Forest Research

Understanding/mapping the socio-cultural benefits of forest recreation

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The Research Agency of the Forestry Commission

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Executive summary

Trees, woods, and forests (TWF) provide multiple benefits to society, including those of social and cultural value. As such there is a need to increase understanding of the multiple benefits that different types of TWF can provide to the public and how management of these spaces can influence synergies and trade-offs of benefits to people at a range of spatial scales.

This report outlines a scoping study which sought to identify and test methods for spatially mapping and surveying the recreation attitudes and behaviours of people living in an area around Cannock Chase National Landscape (CCNL), within which are popular forests used for recreation. Forestry England manage three forest blocks within CCNL. In this study we tested the following:

- The use of existing datasets to map hotspots to identify where people were likely to gather in forests and locations of high footfall in urban areas to target data gathering.
- Sampling places to survey people within 10km of CCNL greenspace access and car park points.
- The use of postcodes as a proxy for surveying people of differing levels of deprivation as measured by the Index of multiple deprivation.
- Sampling three different spatial scales: within CCNL, other woodlands within 20km of CCNL, woodlands within 1km of where people live.
- Development of a survey questionnaire to explore woodland and non-woodland user experiences and values of TWF at three different spatial scales.
- Development and use of an R Shiny (web application) map to capture 3 points along the routes that participants took to explore where they went.

- Evaluation of the method through fieldwork observation and 1-to-1 interviews with contracted surveyors.
- Testing and development of an R Shiny Dashboard to report and share results from the study.

Survey approach – Reflections

Method – lessons learnt

- Focusing on three spatial scales (CCNL, other woodlands within 20 Km of CCNL, and woodlands within 1km of where people live) for data gathering was useful and shows the importance of larger destination sites with facilities and local woods that are near to where people live.
- Asking survey respondents to map the route they took of their forest visit was problematic in multiple ways.
- An effective strategy is to engage with forest managers and local surveyors at an early stage in the research to identify local woods and locations within woods that are popular and well known within local communities and using local names to help survey respondents in identifying where they have been.
- Shadowing a fieldwork contractor as they collected data from people and interviewing surveyors was very useful in understanding the different approaches surveyors take when out collecting data in the field and the challenges they faced.

Results

- 499 people responded to the survey. 44% of those that had visited the CCNL in the last 12 months reported that they did not visit for recreational purposes as much as they would like to. 42% of those that had a woodland with 1km of their home (not including the CCNL) felt the same.

- People spent longer at CCNL forests (44% spending 2-3 hours) than at other woodlands within 20km of CCNL (36% spending 1-2 hours).
- A majority (68%) visited CCNL forests as it is convenient and near to home, and this was also true for other woodlands within 20km of CCNL (57%).
- A slight majority (55%) of respondents had woodlands within 1km of their homes.
- A majority (63%) of respondents want more woodland within 1km of their homes with key priorities being for scenic reasons (trees, wildlife, peace and quiet), paths and safety.

Spatial Mapping Approach – Reflections

Method – lessons learnt

- The use of Huq data (representing people's movement, passively obtained by their mobile phone apps) and Strava data (representing movement activities recorded by registered users) was somewhat useful in helping to identify hotspots of where people go within and around CCNL and its surroundings to aid identification of survey collection points focused on appropriate public spaces and forest locations. This ensured we surveyed people who did and did not visit forests.
- Use of postcode data based on Index of Multiple Deprivation quintiles ensured we got a spread of respondents of different socio-economic status.
- The development of an R Shiny App to be used by survey participants to map their forest routes was a useful approach for testing applicability of the method. However, survey respondents found it difficult to remember/identify the route they took. Any future approach would need to include a map with more detail and recognisable features.

- Using the 'What Three Words' (W3W) app was effective in identifying where people entered CCNL and for exploring any spatial patterns in the data.

Results

- 286 out of 499 respondents (nearly 60%) identified a location where they entered CCNL. These were clustered around car parks, and the majority drove to start their forest visit.
- 84 respondents visited other woodlands within 20 km of CCNL in the previous 12 months, the most popular sites being a nature reserve and a country park.
- 35 respondents said they had visited forests within 1km of where they lived in the previous 12 months (that were not within the CCNL).

Conclusions

The spatial mapping and survey approach taken in this research tested different methods aimed at improving our understanding of the forests people visit, where data can be collected in public spaces to reach people of different socio-economic status, and the routes people take within CCNL. There were mixed results with lessons learnt providing some insight into how the approach could be improved in future research.

The work shows there is complexity in exploring the decision-making process of whether people access a certain forest, where, when and for what purpose. It appears that off-site considerations such as the activity people want to undertake, transport, and distance to forests, as well as the facilities available on site are important in people making decisions about whether to visit a particular forest. Future research could explore whether some of the approaches taken could be scaled up or there could be a more detailed focus on people's decisions to visit forests, the routes they take, and the characteristics of the woodland that are meaningful to them.

Introduction

This report outlines a study which sought to identify and test methods for spatially mapping the recreation attitudes and behaviours of people living in an area around Cannock Chase National Landscape (CCNL) formerly an Area of Outstanding Natural Beauty (AONB), and a popular scenic area for recreation.

This collaborative research utilises the spatial and social science skillset of two Forest Research (FR) teams (Land Use & Ecosystem Services (LUES), and Society & Environment Research Group (SERG), across two core FR research programmes, to develop and test approaches to mapping ecosystem service benefits, and in doing so furthering our understanding of the social and cultural benefits of trees, woods and forests (TWF), with a particular focus on recreation.

Forest Research core research programmes[1] are feeding into The Science and Innovation Strategy for Forestry in Great Britain. Programme 3 is concerned with the 'Societal benefits of trees, woods and forests', in particular exploring how wellbeing benefits and relationships with TWF change over time and across the urban-rural continuum. Programme 5, 'Achieving multiple ecosystem benefits', is exploring how different types of TWF provide ecosystem benefits, as well as how these might differ spatially and temporally. There are many crossovers between these two programmes, providing opportunity for a joint output.

Aims of method development

The key aims of this research were to:

[1] Forest Research – Core Research Programmes Page: https://www.forestresearch.gov.uk/about-us/core-research-programmes-2021-26/

1. Test approaches to spatially map and survey people's visits, experiences, and preferences (in particular regarding recreational behaviour) across multiple forest sites in a specified area.
2. Explore the choices and interactions of people in different TWF environments, and how these might influence the experience of potential benefits.
3. Understand how TWF provide cultural ecosystem service benefits at different spatial and temporal scales and use this to identify suitable opportunities for new woodland creation.

Purpose of this report

This report outlines the steps taken to develop a method, exploring key decisions made and actions undertaken through a series of milestones. Each milestone features: the evidence we used; options and considerations; decisions made and why; outcomes (what happened when we implemented our decisions); and key reflections.

Method development

An explorative approach was adopted to develop a means of effectively mapping social and cultural values / benefits of local woodlands and forests in and around a regional part-forested landscape CCNL. This process was iterative, with challenges and opportunities arising throughout each stage of research and requiring adaptation. This iterative process is reflected upon through a series of milestones documenting the approach and considerations that took place.

The study comprised two key workstreams which concentrated on: a) using maps of TWF to aid sampling of a diverse population within proximity of these locations; and b) an exploration of the social and cultural values associated with these spaces/features, the ecosystem service benefits they provide, and the activities

that take place there. The overall responsibility for the work was divided across the two Forest Research teams to create a pilot method as demonstrated in Figure 1 below.

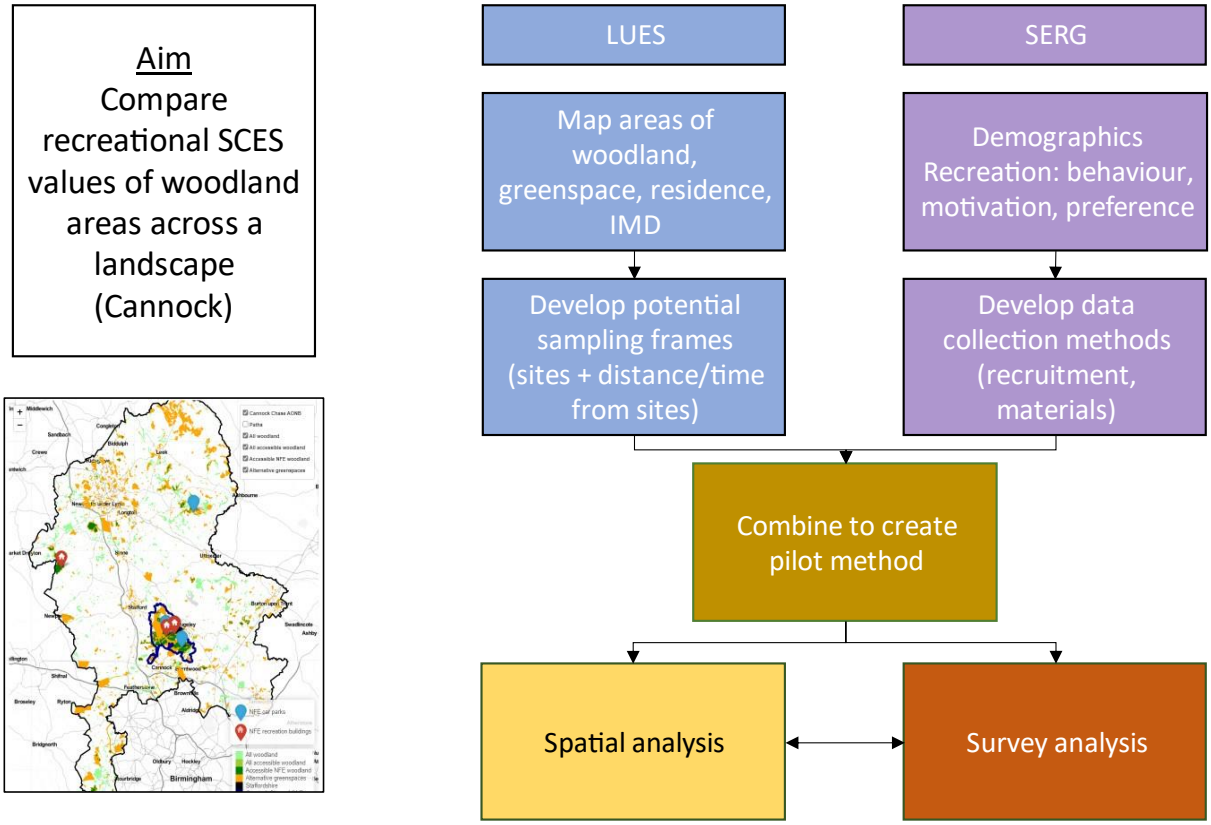

Figure 1 | Outline of collaboration between LUES and SERG to explore recreational social and cultural ecosystem service (SCES) values of woodland areas across a landscape

Milestones

Milestone 1 – Sampling frame

The early phase of the research identified CCNL as the focal point from which to compare recreational, social, and cultural ecosystem service values of woodland areas. CCNL was deemed suitable due to its location near to a large proportion of the population in the Midlands and the diversity of socio-economic status across the

area. The project team was also able to access data for CCNL and two other forested areas from another project, as well as survey data collected by Forestry England staff at Cannock Chase Forest. That survey informed the survey design and questions used in this project.

Identifying the population of study

Index of Multiple Deprivation (IMD)

The study utilised the Index of Multiple Deprivation (IMD)[2], which is a helpful tool for exploring socio-economic disparities across different spatial contexts. The index combines multiple different indicators such as income, employment, health, education, and living environments across small areas (or neighbourhoods) to assess relative deprivation. By using the index as a metric to distinguish our population, the study is able to ensure that the sample represents a diversity (as represented by IMD) of backgrounds, leading to a more comprehensive sample that could potentially be able to draw conclusions about the impact of IMD on people's visits to and attitudes towards forests. As IMD can represent very small areas, the ranking of most to least deprived areas can be extensive. Deciles, or even more so, quintiles, provide a simplification of this ranking in which you cluster together ranges of scores, dividing areas into subsets of either 10 (for deciles) or 5 (for quintiles), with IMD scores of 1 representing the most deprived locations, and the higher the score (up to IMD 10 for deciles, or 5 for quintiles) representing the least deprived.

Postcode Identification

The study identified and recruited participants within 10km of greenspace and car park access points identified within the CCNL, as well as sampling equally across

[2] See more of IMD here: https://assets.publishing.service.gov.uk/media/5a7f0e5ded915d74e33f410b/English_Index_of_Multiple_Deprivation_2015_-_Guidance.pdf

the full IMD range to ensure a diversity of perspectives. Open-source postcode data was used to identify eligible postcodes (see OS Postcodes Data), which was then filtered to include only those postcodes representing single IMD deciles within 10km of the CCNL (See Figure 2).

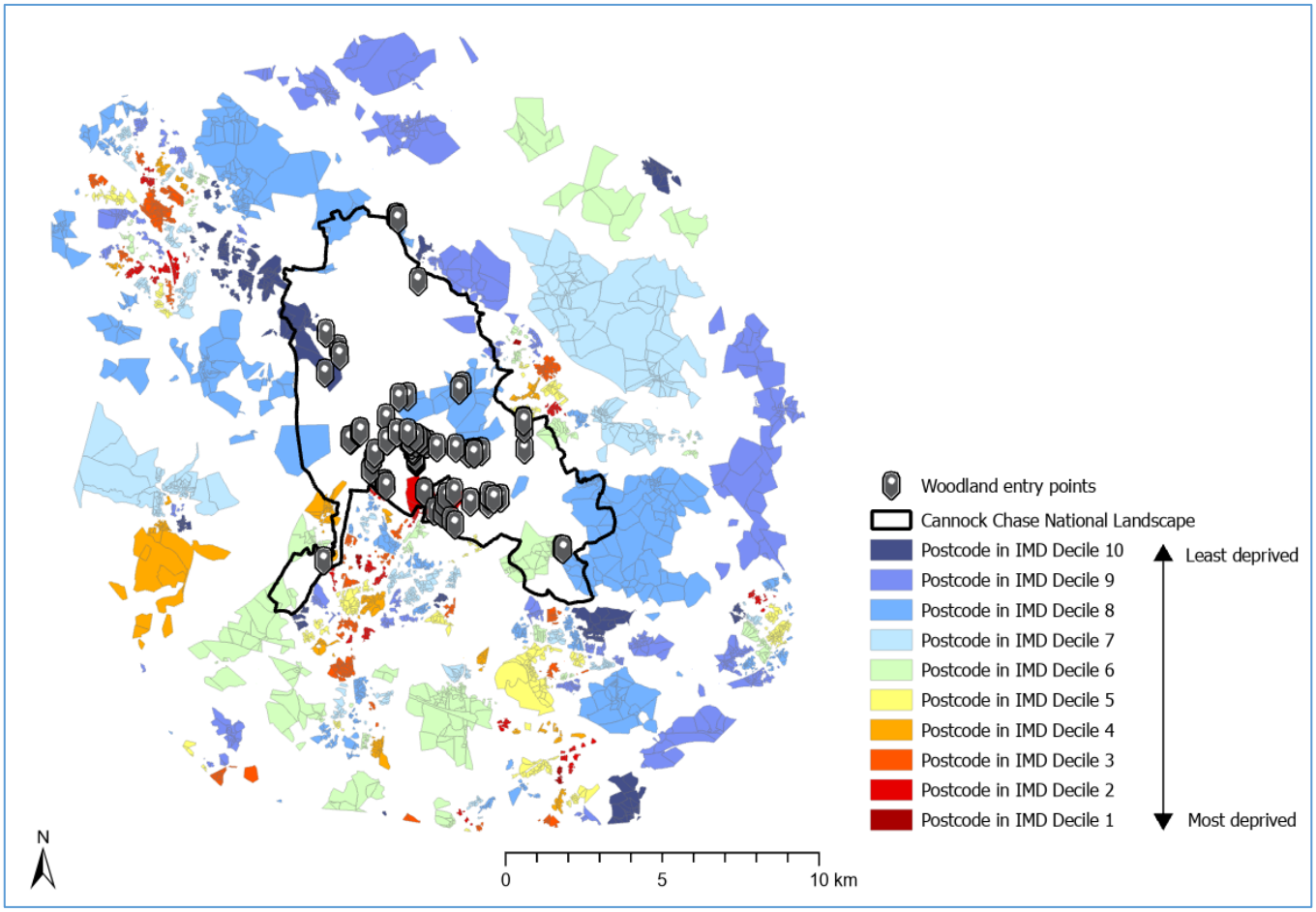

Figure 2 | Illustration of postcodes that wholly fall inside one IMD decile. Different colours represent different deciles. Cannock Chase National Landscape is outlined in black. Only includes postcodes within 10km of a greenspace and car park access point within CCNL.

Approach

Postcodes were used as a proxy for IMD decile, which means that we sought to incorporate only those postcodes which are associated with a single IMD ranking (rather than postcodes which span 2 or more IMD deciles). Once we compiled the postcodes within 10km of a greenspace or car park access point within the CCNL,

we discovered that a large number of postcodes were subsequently excluded from the study (approx. 50%, See Table 1). It was also apparent that there were too few eligible postcodes representing the lowest IMD households (n=14).

In an effort to increase the likelihood of sampling equally across the IMD range, the study adopted quintile ranges instead of deciles. The transition from deciles to quintiles results in the IMD range being compressed from ten into five groups. This meant that quintile group 1 represented decile groups 1 & 2. The resultant blending of IMD ranges meant that the study could establish a sufficient and equal sampling distribution across an IMD range, however it was acknowledged that quintiles would be less distinctive than decile categorisation. To increase the accuracy of the quintile categorisation, a minimum confidence interval of >98% was adopted for one decile, by area, to ensure only those postcodes representing two deciles made up the quintile grouping. This adjustment resulted in an increase from 4186 eligible postcodes, to 5708, improving the likelihood of recruiting a sufficient sample for each group.

Table 1 | Number of eligible postcodes in each IMD decile at a 98% confidence, within 10km of Cannock Chase Forest.

IMD Decile	Number of postcodes in area
1	14
2	250
3	548
4	250
5	451
6	400
7	587

8	716
9	615
10	354
Total	**4186**

Use of third-party data to inform approach

The study used third-party data to explore activity taking place within CCNL. The data provides information on where and what activities are taking place in various locations, including demographic information. This information was helpful in devising a sampling strategy that selected locations with high-footfall or activity, also referred to as 'hotspots': by doing so we would improve the likelihood of interacting with the public and engaging them in the study. The third-party data sources that were used – Huq and Strava Metro - are illustrated below.

Huq[3]

Huq uses mobile phone data to provide information on human movement. Datasets that we accessed showed footfall, dwell time and the density of people within the study area. We used this data to find hotspots of people: both those accessing and using the woodlands, as well as hotspots of the general public (including people who may not visit the woodlands). This approach captures people carrying a device using mobile data and so passively collects data on a wide range of people. It also can be filtered to show a rough income bracket of the users. At present the data can only be seen on the Huq online portal and cannot be downloaded into a GIS to be interrogated so this was a limiting factor for our work, but it was useful for visually assessing trends and finding locations to survey. It requires application and payment to access this data.

[3] https://huq.io/

Strava Metro[4]

Strava is a data provider for human movement. Individuals can sign up for a free or paid for account to use Strava to record and track, map, and plan their physical activities using a smart device with GPS functionality (such as a mobile, tablet, or smart watch). The service functions as a fitness tracker, as well as a social media platform to share your activities with others.

Strava Metro is a distinct partnership service that is provided free of charge (pending Strava approval) to organisations to allow access to datasets containing aggregated and anonymous spatial data from Strava users. Organisations must demonstrate that their use of the service can provide benefit to the community in terms of improving or maintaining active transportation planning and infrastructure.

The datasets include the origins and destinations of journeys, and popular corridors for walking and cycling, number of unique visits along routes as well as some demographics of participants (e.g., age and gender). We can use this data to find hotspots of people visiting areas both within and outside of woodlands. This only includes data from Strava users, which may affect the demographics captured, and only certain types of recreational visits (e.g. walking, running, cycling, swimming) are captured. However, it provides more information in terms of unique visits, reason for visit and demographics than Huq.

Sampling approaches

As part of the method development a range of sampling approaches were considered to meet the research aims. Three strategies were considered and are outlined below.

[4] https://metro.strava.com/

Sampling strategy 1

The aim of this strategy was to identify postcodes within a set distance of a greenspace access point or car park, considering variation in the Index of Multiple Deprivation deciles. The approach taken was as follows. Using the Ordnance Survey Greenspace Access Points[5] and the car parks within CCNL as focal points, map out an area where all properties are within 10km along roads. Then randomly select 10 postcodes within each of the 10 Index of Multiple Deprivation (IMD) deciles present in the area, resulting in a list of 100 postcodes where surveys can be carried out. These represent all IMD decile levels in the area and a good geographic spread.

Figure 3 | Cannock Chase National Landscape (black outline) with the postcode areas to be sampled (blue polygons) within 10km of a greenspace access point or car park. The lighter the blue the more deprived the area is based on the IMD deciles. Points within the postcode areas (green) have been randomly selected for sampling.

Sampling strategy 2 - Control (as random as possible)

This method was designed in response to the idea of having a 'control' that was a randomly generated sample and could be used to compare with our other strategy

[5] https://www.ordnancesurvey.co.uk/products/os-open-greenspace The Greenspace Access Points layer shows access points for entering and exiting urban and rural greenspaces.

which managed to capture variation in IMD decile. This, similar to strategy 1, keeps the border of selection possibilities to those postcodes within 10km of a CCNL greenspace access point or car park but this time randomly selects 100 postcodes regardless of where they are or their IMD status. There was a buffer applied so that samples within 10 metres of each other could not be selected (to prevent too much clustering).

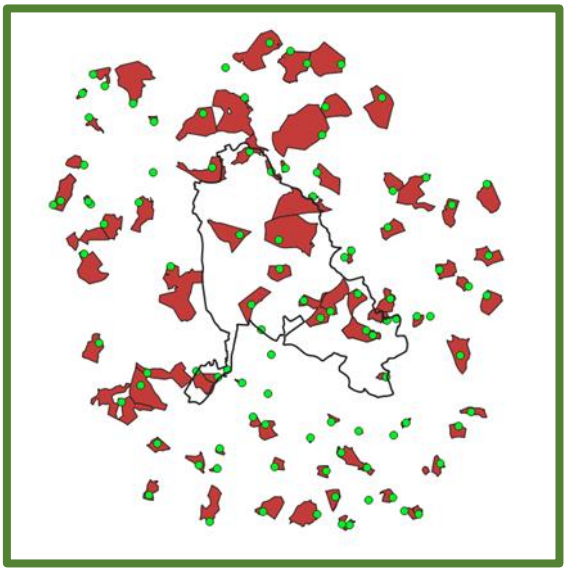

Figure 4 | Chosen postcodes (in red), the outline of the CC National Landscape (black), and the exact locations of the random points in each postcode (in green).

Sampling strategy 3 - Within forest sampling

Using Huq/Strava/footfall data (See Figure 5), pre-select forests that we know are visited and interview people in these forests. Here we can be sure we are interviewing people who use the woodlands and can get information on where they live and their backgrounds, however, the downside is the potential to miss out on finding out why people are visiting other sites. With this method, the range of demographics we can reach is also limited.

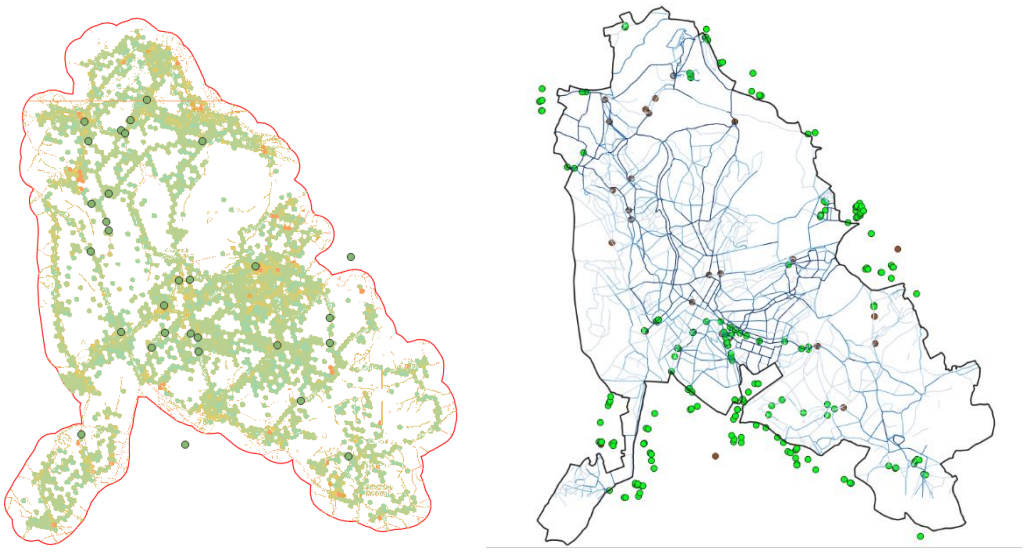

Figure 5 | *Left:* Huq footfall density (April-October 2022) showing the frequency of visits (green is least visited, and orange/red is most visited). The car parks are shown as green dots. *Right*: Strava Metro map showing where people were travelling on foot in July 2022. The darker the blue, the more trips taken on that route. The green dots on this image show the OS Greenspace Access Points and the brown dots show carparks.

Sampling approach implemented

A number of considerations led to the development of a sampling approach that blended elements of the strategies listed above, in particular strategies 1 and 3. As outlined in strategy 3, third-party data from Huq and Strava was supportive in establishing woodland areas within the CCNL where people were likely to gather (e.g. near facilities such as cafes and car parks, or popular bike and walking trails). We adopted the within-forest sampling approach to target woodland users (See Table 2 for woodland locations).

It was also agreed that as barriers to access of woods and forests are a topic of interest, the sample population should not be restricted to people who already visit TWF (within CCNL) for recreation. Sampling strategy 1 provided a method in which to sample residents within close proximity (10km) of the CCNL. This approach would allow the research team to gather data on those that visit TWF at other locations (beyond the CCNL), as well as those within close proximity who do not visit/take part in recreation in woods or forests at all. As such, this sampling

approach would ensure that non-woodland users would be included. A form of hub sampling was also adopted, in which urban locations including town centres surrounding CCNL were identified for sampling both woodland and non-woodland users. Urban locations with high footfall within 10km of a greenspace and car park access point within CCNL were identified, following a similar logic as described in strategy 1. Town centres, retail parks, and other urban hotspots were identified using Strava and Huq data; the established 10km buffer; and expert knowledge and were defined as 'urban locations' (See Table 2 for urban locations).

Visitor Survey Insights

Active Forests Programme

Cannock Chase Forest is part of the Active Forests programme, which has been the subject of prior research [6] (O'Brien, 2020). This programme includes a variety of public forest sites in England and explores recreational activity and opportunities for visitors. The Active Forests Programme which is a partnership between Forestry England and Sport England and aims to encourage people into woodlands to undertake physical activity. This work highlights some of the benefits of Cannock Chase Forest for physical activity (see Active Forests: End of Phase 2 Report (shinyapps.io)).

Quality of experience surveys had been conducted in Cannock Chase Forest, managed by Forestry England, in 2010 and 2013, providing insight on the types of visits, demographics, and activities undertaken on site. In particular, we used visitor data to inform our understanding of the distances people travelled to and from CCNL. This information supported our rationale for setting a 10km spatial distance around the National Landscape boundary as part of our sampling approach, as well as a 20km boundary to discuss other woodlands in the area.

[6] Forest Research – Active Forests Programme Webpage

Identifying zone of influence

To inform the development of a sampling frame for the study, the research team explored existing publications on the use of Cannock Chase National Landscape. An evidence-based review conducted by Footprint Ecology[7], drawing on a 2018 visitor survey, determined a 'zone of influence' (i.e. understanding where from and how far visitors to the site travelled) for Cannock Chase Special Area of Conservation (SAC) (Liley & Panter, 2020). Visitor surveys were conducted at multiple locations across the SAC, collecting postcode data, which was then used to generate Euclidean distances between postcode point location and survey point to understand where people travelled from. Using a 75th percentile (i.e. the distance within which 75% of the visitor survey participants lived), a buffer distance was identified, indicating that in 2018 the 75th percentile of those travelling from home to the Cannock Chase SAC was 14.8km, and for all visitors this was 15.3km (ibid).

Insights from the wider literature were helpful in establishing the spatial extent of our research focus. In particular, setting a wider boundary for exploring other TWF around the CCNL. As we had identified that we would sample postcodes within 10km of the Cannock Chase greenspace access and car park points, we opted to use a 20km boundary from the centre of the CCNL to explore participants' use of other TWF in the surrounding locale. This broadly aligned with the zone of influence for the Cannock Chase SAC as stated earlier.

Milestone 2 – Fieldwork

Literature review – Participatory Mapping of Cultural Ecosystem Services

A rapid literature review was conducted in January 2023 which outlined existing mapping techniques used to develop spatially explicit representations of people's

[7] Footprint Ecology publication – CC Evidence Based Review (Liley & Panter, 2020)

values in a variety of TWF locations across the globe (Colley, 2023). The aim of the review was to inform and provide a reference point in which to develop an approach within this study to map cultural ecosystem services (CES) and values within TWF in England. The review was set up with a protocol to include three areas of focus, stipulating that each reviewed paper must include: 1) a spatial sampling approach, 2) the use of a survey and/or interview to collect data, and 3) include a method of spatial analysis. The review was valuable in providing insight into the practicalities, constraints, and opportunities of various approaches. In the sections below we highlight some of the key takeaways from research integrating participatory mapping.

Participatory mapping

Participatory mapping is a method of data collection that engages participants in a practical task, usually involving plotting or mapping of responses in a visual and collaborative way. Some examples include the creation of maps of a locale or specific place, or the annotation of a map/image in relation to a specific question. This form of data collection allows the participant to determine the outcome and placement of spatial data in a way that is representative of their realities, and it can build complexity and richness in the data that emerge through the combined analysis of qualitative and spatial data. Participatory Public Geographic Information Systems (PPGIS) is an extension of this general approach, with the addition of GIS technology to map spatial data. The technology could be a digital interface (e.g. a tablet or laptop) through engaging a participant with a map and asking them to plot locational or qualitative data, or the location of the participant themselves could be willingly tracked with the use of a GPS device.

Sampling approaches

Notable sampling approaches included ‘on-site sampling’, whereby you collect data directly from the area of study, e.g. a particular woodland; ‘hub-sampling’, whereby you collect data on and/or off-site in areas that represent a central point of

interaction, such as a community hall or town centre; as well as using digital means, for example through the use Application Programming Interfaces (APIs) to scan crowdsourced data, typically originating from social media platforms.

The review demonstrated that there were multifarious participatory mapping exercises that could be designed and implemented.

Participatory Mapping Exercises

Notably, web-based software applications such as Greenmapper[8], and Maptionnaire[9] were supportive in the development of an R-shiny mapping application for this study. They demonstrated the opportunities, as well as the challenges, in mapping values on landscapes through a web-based map. It is worth highlighting that our review was interested in exploring the use of surveys/interviews to supplement a mapping activity, holding the view that they would both contextualise and complement one another. A number of alternative approaches featured and were considered, including the use of 'photo-realistic montages' (Van Berkel & Verburg, 2014) which involved using both a questionnaire and computer-generated, but realistic, images of particular landscapes to elicit emotional responses and establish associated values amongst participants. The use of imagery was something that we considered when sampling off-site in urban hubs, to provide context to the subject of TWF, however, with respect to our available resource this was not implemented in the study.

Spatial Analysis

Many approaches were taken to spatial analysis across the studies, dependent on the adopted sampling frame and data collection method. Cluster analysis was regularly undertaken, in which data is grouped based on similarities / differences. Typically, these studies included point-density analysis, depicting 'hotspots' where different attributed CES preferences and landscape values converged. In many

[8] Greenmapper website: http://www.greenmapper.org/#howitworks
[9] Maptionnaire website: https://maptionnaire.com/

instances studies compared differences between groups such as residents or tourists, or movement between locations, leading to an emphasis on comparative analysis and the use of gravity models (i.e. an approach to predicting flows of goods, services, people, or information between two or more locations). In most instances some form of regression analysis took place, exploring the relationships between landscape features and different CES values, behaviours, and attitudes.

R Shiny mapping activity

R Shiny is an open-source package that facilitates the development of interactive web applications (apps). Through the use of R Statistical Software (R Core Team, 2023) and RStudio (RStudio Team, 2023), an R Shiny mapping application was created by the research team. This application was run as a participatory mapping exercise, through which the public would engage with the application primarily through a tablet device (it is also possible to run the application on a mobile phone or computer). This exercise would aid the survey delivery by providing a visual and interactive element for participants, who were asked to identify points on a map to denote their past visits to woodlands. The exercise would also enable us to capture spatial data on woodland visits, as well as test complimentary data collection methods (i.e. explore how well a survey and R Shiny map work together to generate insightful data to respond to our research questions). The geolocated points are identified and stored using 'What3Words' (W3W) references. Participants were asked to identify three unique points to capture their journey through the woodland (See Figure 6, example of the R Shiny Map interface). A paper map was also made available to the surveyors to aid the identification of woodland visits.

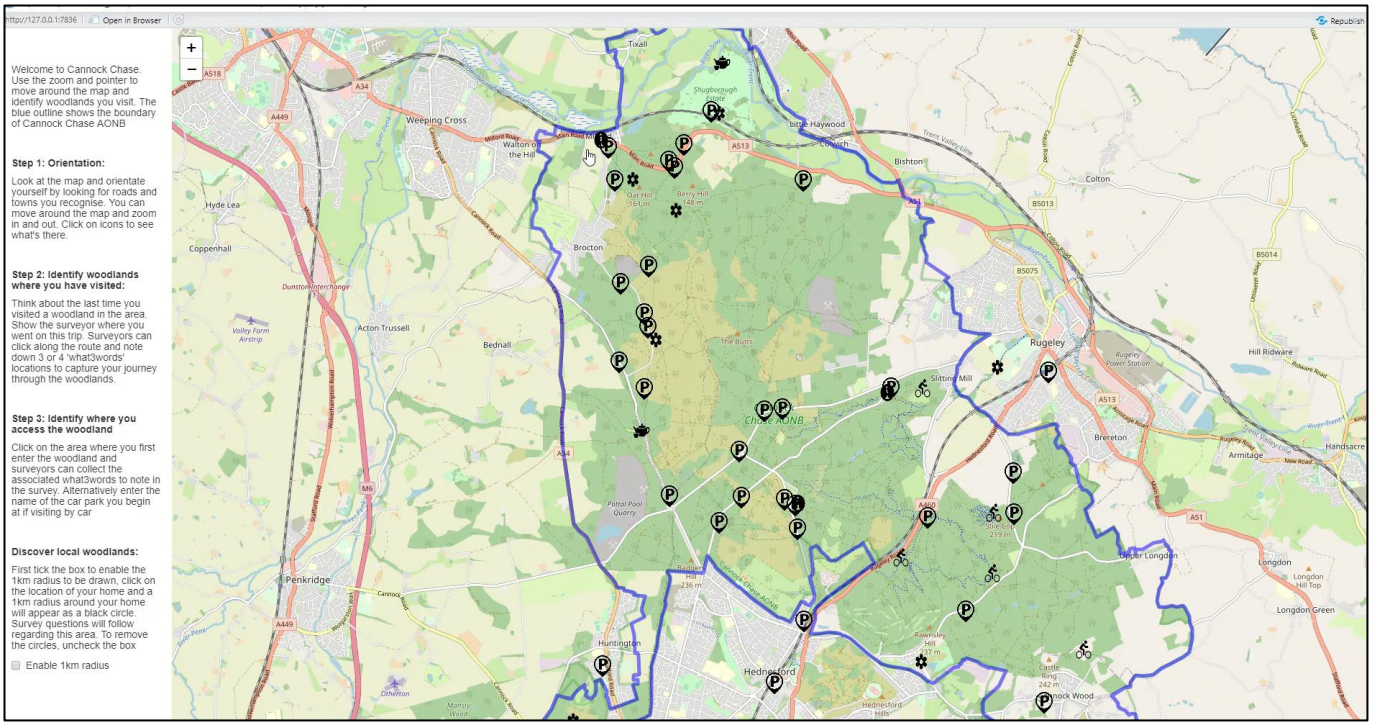

Figure 6 | Screenshot of the R Shiny application

The R Shiny mapping application was shared with the contractor during the development phase. The application was tested with the surveyors who ran pilot shifts, and their feedback refined the design of the application. Key changes included the creation of 'store' and 'clear' functions within the application (See Figure 7).

The 'store' function allowed for W3W locations to be automatically gathered in one place (list-style box) within the left-hand ribbon of the application. A W3W reference would appear in the box following the selection of a location on the map. Each time a location was selected, an additional reference would be added until the box was cleared.

To prepare for a new attempt (i.e. for a new participant), or if a mistake was made, a 'clear' function was made available which deleted all stored entries from the store location. These changes were welcomed by the contractor and improved the facilitation of the survey.

An outstanding issue experienced by the surveyors was ensuring that stored entries were cleared between every participant. This was not straightforward for surveyors, as much of the storing process was invisible to them. To illustrate this, the store function records all 'clicks' made on the map/screen, carrying out this task in the background (not visible to the surveyor), and will only appear to the surveyor once 'store' is selected, which then reveals the W3W references in the box in the left-hand ribbon. The consequence of this is that it is more likely that a surveyor may be unaware that they have not 'cleared' the application between participants, or the surveyor/participant may click the screen during handling of the device, unintentionally recording meaningless W3W references, which only appear in the box once 'store' is selected. These challenges increase the likelihood of erroneous results and increased pressure on the surveyor to be mindful of these issues. The contractor flagged this issue during the development phase, as they were mindful to minimise post hoc data clean-up and maximise data accuracy. No significant changes were made to the application as a result, and so surveyors were reminded to ensure the process was carried out as accurately as possible. It is clear that a few anomalies were returned, and these were often straightforward to rectify during data analysis.

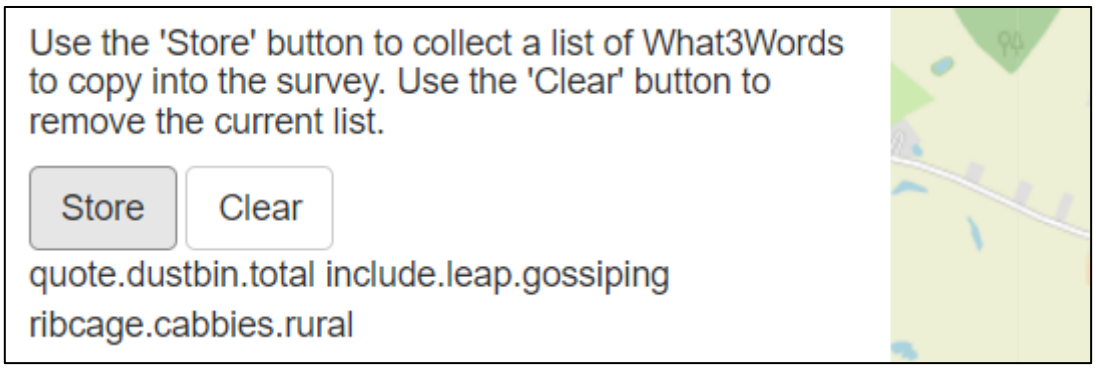

Figure 7 | Image displaying the 'Store' and 'Clear' functions integrated within the R Shiny application. Below these functions are some examples of W3W references captured.

Survey development

The survey aimed to explore people's visits to woodlands at three different spatial scales via visits to:

1. Cannock Chase NL
2. Other woodlands within 20km of Cannock Chase NL
3. Woodlands within 1km of people's homes (as a proxy for woods within 15 minutes walk of where people live).

Through the testing of this approach, we could explore some of the motivations and choices people made when visiting nearby, further away woodlands or destination woodlands such as Cannock Chase Forest. The survey questions were developed to explore the following and focused on key sections:

- Woodlands for recreation: including location, travel time, travel method, point of entry to Cannock Chase NL, route taken on site
- Visits: including frequency, duration, activities, posting of visit or activity on social media
- Preferences: including why people visited the specific woodland, barriers to visiting more, views on new tree planting
- Values: we used statements focused on the social and cultural values of woodlands
- Demographics: including age, gender, ethnicity, number of children in the household.

The value statements were taken from a separate project that aimed to identify the social and cultural (S&C) values of treescapes (O'Brien et al. 2024). The project developed a composite measure of S&C values after an evidence review which resulted in 19 statements covering a diversity and breadth of values. These were then tested in interviews and run in a representative sample of the England

population. Through a detailed analysis of the data, it was identified that five statements could represent the full nineteen in a survey if time and resources were limited. We used the five statements in the survey to identify the strength of survey respondents S&C values for treescapes.

Milestone 3 – Data collection

Contractors were employed to collect data in the field. Face-to-face Computer Assisted Personal Interviewing (CAPI) was utilised, in which the surveyor reads out the survey questions from a tablet device and fills out the participant's answers on their behalf. Surveyors were trained by the contractors on how to use the R Shiny application and carry out the survey prior to fieldwork commencing.

Data collection was carried out over an 8-week period between 14th May and 6th July 2023. 499 surveys were completed.

Initially, 42 surveyor shifts were scheduled for the research in order to achieve the target number of completed surveys. All shifts took place between 10:30am – 16:30pm (6 hours) and were carried out throughout the week (including weekends). This strategy was based on the expert knowledge of the contractor, who estimated a probable strike rate of 12 successful survey completions per six-hour shift. However, as the study filtered by IMD to include single decile postcodes only, the total qualifying postcode sample was reduced from 7375 postcodes to 5708: this meant that only 77% respondents would qualify for the study in the area. This progressively narrowed as more participants were recruited (further detail here). To respond to this, a total of 53 shifts were delivered to ensure sufficient data was collected.

Recruitment and screening challenges

Sub-analysis by IMD quintile was an important requirement of the study. However, this information was not collected for some survey participants who were recorded

as 'uncodable' or 'out of area' (see Table 3). This occurred as a result of miscommunication between the research team and the contractor.

The 'uncodable' group (n=77) arose because the contractor erroneously assumed that a number of postcodes must have been missed from the original list as participants who lived within the study area were being rejected by the screening protocol. As a result, the contractor removed the screening protocol, and filtered participants by asking whether they lived within the study area boundary (utilising a paper map), recording postcodes manually for 'eligible' individuals. Once the research team realised this had happened, they explained to the contractor that postcodes were a proxy for IMD decile and as such, the screening protocol was ensuring that only postcodes which have one single IMD associated with the address were listed (rather than postcodes which might span multiple IMD deciles) to ensure we could differentiate across IMD deciles. Given that a significant number of rejections were occurring, the researchers expanded the eligible sample by shifting from decile to quintile IMD groups. Those in the 'uncodable' group would still be included in the analysis and would provide general insights, but would be separated from IMD quintile comparative analysis.

A transition phase took place halfway through the fieldwork, in which the IMD quintile postcode list was integrated into the screening protocol. During this time, surveyor shifts continued to take place with the screening protocol deactivated. As a consequence, a number of surveys were completed with participants who did not live in the study area, despite having manually screened themselves within the study boundary using a paper map with the surveyor. These cases are represented by 'out of area' (n=40) in Table 3 below.

Table 2 | Of the 499 people surveyed, 384 were matched to an IMD quintile. A further 75 were uncodable and 40 were out of area.

Quintile	Total
Uncodable	75

1	45
2	87
3	90
4	78
5	84
Out of area	40
Total	499

Location considerations

Ten public locations were selected in order to survey the target population. These locations were determined based on a number of factors, including: proximity to relevant postcodes (i.e. incorporating households across the IMD range); areas of high footfall, understood through the use of Strava Metro and Huq data (discussed here); and the local knowledge of surveyors (Table 2). The type of location is split between urban and woodland areas (See Sampling approaches for more detail). For woodland locations within the CCNL that were managed by Forestry England, sites/managers were notified of our intention to survey in advance of fieldwork commencing.

Table 3 | 499 surveys were delivered at ten locations. A total of 380 surveys were completed in urban locations, whilst 119 were completed in woodland locations.

Survey location	Type of location	Number of surveys completed
Stafford town centre	Urban	141
Cannock town centre	Urban	136
Rugeley town centre	Urban	103

Marquis Drive Visitor Centre (car park)	Woodland	33
Birches Valley Forest Centre (car park)	Woodland	36
Punchbowl car park, Milford	Woodland	14
Brocton	Woodland	14
Penkridge Bank car park	Woodland	8
Milford Common, Brocton Road, Milford	Woodland	8
Cannock car park (near Bremen Stone)	Woodland	6

Once approximately half of the target sample had been collected (n=246), the contractor highlighted that most participants were woodland visitors (n=159). The number of woodland location survey shifts was reduced at this point to attempt to get a balanced sample of woodland and non-woodland users, hence the greater number of total survey shifts that are located in predominantly urban locations (See Table 2 above). Similarly, it proved more challenging sourcing Quintile 1 participants as the study progressed, which led to a prioritisation of locations within close proximity of these postcodes, such as Cannock and Rugeley Town Centres. Quintile groups 2, 3, and 4 were better represented than Quintiles 1 and 5 in the 7th week of the study, and therefore it was decided to screen out these three groups for the remaining shifts to prioritise participants from Quintile 1 and 5. These actions maximised the potential of collecting participants from these groups, at the expense of lower strike rates (See Feedback on data collection).

Fieldwork observation

Introduction

Fieldwork observation was carried out to gain insight on, and evaluate the effectiveness of, the method implemented to conduct data collection. On the 4th of July 2023, a member of the research team joined a contracted surveyor carrying out data collection in Rugeley Town Centre, Staffordshire. The exercise had three main objectives, including:

1. Assessing the sampling approach and location
2. Assessing participant engagement with the mapping application and survey questionnaire
3. Observing surveyor behaviour and capturing their experience of collecting data

Due to the exploratory nature of this research, iterative methodological decisions were undertaken throughout, including the late decision to carry out an observation of the fieldwork. With hindsight, this exercise would have taken place much earlier as much of the data had already been collected for the study; there was limited opportunity to adapt the data collection approach following the exercise; and opportunity to observe survey completions was reduced as the data was entering a period of heavy screening to ensure the remaining quintile groups were captured, reducing the number of observations likely to be made.

Sampling of people *in situ*

During the late phases of data collection, surveyors found the screening protocol to be rejecting a number of willing participants from the study. The protocol was designed to filter out non-applicable postcodes, including only those within our sampling frame, but secondly also rejecting postcodes from specific quintile groups once quotas were reached. The second phase was to ensure an even distribution across the IMD quintile range, originally aimed to be 100 participants per quintile, totalling 500 participants within the study. The population within our sampling frame represented a greater proportion of residents from the upper quintile ranges

(see Table 1, sample distributed by decile). This resulted in the upper quintile quotas being achieved earlier in the study as they were recruited more easily. The remaining applicable postcodes at the time of the observation was therefore lower, with those postcodes representing the lowest IMD quintile ranges (most deprived). Surveyors found it challenging reaching the quotas for the lowest IMD quintile ranges, with shifts in the end phases of data collection achieving very low strike-rates.

Rugeley Town Centre, in Staffordshire, England represents an urban 'street' location which had been identified as a suitable location in order to sample both woodland and non-woodland users who reside within close proximity of the CCNL. The observation confirmed that this was a suitable location to survey, with plenty of footfall, and a diverse population present. The general response from the public was enthusiasm to take part in the study, and the surveyor noted that the presence of public seating in the square encouraged participation, in particular because it provided a restful place to conduct the survey, as well as helping the surveyor identify those individuals who might have time to take part. This was confirmed during the observation (See Figure 8, image of Rugeley market square).

Figure 8 | Image of Rugeley Town Centre, the Market Square. Credit: Elliot Brown, 'Rugeley Gold Quarter', 2017, https://www.flickr.com/photos/ell-r-brown/34448806551

With regards to those that the surveyor approached, it was confirmed that many resided in the local area close to CCNL, however, many of these participants were 'screened out' because their postcode did not align with the remaining IMD quintile ranges that were required as part of our sampling criteria. The surveyor recalled that through the study the majority of the recruited sample had been middle to older aged, that in general they struggled to recruit younger participants. Promisingly, on the day of the observation a number of younger participants demonstrated willingness to engage in the study, however, their postcodes were screened out which prevented them from taking part.

Mapping Task

Prior to the observation, the research team set out their intention to explore how the public were engaging with the mapping application that had been created, and how user-friendly this experience was. The team were also interested to find out how accurately data was being recorded.

The mapping task proved fairly challenging for most participants and was not considered a user-friendly tool by the surveyor, and received mixed reviews from the participants present during the observation. Significant assistance was required from the surveyor, and in most cases the surveyor shifted away from the method guidelines and chose to interact with the application themselves on behalf of the participant. This was mainly due to the surveyors using Computer Assisted Personal Interview software. The surveyor also explained that they did this for participants they suspected would struggle, noting that older persons tended to find it hard to use the application / device (tablet) from their experience, and so they would ask these participants to describe the route rather than plotting it themselves.

A major obstacle to the mapping exercise was participants struggling to recall the exact route that they had taken on their visit to forests within the CCNL. The starting location was often the easiest point to identify as it typically corresponded with a visitor car park or centre. In some instances, this was supported by the use of a paper map which some users preferred to use to begin with, before transitioning to the mapping application. Participants found that useful keys within the mapping application such as parking symbols, road names, and visitor centre symbols helped them identify their start location (See Figure 6 | Screenshot of the R Shiny application).

In many cases, participants were able to describe the furthest point along their walk, or the standout features of interest that they encountered. For instance, participants recalled places such as “the stepping stones”. However, translating this detail onto a spatial point was not easy, especially as not all features were labelled

on the map. Some participants said that further descriptive and visual information within the mapping application would have helped them identify the places they had visited and the routes they took. Suggestions included integrating images, or descriptive text, such as that which is available on Google Maps. In most instances, a rough estimate of the location was used to pinpoint the locations, and in some cases, accuracy was improved by surveyor knowledge of the area which had grown through the course of the study.

The requirement to include three points on the map was met with some hesitation by participants. In most cases there was a preference to stick to two located points; the point at which they started and the point of interest, which in many cases was the turnaround point for their trip. The hesitancy towards a third point related to participants lacking confidence to accurately recall and/or plot the route they took, and in some cases, they took different routes for the outward and return legs of their route which compromised the validity of a single point along the route. As a result, the accuracy of the data in many cases is questionable, with the surveyor often placing a point roughly halfway between the estimated start and end points of the route. There is a significant amount of responsibility placed on the surveyor to validate the plotting, and during the observation it was noted that the participants were not always asked to double check that the route plotted by the surveyor was accurate.

Both the surveyor and participants also recalled functionality issues with the mapping application. As it was a sunny day, glare from the sun on the screen of the tablet reduced visibility. The quality and technical specification of the tablet was low which resulted in lag, as well as issues with the touch-screen functionality. Regarding the latter, participants claimed that the map was "jumbling about a little bit" on touch, and in some cases, participants accidently closed the application by mis-clicking on the screen (according to the surveyor this was improved by the use of a stylus).

Survey questionnaire

The survey received positive feedback from both the surveyors and the participants who took part in the observation. Participants found that most of the questions were well-worded, flowed well, and were easy and enjoyable to answer.

One challenge highlighted by both the surveyor and participants was the value-statement questions within the survey. There were five value-statements, each of which asked participants to score their response in relation to a value that might be gained from a woodland visit. The score was provided on a sliding scale from 0-100 (0 means 'strongly disagree', 50 means 'neither agree nor disagree', and 100 means 'strongly agree'). It should be noted that because fieldwork was carried out using CAPI, participants were not able to engage with the sliding scale directly. The indirect nature of the questioning might explain why participants struggled with this question. The observation revealed that participants repeatedly misunderstood the question, failing to provide a score response, and instead providing a descriptive reply. One participant responded saying that "I can't really put a number on it because it is so special to us". Some participants struggled to understand the purpose of providing a score and were less enthusiastic about this question format. Both the user-experience and accuracy of the data may have been negatively impacted by the CAPI approach, a consequence which was not anticipated during the design of the survey but would be worth amending in future iterations.

Another notable observation was that participants responded enthusiastically and with significant detail, often including anecdotes without any prompting. For closed questions, the surveyors were unable to capture this added information. Within open questions, there was opportunity to capture these details, however, it was clear that in these areas there was more onus on the surveyor to include relevant information, which was constrained by time-pressures.

Surveyor Interviews – Fieldwork Evaluation

In light of the valued insight drawn from the fieldwork observation, the research team arranged 1-to-1 online interviews with surveyors via Microsoft Teams. The purpose of this exercise was to capture a comprehensive record of the surveyor's experience of the fieldwork. These interviews collected feedback on the sampling approach, the survey questionnaire, the mapping task, and their general experiences. Five out of seven surveyors took part in an hour-long interview, and they were compensated for their time. The researchers drafted an interview guide which can be found in Appendix B.

Feedback on the sampling approach

- The postcode screening protocol led to a significant number of rejections of eager participants, which was frustrating for surveyors and meant reaching target numbers became more challenging towards the end of the fieldwork period.
- Surveyors suggested that a more targeted sampling approach should be taken to reach samples in specific postcode areas (representing sought-after IMD quintile groups), rather than town centres.
- In general, woodland locations, especially those with visitor centres, were considered easier to recruit from than urban locations: in woodland locations, visitors tended to have more time and a greater enthusiasm to engage, compared to urban locations.
- Some woodland locations consistently had very little footfall, with surveyors struggling to reach daily targets. Woodland locations without a visitor centre were associated with low footfall and were less suitable for recruitment. It is important to ensure that selected woodland locations have sufficient footfall to warrant recruitment effort.

- Surveyors suggested that the research team had missed prime woodland locations for recruitment, such as popular destinations / features within the woodlands themselves (e.g. stepping stones).
- Urban 'street' locations were useful in capturing non-woodland users. To boost recruitment in urban locations, the surveyors recommended:
  - Avoiding recruiting during forecast wet weather;
  - Saturdays should be avoided as people tend to be too busy to take part, whereas mornings in the week are considered optimal;
  - Identify locations where seating is available to aid recruitment, or otherwise other infrastructure such as parking or facilities.
- Surveyors indicated that incentives are a popular method used by other clients, which might have helped with recruitment.
- Weather and time of day had a significant impact on recruitment.

Feedback on the questionnaire

- The survey took between 10–20 minutes to complete. In some cases the survey took longer, which created frustration and a loss of interest.
- Most surveyors felt that the questions were relevant and well-worded. As a result, participants had no trouble responding and surveyors felt they would not make any changes. However, some surveyors indicated that they adapted the survey wording and suggested that reading verbatim is 'not so natural' and this would lose participants, especially with longer questions.
- Some surveyors noted that the questions that included a 0-100 scale for responses were challenging and confusing for participants to answer; this may be because the response was requested verbally, rather than the survey participant inputting the response directly themselves. Some surveyors noted it took too long for participants to consider how to respond to these

questions. It was suggested that a 0-10 scale may be easier for participants to consider.

- Some participants struggled to provide three words to describe their feelings about the woodland.
- Some felt the response options were not adequate, with other options sought by participants. Improved or a greater variety of response options to some questions would be helpful, for instance options to choose from regarding the feelings towards woodlands.
- Some felt that relevant data was missed as participants elaborated on their responses, but the survey did not have space to capture this. It was suggested that either audio recording or an open 'any other comments box' could be used to capture this.

Feedback on the mapping application

Technical issues:

- The app was not user-friendly. The interface was considered to be fiddly and difficult to navigate. Surveyors indicated that it took them a while (during the fieldwork) to learn to how to use the application effectively. The application was susceptible to glitching and freezing, which required a forced shutdown. The app's reliance on an internet connection also caused some issues related to loading at times. Taken together, this made it hard to keep participants engaged and willing to continue participating in the survey.
- The tablet itself did not appear to operate as well as a mobile device. The screen interface was worse, as was the size of the device; being larger meant it was more challenging to handle and navigate between locations on the screen. The size meant it was also more susceptible to glare from the sun. A better tablet device, with an improved screen interface could be beneficial. The screen did not need to be larger.

- It was necessary to navigate between the survey and the mapping app during data collection, but this was found to be difficult/cumbersome. It was felt that the survey and map application should not be separate. The requirement to copy and paste data across these two elements leads to data loss and inaccuracies, as well as delays, reduced user-functionality, and increased time required of participants.
- The surveyor almost always handled the app rather than the participants themselves. In most cases it was not feasible or efficient to allow participants to engage with the app due to the risk of them entering inaccurate information, mis-clicking, closing the application, losing data, or generally finding it challenging to interact with.
- The addition of a 'store' and 'clear' function was a welcome improvement to the app; this made data capture easier to process and more accurate. However, surveyors forgot to clear previous history at times.

Using the map to capture location information:

- Not enough detail was provided within the app: zooming in to the map did not reveal additional features. Some roads, particularly those that were labelled on the application, were considered helpful.
- The use of an accompanying paper map proved useful - even essential - in many cases, as it provided wider contextual detail (including road detail) allowing for the initial identification of a location, which was then translated across to the application. However, some did not feel the paper map was required.
- Although initially challenging, surveyors progressively developed knowledge of the sites through the fieldwork activity, which made it easier to interpret site descriptions to identify a corresponding location. It became clear that reliance on surveyor knowledge of the area / sites was integral to improvements in data accuracy.

- Improved integration and clarity of labelling throughout the map and at varying scales would be helpful. The inclusion of site features such as clearer paths, key viewpoints and attractions would better help participants and surveyors orientate and locate points and routes. The labelling should include key landmarks, or imagery to help participants make the connection between the map and the route they took.
- Exploring local woodlands with participants was challenging because it utilised the whole map. Participant home locations should be determined before asking about local woodlands to provide a more detailed visual aid on screen, rather than the full scale of the main map.

Participant recollections of routes taken:

- Whilst some participants were able to accurately locate the routes they took, for instance cyclists or those that recorded their visits via GPS, many struggled to geolocate their visits and provide the 3 points required for the participatory mapping exercise. There was a preference to use 2 points instead: the starting location and the feature visited/turning point. On this basis, it was suggested that only 2 geolocations should be collected.
- Start locations were easiest to recall (compared to mid- and endpoints) and most accurately recorded as they typically began from a car park or visitor centre, which was sufficiently labelled on the map – however, where there were multiple car parks, this could pose a challenge to correctly identifying the one used.
- Spatial data was often inaccurately recorded as the surveyor had to rely on rough guesses, or the use of random points where a participant simply could not provide an answer. In some cases, participants were more comfortable describing their route in distance and time rather than spatially.

Feedback on surveyors' general experiences of delivering the fieldwork

- Most surveyors struggled at the beginning of the fieldwork. Although the process was straightforward and training was regarding as adequate, there were a number of challenges related to IT (especially relating to use of the app) and sampling that arose in practice.
- It took multiple shifts for surveyors to become comfortable with the IT, and familiar enough with the sites and common routes taken to be able to effectively aid the participants in identifying the routes they were describing.
- Most surveyors adapted the approach to the fieldwork in order to carry out the survey and mapping tasks. In most cases, surveyors admitted that the spatial data was at best a rough guess of the route participants took, and rarely had confidence in the plotted locations. This was because participants found it too challenging to translate their experiences onto the map.

Milestone 4 – Analysis

Spatial analysis

Spatial analysis of the survey results was carried out using R Statistical Software (R Core Team, 2023) with R Studio (Rstudio Team, 2023). The W3W points selected by the survey respondents were translated into geographical coordinates. These were then mapped to identify the locations where people entered CCNL, as well as trying to identify spatial patterns based on visitor demographics (IMD decile/quintile, number of children in the household, means of transport used to reach CCNL, travel time to reach CCNL, age group, gender, ethnicity, mental/physical illness, urban/rural address). Other locations visited by the survey respondents were also mapped to highlight 'hotspot' areas within the NL. The survey also asked about visits to other local and regional woodlands, and the responses to these questions were mapped in a similar way to the CCNL entry points, with maps showing different demographic groupings.

Results

Out of the 499 people who answered the questionnaire, 286 people identified a location where they entered CCNL. The clustering of points around car parks suggests that a large number of people used these locations to start their journey in the NL. Most people used a car to reach the CCNL and selected one of the car parks as their starting point, but no other spatial pattern could be identified based on visitor demographics. 283 people pointed out other locations they have visited within the CCNL, with points clustered around the car parks and recreation buildings, which makes sense as most people started their walks from there.

Only 84 respondents said they visited other woodlands as well, the most popular areas being a nature reserve near Hednesford and Chasewater Country Park, with a variety of visitor facilities. Lots of the points people picked seem to not be in woodlands but other alternative greenspaces. 35 people said that the woodlands they have visited were within 1 km of their home. No clear spatial pattern could be identified based on visitor demographics.

The results of the spatial analysis and the accompanying maps are included in an interactive dashboard and will be made available on request.

Survey analysis

Analysis of the survey results was carried out using the R Statistical Software (R Core Team, 2023) with R Studio (R Studio Team, 2023). The principal approach taken to the analysis was visual, using plotting to explore the distribution of survey responses for each question, grouped by the greenspace / location being discussed with the respondent (i.e., visits to CCNL, visits to other woodlands within 20km of CCNL, or to local woodlands within 1km of where people lived). Additionally, some statistical analyses were carried out exploring what variables may be associated with key questions, such as how often respondents visited CCNL.

The questions in the survey took a variety of forms, some being multiple choice, others single response and some open text responses (see Appendix C).

Results

Due to the number of questions asked, it was decided to present the results of the survey (and spatial) analyses using a dashboard (Karlsdóttir & Pollard, 2022). This provides users with an opportunity to explore the data as an interactive report, where the figures are interactive. This can be more engaging than a more traditional report document, allowing users to explore elements they find interesting (Karlsdóttir & Pollard, 2022).

The following presents a high-level summary of the survey results. For a more detailed insight into the results, a request can be made to see the interactive dashboard.

Demographics

Our sample had more female than male respondents (58% vs 42%), more households without children present than with them (72% vs 28%), the overwhelming majority (95%) were white British, a majority (78%) had a vehicle, however 22% had no car, 72% did not have a bicycle, 27% had a health condition and 79% were primarily living in an urban environment.

Result highlights

- 44% of those that had visited the CCNL in the last 12 months felt that they do not visit for recreational purposes as much as they would like to. A common reason cited was feeling ‘too busy’.
- Of those that indicated that they had a woodland within 1km of their home (not including the CCNL), 42% said they do not visit for recreational purposes as much as they would like to. Common reasons provided included ‘poor mobility’ and ‘poor health’.
- People seem to spend longer at CCNL (44% spending 2-3 hours) than at woodlands within 20km of CCNL (36% spending 1-2 hours).

- A majority (68%) visit CCNL as it is convenient and near to home; this is also true for other woodlands within 20km of CCNL (57% for the same reasons).
- The majority (82%) of respondents had not visited other woodlands within 20 km of CCNL.
- A slight majority (56%) of respondents had woodlands within 1km of their homes, however it appears that only 26% of them visited these woodlands between 1 – 7 times a week.
- A majority (63%) of respondents want more woodland within 1km of their homes, with key priorities being for scenic reasons (trees, wildlife, peace and quiet), paths and safety.

The results of the modelling suggest that the frequency of visits to CCNL, local woods within 1km of where people live and woods within 20km of CCNL are associated with similar variables, such as: number of vehicles owned, the IMD quintile, whether the respondent had a health condition, whether children were present within a household and respondent age. All of these factors showed a positive relationship with frequency of visits to these woods (i.e., if someone lived in IMD quintile 5 they were more likely to visit woods more often), apart from those who did not have a vehicle, which appears to limit the frequency with which respondents can visit woodlands.

The five Social & Cultural values questions show differences at the local level. It seems that woods are more valued at a local level.

Lessons learnt

Survey

- Focusing on three spatial scales (CCNL, Other woodlands within 20 Km of CCNL, and woodlands within 1km of where people live) for data gathering was useful and shows the importance of larger destination sites with facilities and local woods that are near to where people live.

- Asking survey respondents to map the route they took in their forest visit was problematic in multiple ways.
- There is potential to engage with forest managers and local surveyors at an early stage in the research to identify local woods and locations within woods that are popular and well known within local communities, using local names to help survey respondents identify where they have been.
- Shadowing a fieldwork contractor as they collect data from people and interviewing surveyors was very useful in understanding the different approaches surveyors take when out collecting data in the field.
- It is recommended that a site visit take place at the beginning of the study. This would aid the sampling design, for instances by mitigating the inclusion of unsuitable sampling locations, as well as identifying areas with suitable footfall. In hindsight, although we chose to focus on entry points around the CCNL, we could have sampled within the woodland itself, at popular destinations, to aid recruitment.

Mapping approach

- The use of Huq and Strava data was somewhat useful in helping to identify hotspots of where people go within and around CCNL and its surroundings to aid identification of survey collection points focused on appropriate public spaces and forest locations. This ensured we surveyed people who did and did not visit forests.
- Use of postcode data based on IMD quintiles ensured we got a spread of respondents of different socio-economic status.
- The R Shiny app developed in this project to facilitate participatory mapping in the survey proved to be useful, but with some limitations: survey respondents found it difficult to remember/identify the route they took. Any future approach would need to include a map with more detail and recognisable features.

- Using ‘what three words’ was effective in identifying where people entered CCNL and for exploring any spatial patterns in the data.

Conclusions

In this study we tested several approaches to surveying and mapping recreational visits to forests at different spatial scales. The approach and lessons learnt provide some insights into how future research could be developed that could build on this work. The work shows there is complexity in exploring the decision-making process of whether people access a certain woodland, where, when and for what purpose. It appears that off-site considerations such as the activity people want to undertake, transport, and distance to woodlands, as well as the facilities available are important influences on people’s decisions to visit a particular woodland. Future research could explore whether some of the approaches taken could be scaled up or there could be a more detailed focus on people’s decision to visit woodlands, the routes they take and the characteristics of the woodland that are meaningful to them.

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Appendix A: R Shiny dashboard

R Shiny is an open-source package provided by R Studio that enables users to develop applications, including interactive maps and dashboards. More information on dashboards is available here. The dashboard was developed by the research team to provide a visual and interactive platform in which to engage with the results of our research. For more information on our dashboard, please contact Dr Emma Hinton (Social Scientist and project lead, Forest Research): emma.hinton@forestresearch.gov.uk.

The dashboard, entitled 'Cannock Chase Exploration' contains 7 sections. Each section includes detail on the types of questions asked as part of the research, as well as the results which are displayed in graph format. The sections of the dashboard include:

1. Participant Demographic Summary
2. Questions about Cannock Chase National Landscape
3. Questions about visits to other woodlands (Within 10km of CCNL)
4. Questions about visits to hyper-local woodlands (within 1km of respondents' homes)
5. Modelling the responses for types of woodland
6. Agreement questions
7. Maps

Section 1-6 contain detail and findings from the questionnaire that participants engaged with. The final section, entitled 'Maps', explores the spatial data captured through the R Shiny Mapping exercise.

Appendix B: Surveyor feedback interview guide

Note: Questions in orange text are optional

Preamble

Thank the participant for their work collecting the data and for taking part in the interview. Reassure the participant that the interview will be completely anonymised and that this is a confidential space to share their experience. We're interested in getting open, honest feedback to evaluate our research and their support will be greatly appreciated.

Aims & Structure

The purpose of this interview is to help us understand how the fieldwork went and what you can tell us about your experience and observations whilst collecting data. In this interview, we'll discuss:

A. Your impression of the survey and general experiences
B. The effectiveness of the sampling approach (i.e. site selection, recruitment of participants)
C. A discussion on the map application
D. A discussion on the survey questions
E. Final thoughts

Make sure the participant has submitted the consent form and is happy for the interview to be recorded. Ask if there are any questions about the objectives of the interview. Remind the participant that the interview will take between 45 – 60 minutes and they are free to stop at any time. They do not have to answer any questions if they don't want to. Seek permission to record the interview.

[Start the recording]

Interview Questions

A. General Experiences

1. How did you find the experience of conducting this survey?
2. What were your first impressions of the survey?
3. Did you find anything challenging? (Prompt: Did you feel the training prepared you well? did it get easier?)
4. Did you have to adapt beyond the survey training/instructions to conduct the survey? How? (e.g. filling out the survey for people rather than providing the tablet)
5. How long did the survey usually take?

B. Sites & Recruitment

In this section, we're going to discuss your experience and observations at the different sites, as well as your thoughts on the recruitment process.

6. What was your favourite site and why?
7. What was your experience sampling at woodland sites (e.g. Milford Common in Stafford, Marquis drive, Penkridge Bank in Rugeley, Brocton, Cannock Car Park (near Bremen Stone), Seven Springs car park in Stafford, and the Punchbowl car park?)
8. What was your experience sampling at street sites? (e.g. Rugeley, Stafford, and Cannock town centre?) (Prompt: what was the same as woodland sites? What was different compared to woodland sites?)
9. We were trying to reach people who lived within 10 km of Cannock Chase and get high numbers of people who did use woodlands and high numbers of people who didn't use woodlands as much - do you think we chose the right sites to achieve this?
10. Did you notice any differences between those who were willing to take part and those that weren't? (Prompt: Did you find any particular people / people doing certain activities hard/easy to recruit?)
11. Can you describe any instances where people were interested in what you were doing and tried to engage with you without prompting?
12. What might have impacted recruitment? (Prompt: Weather, time of day, the surveyor, day of the week)
13. How might we have improved recruitment and is there anything we missed (prompt: was anyone missed, under or over-represented?)

C. Map application

In this section we're going to discuss the application we created for the mapping aspect of the survey and the tasks we asked participants to complete.

14. How did people engage with the map application? / did people need much support to complete the mapping task? (Prompt: did you observe any participants in particular that needed greater/lesser support in regard to explanation / filling it out for them)
15. Were people able to locate points on the map easily? (i.e. location of site, start location, plotting a route)
16. How did you (as the surveyor filling out information) find using the map application and recording the data? (Prompt: did you have access to one tablet or two? If the latter, how did you use this?)
17. How accurately do you think data was captured on the map application? (Prompt: did you validate the locations given? Do you think participants were always able to accurately identify locations?)
18. How useful was the paper map and to what extent was this used to aid the task?
19. Could we have asked participants to do more with the map application (i.e. get more detail)? Why/why not?

D. Survey questions

In this section we're going to discuss the questions we asked participants.

20. How well do you think the survey questions were worded? i.e. were participants able to easily answer questions? (Prompt: for example, 0-100 value scores seemed tricky)
21. Were you able to read out all the questions exactly as written? If not, why not? (i.e. to help the flow of the conversation, explain things further, prompt responses)
22. Can you recall any questions you found difficult to ask / or participants struggled to answer?
23. Can you recall any questions that sparked interested from the participants or led to good discussions?

24. How well were question responses recorded? (i.e. did you manage to capture everything they said in the survey, or did you summarise their points? How difficult was this?)
25. Is there anything you'd change about the survey questions? Why?
26. Is there any questions you think we should have asked?

E. Final thoughts

To wrap up, we'd like to ask some final thoughts (Only ask orange questions if time permits)

27. How enthusiastic were participants in completing the survey?
28. Other than what we've already discussed, is there anything else you feel worked or didn't work? (In regard to the whole survey and fieldwork)
29. How might the survey be improved?
30. Did you receive any feedback or comments from participants? If so, what?
31. How was the experience at the end of the data collection, did anything change in how you approached the fieldwork? (Prompt: when the postcode range was limited)
32. How do you think the other surveyors found the fieldwork?

End of interview questions. Thank the surveyor for their time and contribution to the project. If they have any questions about the project or our outputs inform them that they are encouraged to email / contact us.

Appendix C: Survey protocol

Visits to forests in Cannock Chase National Landscape

Q1. Over the past 12 months, how often have you visited this forest for recreation (Cannock Chase)?

Q2. How did you get to Cannock Chase?

Q3. Where did you enter Cannock Chase?

Q4. Beyond the point you entered Cannock Chase, where did you go on this visit?

Q5. How long does it take you to get to this point of entry from your home?

Q6. How long did you spend at Cannock Chase?

Q7. What did you do while you were at Cannock Chase?

Q8. What influenced your decision to visit Cannock Chase compared to another local attraction?

Q9. In one sentence, can you describe what feelings you associate with your visit to Cannock Chase?

Q10. Did you (or will you) post your visit/activity to social media?

Q11. Please can you briefly describe what you posted?

Q12. Do you visit Cannock Chase for recreational purposes as much as you would like to?

Q13. What stops you from visiting Cannock Chase as much as you would like?

Q14. Why don't you go to Cannock Chase?

Visits to woodlands within 20km of CCNL

Q15. Over the past 12 months how many different woodlands in the specified area do you think you have visited for recreation (not including Cannock Chase National Landscape)

Q16. Over the past 12 months, how often have you visited these other woodlands for recreation?

Q17. Looking at the map, which woodland (in the specified area, not including Cannock Chase AONB) have you visited the most in the last year?

Q18. Is this woodland within 1km of your home?

Q19. Over the past 12 months, how often have you visited this particular woodland for recreation?

Q20. How did you get there?

Q21. How long does it take you to get there from your home?

Q22. How long did you spend at the woodland on your most recent visit?

Q23. What did you do while you were at the woodland?

Q24. What influenced your decision to visit the woodland on your most recent visit?

Q25. In one sentence, can you describe what feelings you associate with your visit to this woodland?

Q26. Did you post your most recent visit/activity to social media?

Q27. Please can you briefly describe what you posted?

Q28. Do you visit this woodland for reactional purposes as much as you would like to?

Q29. What stops you from visiting this woodland as much as you would like?

Q30. Why don't you go to woodlands in this area?

Visits to woodlands within 1km of home

Q32. Are there any woodlands that are within 1km of your home?

Q33. Over the past 12 months, how often have you visited any of the woodlands within 1 km of you home for recreation?

Q34. In one sentence, can you describe what feelings you associate with your visit to this woodland?

Q35. Did you post your most recent visit/activity to social media?

Q36. Please can you briefly describe what you posted?

Q37. Do you visit any of these woodlands for recreational purposes as much as you would like to?

Q38. What stops you from visiting this woodland as much as you would like?

Q39. Why don't you go to any woodlands within 1km of your home?

Opinions about woodlands

Q40. In the future, how much woodland would you like to see within 1km of your home?
Q41. Why less woodland?
Q42. Why the same amount as now?
Q43. Why more woodland?

Q44. What features would you say are most important when thinking about new woodland?

Q45. Please respond to each statement on social and cultural values using the 0-100 sliding scale: 0 means 'strongly disagree' 50 means 'neither agree nor disagree' 100 means 'strongly agree'

Demographic questions

D1. Please could I ask which of these age groups you fall into?

D2. Please can I ask how you'd describe your gender?

D3. Please may I ask how many children (under 16) live in your household?

D4. Please choose one option that best describes your ethnic group or background:

D5. Please may I ask how many vehicles (cars or vans) your household has?

D6. Do you have access to a bicycle (or bicycles) that you can use for personal transport? (rather than purely for recreation)

D7. Do you have any physical or mental health conditions or illnesses lasting or expected to last 12 months or more?

D8. Would you describe the area where you live as urban or rural?

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