conservation*, **135**, 99–106.

Møller, A.P. (2008) Flight distance and population trends in European breeding birds. *Behavioral Ecology*, **19**, 1095 –1102.

Moss, S. (2012) *Natural Childhood*. National Trust.

Newsome, D., Moore, S.A. & Dowling, R.K. (2002) *Natural Area Tourism: Ecology, Impacts and Management.* Channel View Publications, Clevedon.

Nolet, B.A., Bevan, R.M., Klaassen, M., Langevoord, O. & Van der Heijden, Y. (2002) Habitat switching by Bewick's swans: maximization of average long-term energy gain? *J. Anim. Ecol.*, **71**, 979–993.

O'connell, M.J., Ward, R.M., Onoufriou, C., Winfield, I.J., Harris, G., Jones, R., Yallop, M.L. & Brown, A.F. (2007) Integrating multi-scale data to model the relationship between food resources, waterbird distribution and human activities in freshwater systems: preliminary findings and potential uses. *Ibis*, **149**, 65–72.

Pretty, J., Griffin, M., Peacock, J., Hine, R., Selens, M. & South, N. (2005) A countryside for health and well-being: the physical and mental health benefits of green exercise. *Countryside Recreation*, **13**, 2–7.

Randall, R.E. (2004) Management of coastal vegetated shingle in the United Kingdom. *Journal of Coastal Conservation*, **10**, 159–168.

Regel, J. & Putz, K. (1997) Effect of human disturbance on body temperature and energy expenditure in penguins. *Polar Biology*, **18**, 246–253.

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

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

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

Stillman, R.A. & Goss-Custard, J.D. (2002) Seasonal changes in the response of oystercatchers Haematopus ostralegus to human disturbance. *J. Avian Biol.*, **33**, 358–365.

Stillman, R., West, A.D., Caldow, R. & Durell, S.E.A. le V. dit. (2007) Predicting the effect of disturbance on coastal birds. *Ibis*, **149**, 73–81.

Stock, M. & Hofeditz, F. (1997) Compensatory limits: energy budgets of Brent Geese, Branta b-bernicla, the influence of human disturbance. *Journal Fur Ornithologie*, **138**, 387–411.

Sutherland, W.J. (1996) From Individual Behaviours to Population Ecology. *From Individual behaviour to population ecology* Oxford series in Ecology and Conservation. (ed P.H. Harvey), pp. 67 – 88. Oxford University Press, Oxford.

Swennen, C., Leopold, F. & Bruijn, L.M. (1989) Time-stressed Oystercatchers Haematopus ostralegus, can increase their intake rate. *Animal Behaviour*, **38**, 8 – 22.

Thiel, D., Jenni-Eiermann, S., Palme, R. & Jenni, L. (2011) Winter tourism increases stress hormone levels in the Capercaillie Tetrao urogallus. *Ibis*, **153**, 122–133.

Thomas, K., Kvitek, R.G. & Bretz, C. (2003) Effects of human activity on the foraging behavior of sanderlings Calidris alba. *Biological Conservation*, **109**, 67–71.

Tydeman, C.F. (1977) The importance of the close fishing season to breeding bird communities. *Journal of Environmental Management*, **5**, 289 – 296.

Tydeman, C.F. (1978) *Gravel Pits as Conservation Areas for Breeding Bird Communities*. Bedford College,.

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

Urfi, A.J., Goss-Custard, J.D. & Lev. Dit Durell, S.E.A. (1996) The Ability of Oystercatchers Haematopus ostralegus to Compensate for Lost Feeding Time: Field Studies on Individually Marked Birds. *Journal of Applied Ecology*, **33**, 873–883.

Walker, B.G., Dee Boersma, P. & Wingfield, J.C. (2006) Habituation of Adult Magellanic Penguins to Human Visitation as Expressed through Behavior and Corticosterone Secretion. *Conservation Biology*, **20**, 146–154.

Weimerskirch, H., Shaffer, S.A., Mabille, G., Martin, J., Boutard, O. & Rouanet, J.L. (2002) Heart rate and energy expenditure of incubating wandering albatrosses: basal levels, natural variation, and the effects of human disturbance. *J Exp Biol*, **205**, 475–83.

West, A.D., Goss-Custard, J.D., Stillman, R.A., Caldow, R.W.G., Durell, S. & McGrorty, S. (2002) Predicting the impacts of disturbance on shorebird mortality using a behaviour-based model. *Biol. Conserv.*, **106**, 319–328.

Yasué, M. (2005) The effects of human presence, flock size and prey density on shorebird foraging rates. *Journal of Ethology*, **23**, 199–204.

Appendix 1: Access points included in the car-park transects.

This appendix lists the access points that were included in the driving transects. Each transect was comprised of three circuits, identified in the left hand column.

ID	Type	Parking capacity		Coordinates		Direct linkto SPA?	Circuit
				x	y		
2	Formal Parking	10	Small car park next to much larger CP (latter opened only for FC), in corner. HR bar	-0.933179	52.2331		1
3	Formal Parking	60	Big car park, tucked away over bridge (access down side of big cp that is clearly linked to FC) and clearly popular	-0.930302	52.2302		1
7	Formal Parking	500	Massive car park linked to FC	-0.9178	52.2353		1
8	Informal Parking	10	Lot of roadside parking. Road end next to school / recreation ground	-0.915558	52.2285		1
14	Formal Parking	195	Huge car park. Pay and Display. Parking estimated from Google Earth	-0.884344	52.2327		1
16	Formal Parking	30	CP with HR bar, just to east of BMX track (called Radlands Plaza). Urban type green space at edge of river	-0.878524	52.2309		1
19	Formal Parking	35	Car park accessed down the side of the Marriot Hotel, turning just off roundabout. Private water ski club near car park, club with additional parking	-0.875588	52.2243		1
25	Formal Parking	20	Car park accessed via entrance to holiday inn. CP tucked away, hidden and lots litter. Celubrious. GATED	-0.863371	52.2292	1	1
26	Informal Parking	2	From google earth, parking in gateway	-0.859641	52.2272	1	1
28	Formal Parking	4	Layby on A428 with burger van Footpath nearby. Looked underused	-0.840467	52.2261	1	1

ID	Type	Parking capacity		Coordinates		Direct linkto SPA?	Circuit
				x	y		
29	Informal Parking	15	Informal roadside parking at end of Weston Mill Lane. Riverside paths, tarmaced cycle route to city centre. Next to industrial estate	-0.83987	52.2398	1	1
31	Informal Parking	2	Roadside parking in village, footpath and leafleted walk	-0.825937	52.2277	1	1
32	Informal Parking	5	Down mill lane. Industrial units but room to park a few cars. Not used much. PROW	-0.821152	52.2366	1	1
36	Formal Parking	40	People clearly feed ducks at car park	-0.808111	52.2431		1
40	Informal Parking	3	Small lane through village, turns into private road adn caravan park. Verge parking and PRoW. Not well used	-0.780897	52.2417		1
41	Formal Parking	50	Car park with different bays. By pumping station. £2.50 to park	-0.778579	52.2771		1
42	Formal Parking	65	Upper car park with views of the lake. £2.50 to park	-0.775872	52.2784		1
44	Informal Parking	3	Bridleway across fields below power lines. "Rotary Wildlife Corridor"	-0.758036	52.2402		1
45	Formal Parking	10	Earls Barton. Small carpark at 90 degree bend. PROW. Canoe porterage point	-0.741657	52.2486	1	1
47	Informal Parking	3	Byway down to farm onto Nene Way. No parking at end but some space near start	-0.737798	52.2643	1	2
48	Informal Parking	2	Trackside parking. Bumpy	-0.733881	52.2598	1	2
49	Informal Parking	1	Trackside parking. Bumpy	-0.733171	52.2592	1	2
50	Formal Parking	20	Main car park for lake, with small cafe	-0.730888	52.2311		1
51	Formal Parking	5	Layby. On road by carpark, but not gated like other CPs around lake	-0.729988	52.2324		1
52	Formal Parking	11	Small gated car park used by anglers	-0.725608	52.2335		1
53	Formal Parking	8	Small gated car park used by anglers	-0.724258	52.2334		1

ID	Type	Parking capacity		Coordinates		Direct linkto SPA?	Circuit
				x	y		
55	Informal Parking	4	Layby before bridge and PROW - including Nene Way	-0.715096	52.2639	1	2
57	Informal Parking	1	Parking difficult, roadside only. PRoW in village	-0.708894	52.2728	1	2
62	Informal Parking	1	Parking difficult, roadside only. PRoW in village	-0.703801	52.2749	1	2
63	Formal Parking	40	SummerLeys.	-0.701596	52.2608	1	2
64	Informal Parking	6	Doddington Crossing. End of track. Turning area and room to park. Near house. Canal boats on river nearby	-0.69584	52.2703	1	2
65	Informal Parking	5	Parking along road, access to Summerleys NWT reserve on one side of road and on other side access to fishing lake	-0.695694	52.2674	1	2
67	Formal Parking	10	Gated and private car park. Not found during site visit. Located using google earth	-0.684032	52.2865	1	2
71	Formal Parking	40	Embankment Car Park. CP with urban feel; mown lawn, toilets, river walk and watersplash in summer	-0.679032	52.291	1	2
72	Informal Parking	20	Informal parking along road. Next to tow path and PRoW	-0.677227	52.292	1	2
74	Formal Parking	300	Irchester Country Park. Main parking here, additional parking near entrance; gated; parking £2.50; outside NIA. Large site	-0.666468	52.2844		2
75	Formal Parking	8	Private anglers CP. Accessed through industrial estate	-0.666012	52.2918	1	2
76	Formal Parking	55	Irchester Country Park. Car park at entrance. Also main parking further into site; gated; parking £2.50; outside NIA. Large site	-0.663562	52.2827		2
78	Formal Parking	30	Locked gate and closed. Some works going on and diggers around gateway. Access to portacabin (clubhouse) and grass on edge of lake. Waterksiiing. Model aircraft being flown too.	-0.635896	52.3038	1	2

ID	Type	Parking capacity		Coordinates		Direct linkto SPA?	Circuit
				x	y		
81	Formal Parking	10	Opposite waterski club gate; HR bar and slope down into car park	-0.63519	52.3039	1	2
82	Informal Parking	2	Possible to park in gateway. Dead end road off roundabout on A45	-0.616328	52.3011	1	2
83	Informal Parking	1	Roadside parking, path under pylons. Local access from housing	-0.616044	52.3185	1	3
84	Informal Parking	3	Footpath access to floodplain near the end of Crouch Road	-0.612291	52.3224	1	3
86	Informal Parking	2	PRoW at end of Church Lane	-0.608562	52.3253	1	3
89	Informal Parking	5	End of road, turning area and room to park	-0.602729	52.3081	1	2
93	Informal Parking	15	Scrap yard turning and not particularly attractive entrance from scrapyard end. Access to Stanwick lakes (free) and road loops back down towards Kettering FC	-0.593932	52.3238	1	3
94	Formal Parking	33	Gated private parking for fishing; capacity estimated from google earth	-0.58883	52.3226	1	3
95	Formal Parking	17	Gated private parking for fishing. Capacity estimated from google earth	-0.585697	52.3237	1	3
96	Formal Parking	200	Main Stanwick Lakes CP. GATED. Dogs on leads. Car parking £2	-0.579875	52.3329	1	3
98	Informal Parking	8	Road end. Parking and gate - Norththorne Marina. Permissive route and access to Stanwick	-0.575426	52.3593	1	3
101	Formal Parking	18	On sharp bend. Parking for marina and tea rooms (Woodford Mill Tea Room) only	-0.570344	52.3664	1	3
102	Formal Parking	10	Anglers only. Private gated CP	-0.570096	52.3613	1	3
106	Formal Parking	12	Kinewell Nature Reserve. Dogs on leads during breeding season. Gated	-0.557841	52.364	1	3
107	Informal Parking	1	Roadside parking and PRoW	-0.556931	52.3652	1	3
114	Informal Parking	4	End of Mill Lane. Nene Valley Way	-0.543095	52.4019	1	3

ID	Type	Parking capacity		Coordinates		Direct linkto SPA?	Circuit
				x	y		
117	Informal Parking	30	Bumpy track past surgery leads to parking area and marked trails	-0.539022	52.4001	1	3
121	Informal Parking	1	PRoW by road at corner	-0.522753	52.4198	1	3
122	Formal Parking	20	Down Lowick Lane	-0.519337	52.4198	1	3
123	Informal Parking	5	PRoW from lay-by; big lay-bys so possibly more parking.	-0.51815	52.404	1	3
125	Formal Parking	25	Private Marina; locked gate	-0.506922	52.4168	1	3
126	Informal Parking	5	Room for cars by bridge in 3 separate bays. Canoeists seen here pulling canoes out of water	-0.498595	52.4212	1	3

Appendix 2: Visitor Questionnaire (Spring)

Nene Visitor Survey

Good am / pm. Please could you spare me a few minutes to take part in a short survey about your visit today. The survey is being conducted by the Nature Improvement Area partnership to understand how people use sites for recreation in the Nene Valley.

Q1 Which of the following best describes your situation today? *Read list. Tick one only.*

	1 On a day trip/short visit and travelled from home
	2 On a day trip/short visit & staying with friends or family
	3 On holiday in the area, staying away from home
	4 Other: [*note details*]:

Main	Other	**Q2 What is the main activity you are undertaking today?** *Do not prompt. Tick only one main activity and tick as many other activities as visitor gives*
		1 Dog walking
		2 Walking
		3 Jogging/power walking/Nordic walking
		4 Outing with children/family
		5 Cycling
		6 Wildlife watching/Bird watching
		7 Fishing
		8 Enjoy scenery
		9 Photography
		10 Meet up with friends
		11 Watersports
		12 Other/further detail:

Q3 How long have you spent / will you spend in the area today? *Tick one only.*

	1. Less than 1 hour
	2. 1 - 2 hours
	3. 2 - 3 hours
	4. More than 3 hours

Q4 Over the past year, roughly how often have you visited this part of the Nene Valley? *Tick closest answer. Tick one only. Only prompt if interviewee struggles.*

	1. Daily
	2. Most days (180 + visits)
	3. 1 to 3 times a week (40—180 visits)
	4. 2 to 3 times per month (15-40 visits)
	5. Once a month (6-15 visits)
	6. Less than once a month (2-5 visits)
	7. Don't know/First visit

Q5 Do you tend to visit this area at a certain time of day? *Tick closest, multiple answers ok*

	1 Before 9am
	2 Between 9am and 12
	3 Between 12 and 3pm
	4 Between 3 and 5pm
	5 After 5pm
	6 No/Don't know/First visit

Q6 Do you tend to visit this area more at a particular time of year for [*insert activity*]**?** *Multiple answers ok*

	1 Spring		4 Winter
	2 Summer		5 Don't know / 1st visit
	3 Autumn		6 Equally all year

Q7 How did you get here? What form of transport did you use? *Tick one only. Do not prompt.*

	1 Car/Van		4 Bicycle
	2 On Foot		5 By water (boat, canoe)
	3 Public transport		6 Other (please detail)

Q8 What makes you come here, specifically, rather than another local site? *Tick all responses given by visitor in 'other' column. Do not prompt. Tick closest answers then ask* 'Which would you say had the most influence over you choice of site visit today? *Tick only one in the 'main' column. Tick closest answers. Use text box to detail reasons that didn't fit with categories/extra detail.*

Main	Other		Main	Other	
		1 Don't know/others in party chose			10 Habit / Familiarity
		2 Close to home			11 Right place for activity (eg kite surf/fishing/good for kids)
		3 Quick and easy travel route from home/accommodation			12 Particular wildlife interest
		4 Good/easy parking			13 Good for dog/dog enjoys it
		5 Feel safe here			14 Ability to let dog off the lead
		6 Particular facilities here (provide detail in other text box about facilities)			15 Suitability of area given weather conditions
		7 Choice of routes/ability to do different circuits			16 Quiet with no traffic noise
		8 Quality of this area			17 Refreshments/Cafe/Pub nearby
		9 Rural feel/wild landscape			18 Not many people
		19 Other / Extra details			

Now I'd like to ask you about your route today. Looking at the area shown on this map, can you show me where you parked (if travelling by car) and where you started your walk or visit today. And the finish point. And your route please ?
Ensure route is accurate. P *to indicate parking,* E *to indicate start point and* X *to mark exit*
Use solid line for actual route and dotted line for expected.
GPS USED: Y / N ***GPS Number:*** ***START***

Q9 Is/was your route today reflective of your usual route when you visit here for [*insert activity*]. *Tick one, do not prompt.*

	1 Yes, normal		2 Longer than normal		3 Shorter than normal		4 Not sure/no typical visit

Q10 What (if anything) influenced your choice of route here today? *Multiple answers ok. Do not prompt. Tick closest answers. Use free text box additional influences or/and detail.*

	1 Weather		7 Followed marked trail
	2 Daylight		8 Previous knowledge/experience
	3 Time		9 Activity undertaken (e.g. presence of dog)
	4 Other people		10 Access to hides
	5 Group members (kids, less able)		11 Information about reserve/leaflets etc
	6 Muddy tracks/paths		12 Other (please detail in free text)

Free Text: other reasons / detail:

Q11 Aside from this location, do you visit any other places for similar purposes as you visited here today? *IF YES:* **which 3 locations do you visit most often?** *Do not prompt. Check locations on map and code where possible below, otherwise record as free text in blank rows.*

	1 Stortons Gravel Pits		9 Irchester Country Park
	2 Pitsford Reservoir		10 Ditchford Gravel Pits (W)
	3 Hardingstone Gravel Pit		11 Ditchford Gravel Pits (E)
	4 Clifford Hill Gravel Pits		12 Stanwick Gravel Pits
	5 Sywell Country Park		13 Ringstead Gravel Pits
	6 Earls Barton (W)		14 Thrapston Gravel Pits
	7 Earls Barton (Central)		15 Wadenhoe Area
	8 Earls Barton (E)		16 Barnwell Country Park

Q12 Did you know that parts of the Nene Valley are important for the number of birds that spend the winter here? *Single response only*

	1 Yes			2 No			3 Unsure/Don't know

Q13 Did you know that parts of the Nene Valley have an international designation because of the birds that winter here? *Single response only*

	1 Yes			2 No			3 Unsure/Don't know

If YES: **Do you know what this designation is called ?** *If necessary prompt:* **Can you tell me what the designation is called?** *Single response only*

	1 "SPA" or "Special Protection Area" mentioned				2 Other response

Q14: *If interviewee is here for 1st time, skip this question.* **We would now like to ask you about the influence of flooding over the winter on your previous visits to this site. Did the flooding cause you to change your visit patterns at this location?**

	1) Yes			2) No			3) Not sure

14b) If yes to 14a, ask: **How did it change?** *Do not prompt. Tick closest answers. Multiple answers ok.*

	1) Visited different sites instead of here			2) Visited here but used different routes			3) Didn't visit anywhere during floods
	4) Visited less frequently			5) Undertook different activity			

Comments/Further details:

Q15 Do you have any other comments about your visit and access to this area?

Finally, so that we can check whether we have a representative sample, please answer the following questions.

Q16 What is your full home postcode? *(this is the most important piece of information required from the survey, please make every effort to record correctly)*

If visitor unable/refusal to give postcode:

What is the name of the nearest village/town? (*Please ensure correct spelling*)

Q16b If visitor is on holiday ask: **Which town/village are you staying in?**

Q17 How many of your party fall into the following age categories? *Enter number per category*

	1 Under 18		3 41-65
	2 18-40		4 Older than 65

To complete once interview has finished. Questionnaire Number : **Map ? Y / N**

Date:	Number of dogs:	Group size (total people):	Location:	
Time:	Dog(s) seen off lead? Y/N	Gender of respondent (M / F):	Surveyor	Interview conducted part way through route (tick if yes)

Appendix 3: Visit Rates per Settlement

Summary of interviews by settlement. Settlements are defined using the OS open source data (built-up areas). The table gives the number of visitor postcodes from the winter survey only for each settlement and the total number of residential delivery points for each settlement too. Visit rate is the number of postcodes (adjusted to allow for the number of groups interviewed and day length – see methods of section 4).

Settlement	Number of visitor postcodes	Number of all delivery points	Visit rate (groups per day)
Northampton	137	87678	0.0010
Wellingborough	88	20964	0.0027
Rushden	79	12248	0.0042
Higham Ferrers	61	2887	0.0136
Earls Barton	58	2353	0.0159
Raunds	56	3565	0.0101
Thrapston	53	2043	0.0167
Irthlingborough	36	3083	0.0075
Islip (East Northamptonshire)	35	288	0.0782
Stanwick	25	758	0.0212
Ringstead	24	591	0.0261
Kettering	15	25133	0.0004
Wollaston	14	1478	0.0061
Irchester	12	1938	0.0040
Finedon	9	2069	0.0028
Great Doddington	8	498	0.0103
Titchmarsh	5	240	0.0134
Cogenhoe	5	590	0.0055
Wootton/Hardingstone	5	3345	0.0010
Aldwincle	4	132	0.0195
Stanion	3	402	0.0048
Bozeat	3	867	0.0022
Brixworth	3	2020	0.0010
Rothwell (Kettering)	3	3352	0.0006
Grendon	2	205	0.0063
Sywell	2	555	0.0023
Desborough	2	3707	0.0003
Horton	1	151	0.0043
Mears Ashby	1	193	0.0033
Creaton	1	204	0.0032
Pitsford	1	258	0.0025
Collingtree	1	263	0.0024
Great Houghton (Northampton)	1	277	0.0023

Yardley Hastings	1	310	0.0021
Walgrave	1	345	0.0019
Brigstock	1	580	0.0011
Geddington	1	654	0.0010
Broughton (Kettering)	1	921	0.0007
Oundle	1	2086	0.0003
Olney	1	2699	0.0002
Burton Latimer	1	3102	0.0002
Bedford	1	36851	0.0000