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A survey of volunteer interest in recording habitat data

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Summary

Citizen science biodiversity recording schemes traditionally focus on specific taxa, with some initiatives recording habitat information to varying degrees of detail. With the growth in Earth Observation (EO) applications in recent years, there was interest in the possibility of collecting habitat information through citizen science, such that it can contribute towards the validation of EO. Increased collection of habitat data would also contribute to a broader range of conservation aims. This project therefore conducted a survey of current and potential citizen scientists to understand the level of interest, self-assessed confidence, barriers, and other preferences associated with recording habitat (resulting in 458 responses). The project also conducted a second survey aiming to understand the user-friendliness of a new app called EarthTrack, which has been designed by Natural Apptitude on behalf of Aberystwyth University to support citizen scientists to record habitat data, as an example to understand these factors in a practical setting (resulting in 48 responses).

Overall, the surveys demonstrate a moderately high level of interest and self-assessed confidence in recording habitat data. This suggests that it could be feasible to encourage citizen scientists to collect more habitat data. There may be a bias in respondents to the survey, as people who are already interested in this topic are most likely to complete a survey on habitat recording. However, the relatively high number of survey participants overall provides evidence for the potential feasibility of this initiative. Following previous work, insight is also provided into some factors that those designing habitat recording in future may wish to consider, such as the importance of the provision of training and of keeping time commitments manageable.

The survey results are provided in two annexes.

- Annex 1 provides the survey results, including a tab for each question that was asked with a table showing the total responses for each of the multiple choice options that were provided.
- Annex 2 provides survey results presented by scheme. This includes the same information as Annex 1, except with the answers from those who responded who currently participate in an environmental recording scheme grouped by row. Percentages are also presented to enable easier comparison between schemes.

Contents

1. Introduction

1.1. Rationale

Citizen science, which involves actively engaging the public in scientific research, can be useful to generate widespread datasets efficiently, as well as to increase participants' knowledge of scientific processes and, in many cases, their wellbeing (Bonney *et al*. 2016; Haklay *et al.* 2021). Use of citizen science in ecology typically involves recording schemes that focus on specific taxa, with some initiatives recording habitat information to different levels of detail (Barnes *et al*. 2022).

Habitat information includes any data related to the environment in which a species lives, including the features present (Bamford & Calver 2014). This may include factors such as general habitat types (e.g. woodland or grassland), more specific habitat types (e.g. oak woodland, calcareous grassland), management (e.g. grazed or ungrazed), quality (e.g. availability of sufficient food resources) and specific features (e.g. presence of dead wood, absence of pollution). More widespread collection of habitat data could contribute to a broad range of conservation aims such as evaluation of management strategies, identification of areas of change, gaining knowledge on drivers of change, improving understanding of species-habitat associations, feeding into predictive species modelling and species protection goals, validating species records and contributing to species monitoring scheme survey design (Hassell *et al*. 2022). With the recent growth in Earth Observation (EO) applications, the possibility of collecting habitat information through citizen science, such that it can contribute towards the validation of EO, is also of particular interest (Hassell *et al*. 2022). Satellite data from Earth Observation can be used to estimate the locations of different habitat types, but information from people on the ground is needed to feed into the models behind this and to check the accuracy of the habitat maps once produced.

Previous work as part of the Terrestrial Surveillance Development and Analysis (TSDA) programme and the Earth Observation Data Integration Pilot has explored the potential for citizen scientists to collect additional habitat information that will benefit Earth Observation applications, and wider research (Barnes *et al*. 2022; Hassell *et al*. 2022; Medcalf *et al.* 2014; Newson *et al.* 2016). This has included two workshops with those leading on species monitoring schemes (one in 2018 and one in 2021), but has not yet engaged with potential citizen scientists directly. The perceptions of volunteers to this opportunity therefore remained an evidence gap to understanding the feasibility of taking this idea forward. This evidence gap was particularly important to explore given evidence from species recording scheme managers that some volunteers had expressed negative perceptions towards collecting habitat data, for example, voluntary habitat recording as part of the Breeding Bird Survey had been declining until it was made compulsory (Barnes *et al.* 2022).

2. Methods

We undertook two surveys of current and potential citizen scientists through Microsoft Forms.

Surveys were designed with the assistance of a steering group consisting of representatives from a range of partner organisations (the Amphibian and Reptile Conservation Trust, the Bat Conservation Trust, the British Trust for Ornithology, Butterfly Conservation, NatureScot, Plantlife and UKCEH), and went through the UKCEH ethics approval process prior to release. The app survey was also designed in collaboration with the EarthTrack team at Aberystwyth University. Appendices 1 and 2 detail the questions that were asked in each survey.

JNCC and partner organisations' social media channels and mailing lists were used to circulate the questionnaires. Due to resharing, it is not possible to estimate the number of people that saw the links, but as an example to give context of potential reach, one of the organisations involved has a following of 120,000 on Twitter and direct mailing lists of about 68,000 people. The first survey received 458 responses over a period of three months in summer 2023. The second, which was more involved and involved downloading an app to test out in the field, received 48 responses over the same time period.

3. Results and discussion

3.1. Volunteer interest survey

3.1.1. Context

Of the 458 people who responded to the survey, 410 had participated in some form of environmental recording within the past year. Of these, 55 had participated in only structured recording schemes (schemes with a defined protocol and sampling strategy), 114 in only unstructured recording schemes (ad hoc recording of species), and 241 had participated in both structured and unstructured schemes. From a taxon perspective, 182 respondents had participated in schemes related to birds, 153 related to butterflies, 37 to plants, 41 to pollinators, 95 to bats, 75 to schemes relating to a specific taxon not listed here, and 296 relating to generalist (non-taxa specific) recording initiatives such as iRecord or iNaturalist. Many respondents had participated in more than one scheme; hence numbers sum to higher than the total number of respondents.

3.1.2. Interest

Overall, respondents showed high levels of interest in recording habitat data. When asked to rank their interest in recording habitat data on a scale of 1–5 where 1 was “no interest at all” and 5 was “very interested,” between 79% and 82% of respondents answered 4 or 5 across a range of types of habitat recording options presented (Figure 1). These differing types were:

a) general habitat (e.g. woodland or grassland),

b) specific habitat type (e.g. oak woodland, calcareous grassland),

c) visible habitat management (e.g. grazed or ungrazed), and

d) specific habitat features (e.g. presence of dead wood, evidence of pollution).

It should be recognised that this type of question may lead to bias; those who choose to complete a survey such as this are likely to have some level of interest given that they clicked on the link and took the time to fill in the questionnaire. However, the high absolute number of respondents reporting high levels of interest indicate that there would be sufficient interest for increased habitat recording to be feasible. It is likely that only a subset of those who express interest in a survey will go on to submit data or continue with a survey. However, it is also likely that the survey only reached a subset of the audience who could be engaged around this topic, largely focusing on those already participating in biological recording, and missing out on others who already spend time out in the countryside such as ramblers and walkers.

A breakdown of level of interest by current participation in species recording scheme is shown in Figure 2. Interest was found to be well spread across schemes; no one scheme stood out as having volunteers with a particularly high or low level of interest by percentage compared to others. Schemes that were the biggest outliers (the Goose and Swan Monitoring Programme had the lowest interest by percentage and the Volunteer Mountain Hare Survey had the highest) also had some of the lowest numbers of respondents (5 and 1 respectively), so one high or low response made a big difference to the total. See Annex 2 for a full breakdown of results by scheme.

Existing citizen scientists (i.e. respondents who had taken part in an environmental recording scheme or coordinated recording effort within the last year) had a slightly higher level of interest compared to respondents who would be new recorders if they chose to subsequently get involved (or those returning after a break of more than one year; Figure 3 and Annex 1). This suggests that those who are more engaged with an existing effort are more likely to be open to recording additional data. However, the fact that it is only slightly higher suggests potential for engaging new audiences for habitat recording as well, although a larger sample size of those not already recording would be required to reliably inform this.

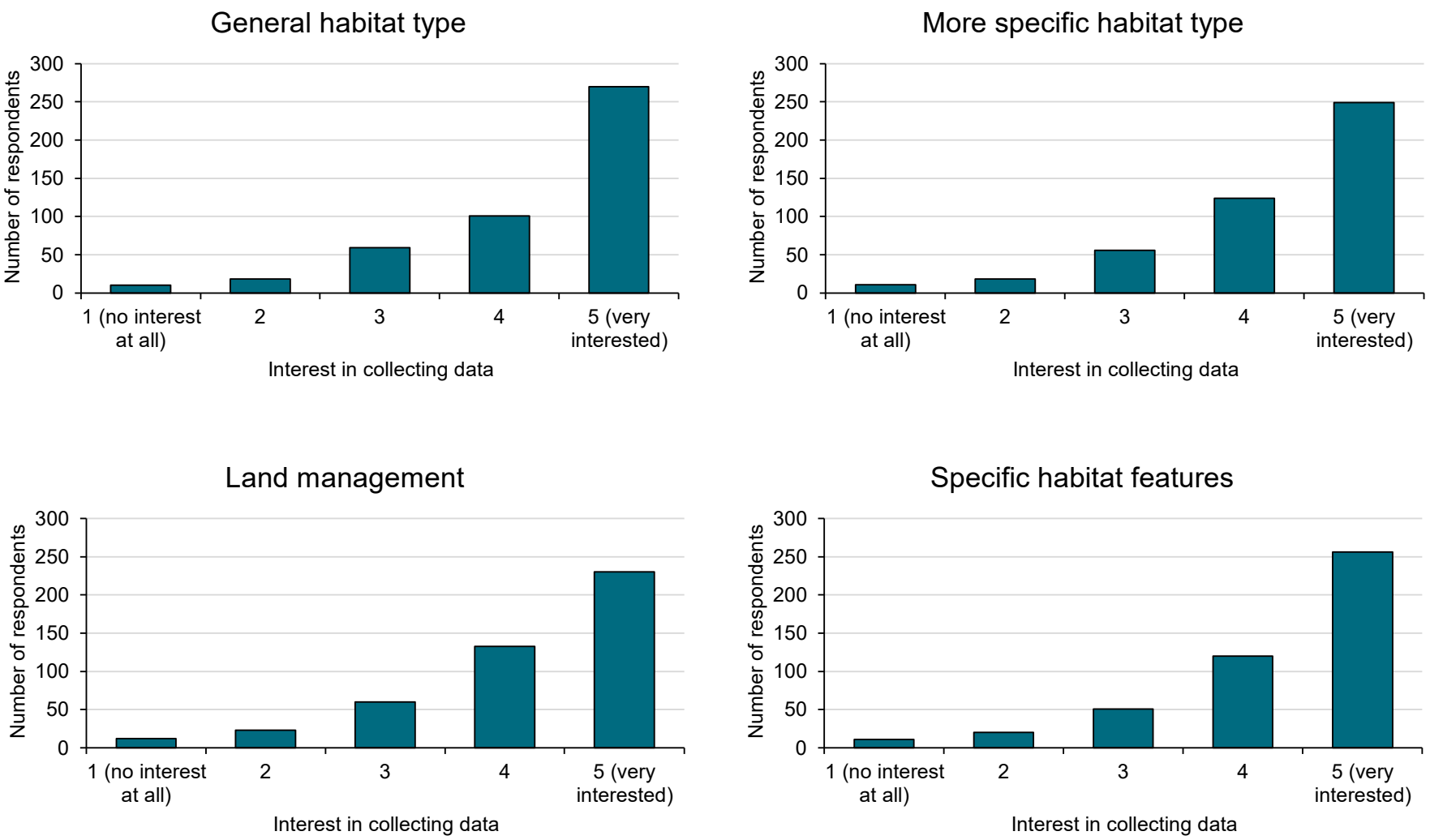

Figure 1. Survey responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting each of the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?"

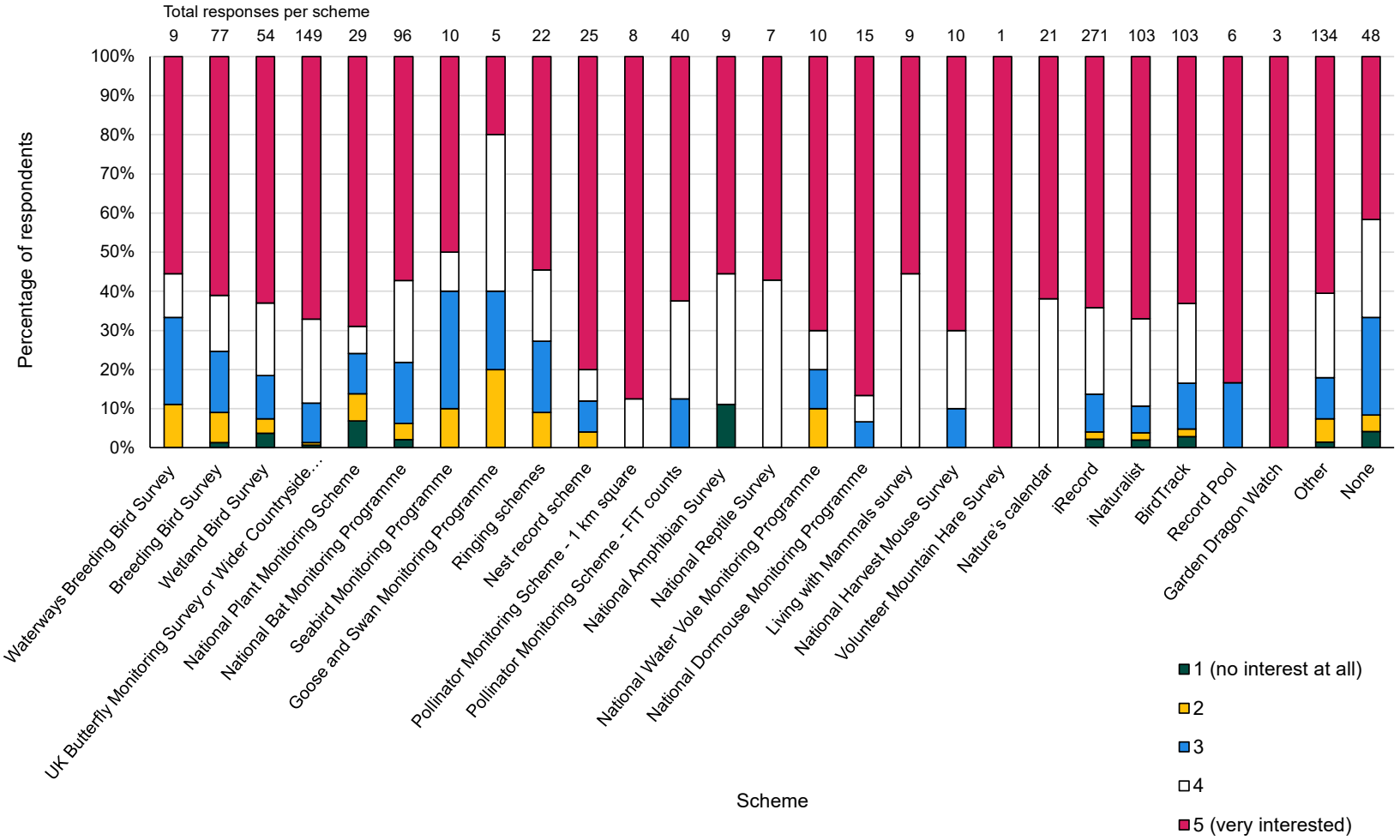

Figure 2. Survey responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting general habitat data (e.g. woodland or grassland), broken down by the schemes in which respondents currently already participate. See also Annex 2. The bottom section of each stacked column shows responses of 1 (no interest at all), whilst the top section shows responses of 5 (very interested). Responses from those who participate in multiple schemes were included within the total for each scheme separately. 'Other' included any environmental recording not listed in the question.

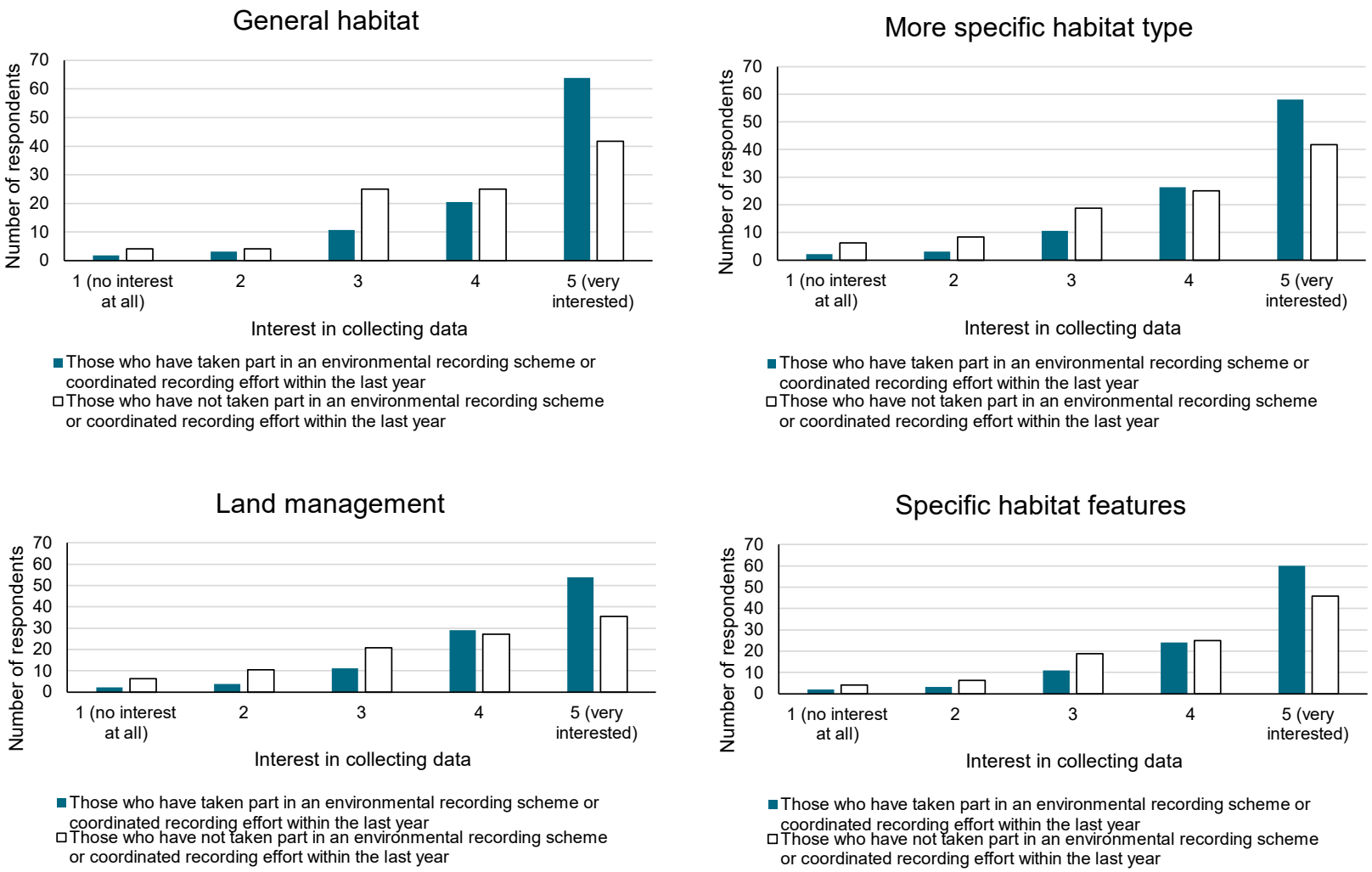

Figure 3. Percentages of total responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting each of the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?," broken down by whether respondents had taken part in an environmental recording scheme or coordinated recording effort within the last year.

3.1.3. Informed interest

Most people (66%) reported no change in their level of interest after being given information about why habitat recording is important and what it can be used for (Figure 4). However, those that did have an increase in interest were typically those who were already most interested; 27% of those who initially ranked their interest as 5, stated that they were much more interested, compared to 0% for those who initially responded 1, 6% for those who had responded 2, 3% for those who had responded 3 and 5% for those who had responded 4 (Figure 5). This suggests that monitoring must align with a participant's existing motivations (in agreement with Barnes *et al.* 2022) and that, for those wishing to encourage increased data collection, communication about data uses and the importance of data collection may be a more important tactic for further motivating or retaining those who are already interested (where required), rather than encouraging those who have little interest in the first place. This trend did not differ notably by scheme (see Annex 2), or by the type of habitat recording (Figure 4). It also highlights that people do not necessarily need to know all of the reasons why habitat recording is important in order to be interested in it.

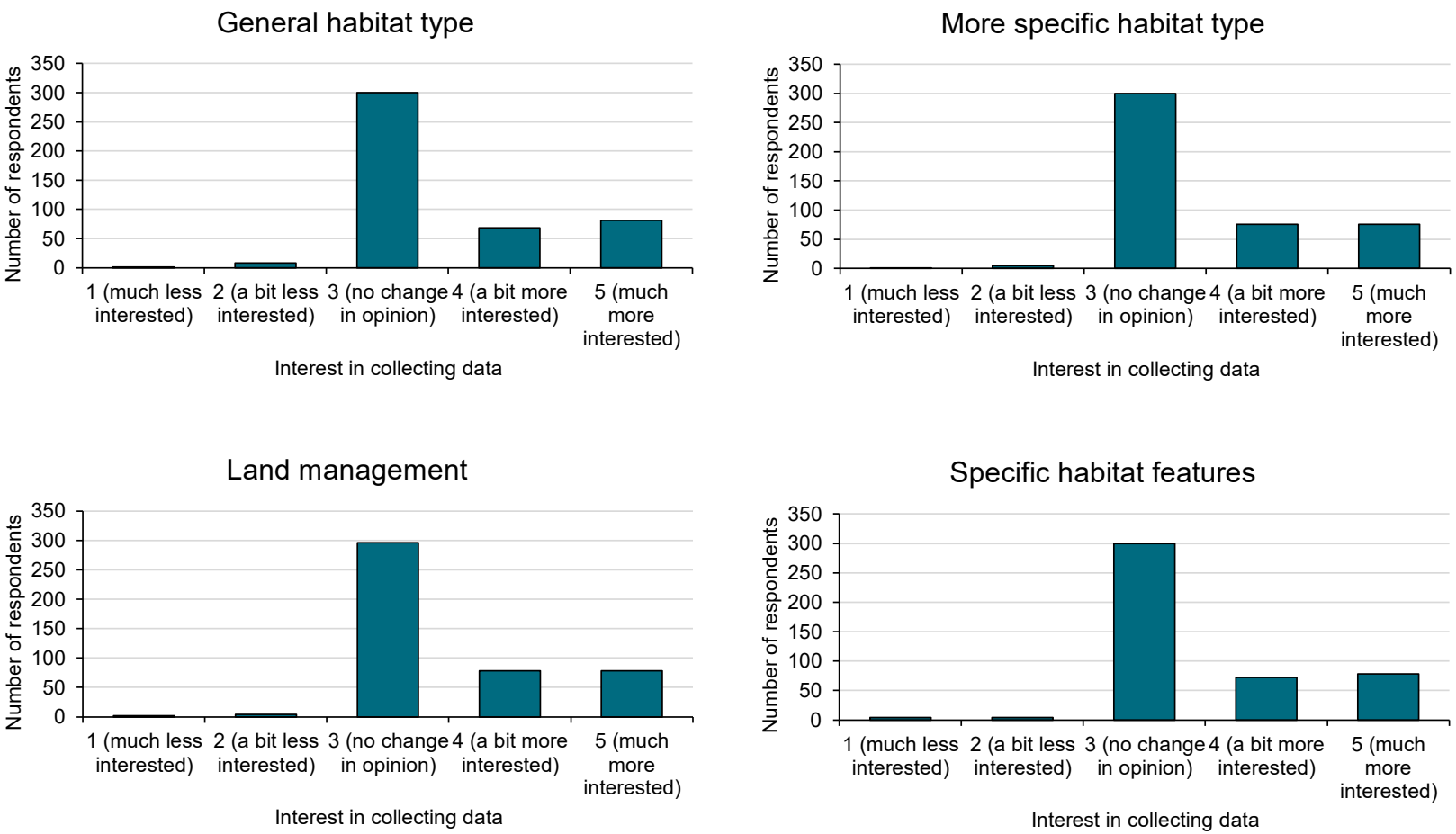

Figure 4. Survey responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting each of the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?", asked after respondents were provided with information about how habitat data can be used (see Appendix 1 for information provided).

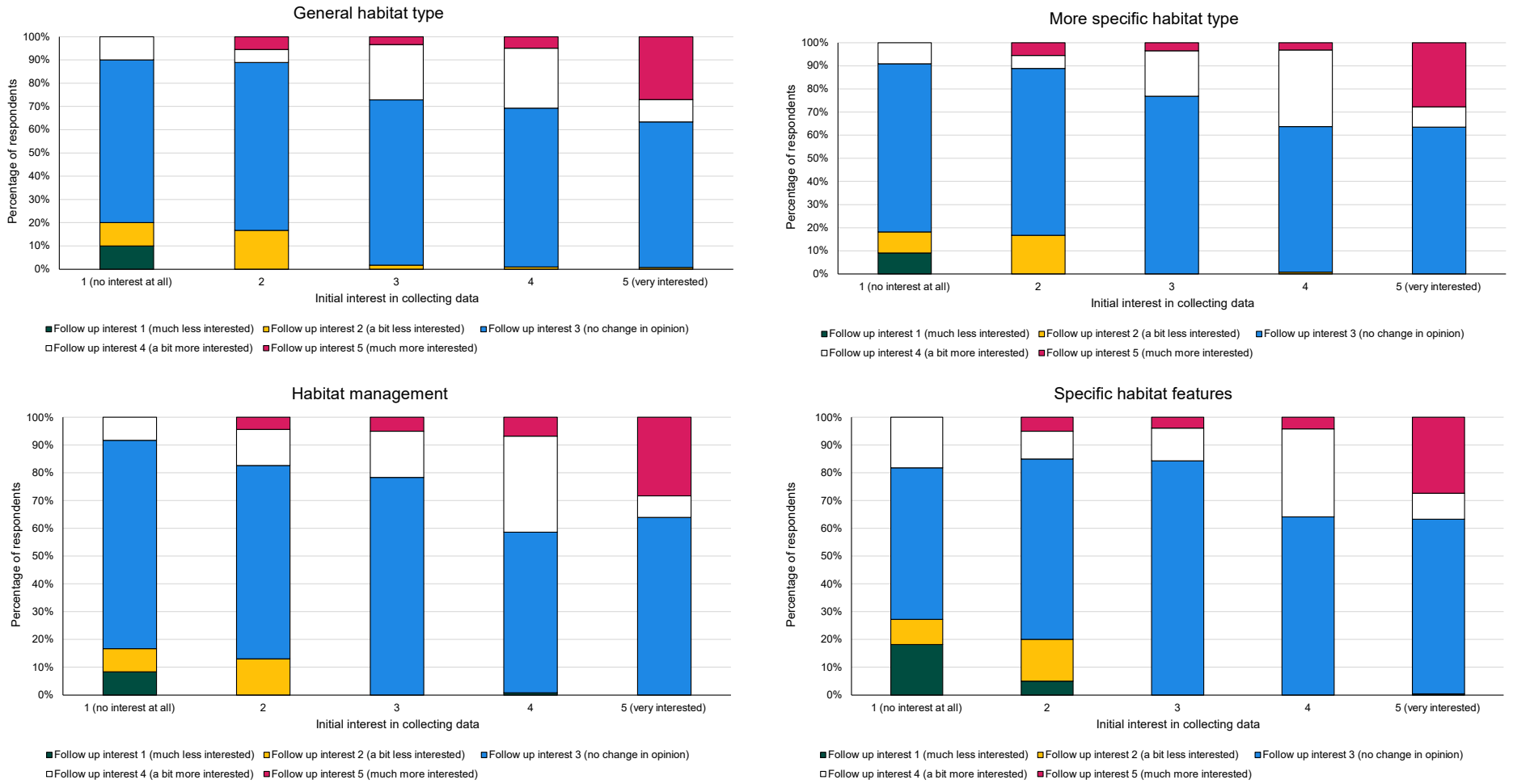

Figure 5. Survey responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting each of the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?," broken down by the extent to which respondents changed their opinion after being given information to read explaining what habitat data can be used for.

3.1.4. Barriers

The barriers to participation in habitat recording selected most frequently were found to be a lack of time (30% of the 722 total responses, where an individual could select up to three responses) and a lack of confidence (26% of total responses - Figure 6). Very few respondents selected factors such as a lack of personal interest (2.6% of total responses) and a lack of understanding of the importance of habitat data (2.5% of total responses). This trend did not differ notably by scheme (see Annex 2).

This suggests that minimising the time commitment required to collect habitat data (e.g. through simple protocols, the use of apps that volunteers may have on them when outside anyway, and combining habitat recording with visits for recording sections – ensuring that it does not detract from the original survey), training and feedback to improve confidence may be useful tools to improve the likelihood of volunteers collecting habitat data (in agreement with Barnes *et al.* 2022). The fact that interest was selected as a barrier by so few respondents may reflect similar biases in the types of people filling out this survey as explored in the 'Interest' section (3.1.2), such as those with little interest in habitat recording being less likely to engage with a survey about it. The fact that a lack of understanding of the importance of habitat data was selected as a barrier by so few respondents may reflect findings in the previous section (3.1.3) relating to the fact that there was little difference in interest levels before and after being given information to read explaining what habitat data can be used for, suggesting that respondents did not see this as an important factor. Whilst transport was not considered a substantial barrier by many respondents, it should be noted that a high proportion of respondents already participated in some form of biological recording and so this may be a more important barrier if attempting to engage a broader audience. For example, Gillings and Harris (2022) found that 88% of visits to BBS squares relied on travel by private car, but only 78% of households within the UK have access to a private car (Department for Transport 2021). Similarly, awareness about recording habitat data may have been biased by the fact that most respondents already participated in other types of recording, as some of them may already record aspects of habitat information as part of their existing schemes or be more generally aware of the options available as part of the existing recording community.

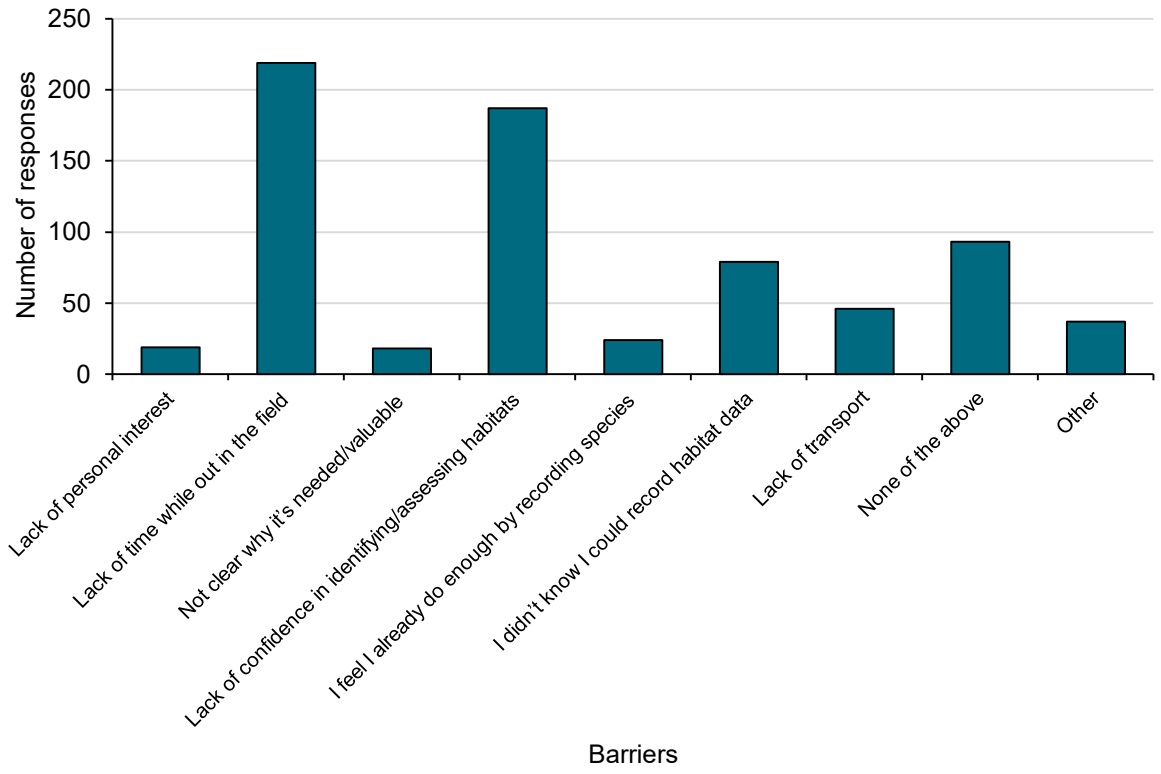

Figure 6. Survey responses to the question "Would any of the following factors prevent you from collecting habitat data? If you already collect habitat data, would any of the following factors prevent you from collecting more habitat data?" Participants were able to select up to three responses. Where more than one option was selected, each response was counted separately, therefore the total number of responses was 722.

3.1.5. Confidence

Despite being identified as a barrier in the previous section, respondents showed reasonably high levels of confidence in terms of recording general habitat data (with 73% stating that they would be confident in recording all types of general habitat, Figure 7). Whilst confidence did decrease for finer scale habitats, it remained high, with only 6–8% stating they would not be confident in recording any types of specific habitat types, visible land management or specific habitat features. This suggests that whilst confidence is likely to be highest for collection of simpler types of habitat data, there is a potential for volunteers to engage with more complex protocols related to finer scale data products. However, it should be noted that an individual's perception of their confidence and their actual accuracy may not align. It should also be noted that respondents may have also been biased by the examples that were given to illustrate the four different types of recording. For example, presence of deadwood and evidence of pollution may be easier 'features' to recognise than other examples within this category that could have been given, such as veteran trees or distinguishing between different types of water-related features, or types of grassland. The fact that confidence was one of the most important barriers to collecting habitat data in the previous section (3.1.4) provides an interesting contrast, suggesting that training or other mechanisms to improve confidence and retain volunteers would be beneficial, even if results to this question suggest a relatively high level of confidence overall.

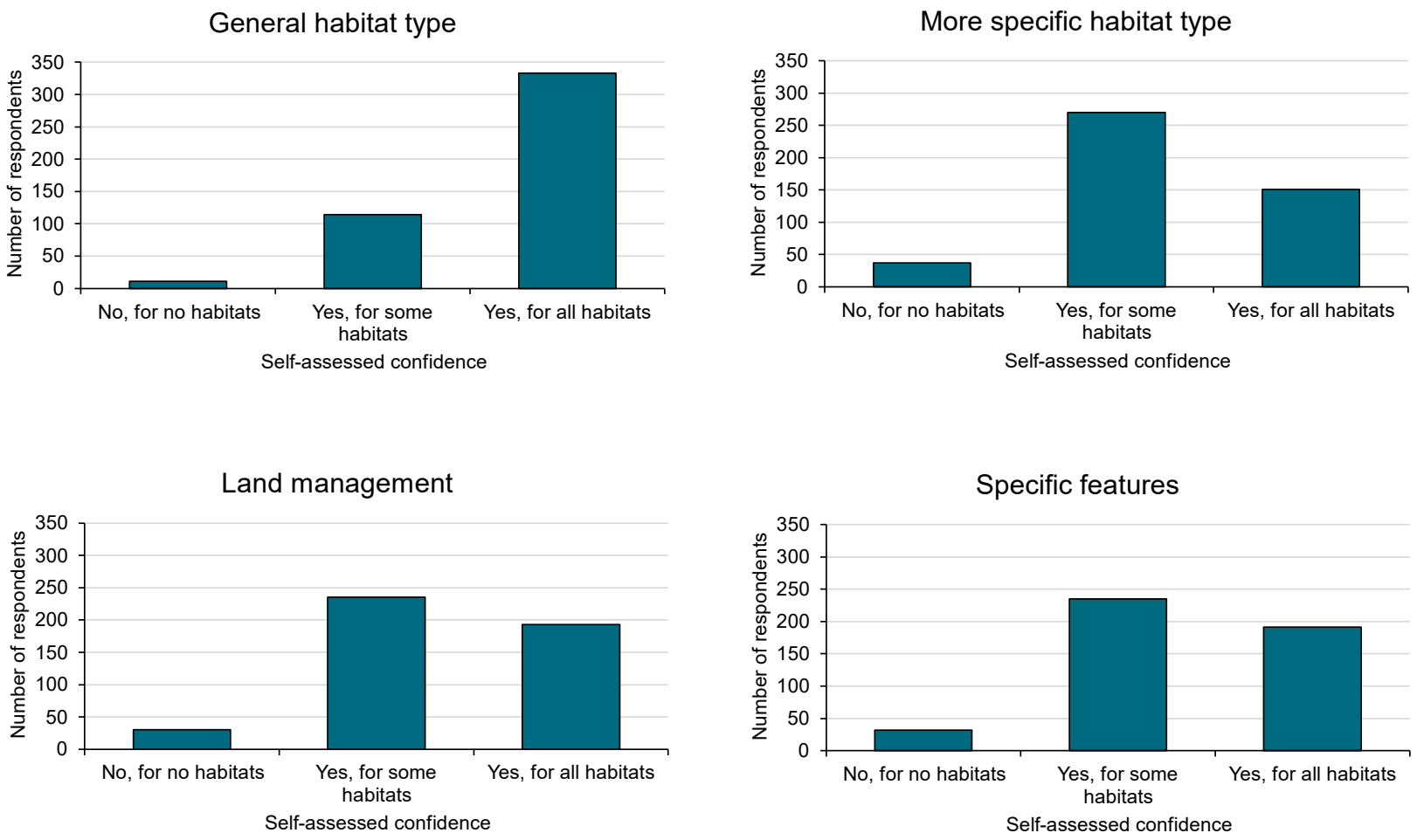

Figure 7. Survey responses to the question "Would you feel confident in your ability to record the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?"

When recording general habitat type, those with high confidence were found to have similar levels of interest than those with low confidence (Figure 8). For example, 64% of those who stated they would be confident recording all general habitat types and 63% of those who stated they would not be confident recording any general habitat types, said they would be very interested in recording habitat data. This suggests there could be a demand for training to improve confidence, and that such provision may be an effective way to increase the number of volunteers taking part in habitat recording (in agreement with Barnes *et al.* 2022). However, when recording finer habitat types (specific habitats, management, and features), those who stated higher confidence did also show higher levels of interest. For example, 68% of those who stated they would be confident recording all specific habitat types but only 19% of those who stated they would not be confident recording these, said they would be very interested in recording habitat data. This provides support for participants having higher interest and confidence in the easier to identify habitat categories over finer habitats and features. Therefore, it depends on the level of habitat information the organiser requires as to the likelihood that volunteers will gladly record and continue to record habitat information.

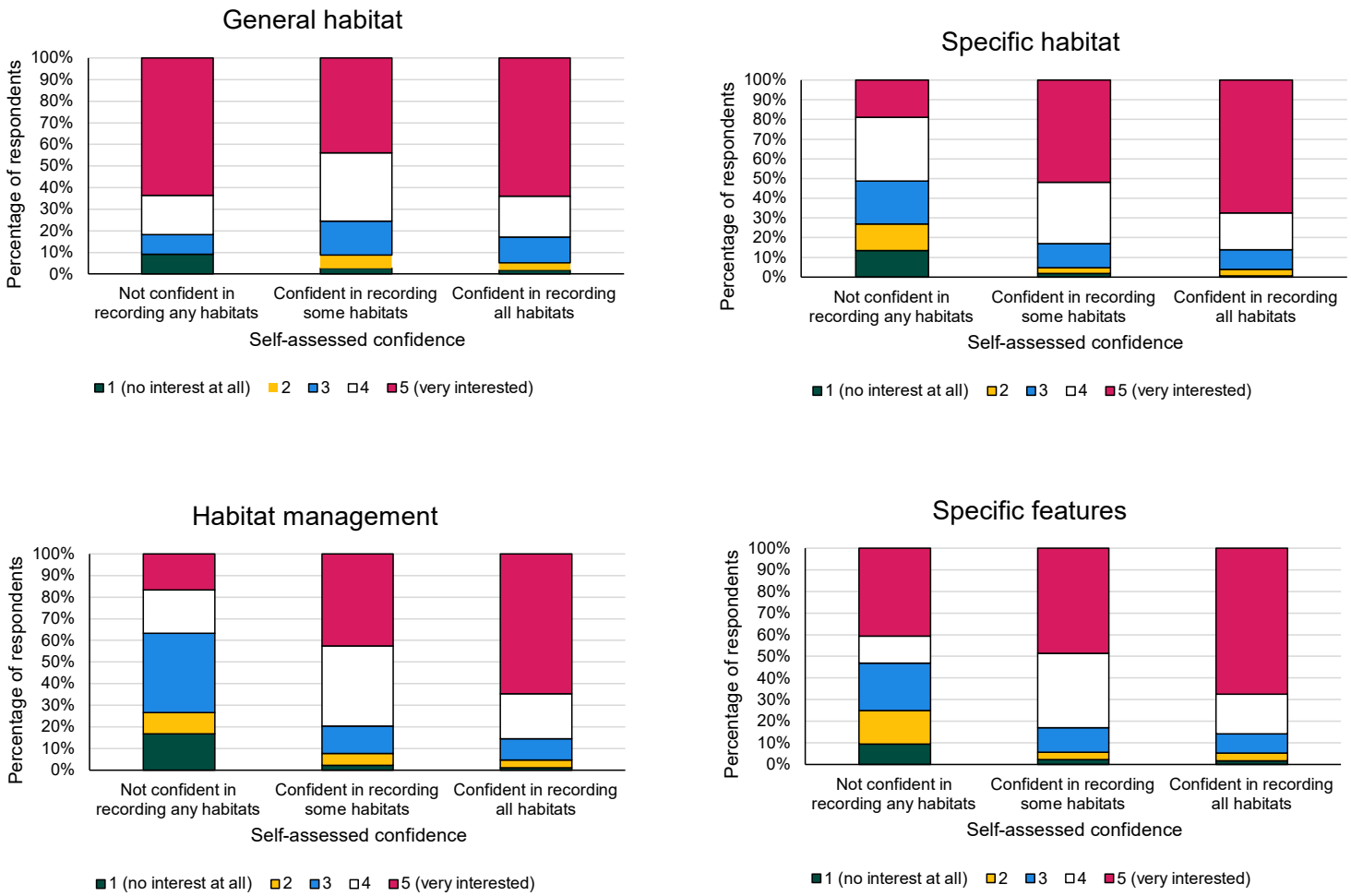

Figure 8. Survey responses to the question "On a scale of 1–5 (where 1 is no interest at all and 5 is very interested) how interested would you be in collecting each of the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?," broken down by responses to the question "Would you feel confident in your ability to record the following types of habitat data: general habitat (e.g. woodland or grassland), specific habitat type (e.g. oak woodland, calcareous grassland), visible habitat management (e.g. grazed or ungrazed) and specific habitat features (e.g. presence of dead wood, evidence of pollution)?"

3.1.6. Training preferences

The most popular training options were found to be instructions to follow in the field (31% of the total 1138 responses, where an individual could select up to three responses) and ongoing support (23% of total responses - Figure 9). The implies a need to ensure any habitat recording is adequately resourced to ensure volunteers can be provided with such support. Options such as online quizzes (7.4% of total responses) and in-person training in the field (9.5% of total responses) were least popular among respondents. This highlights where those developing habitat recording should invest effort to increase participants' confidence and accuracy, showing it may require both in the field training and ongoing support. The percentages did not differ notably by scheme (see Annex 2).

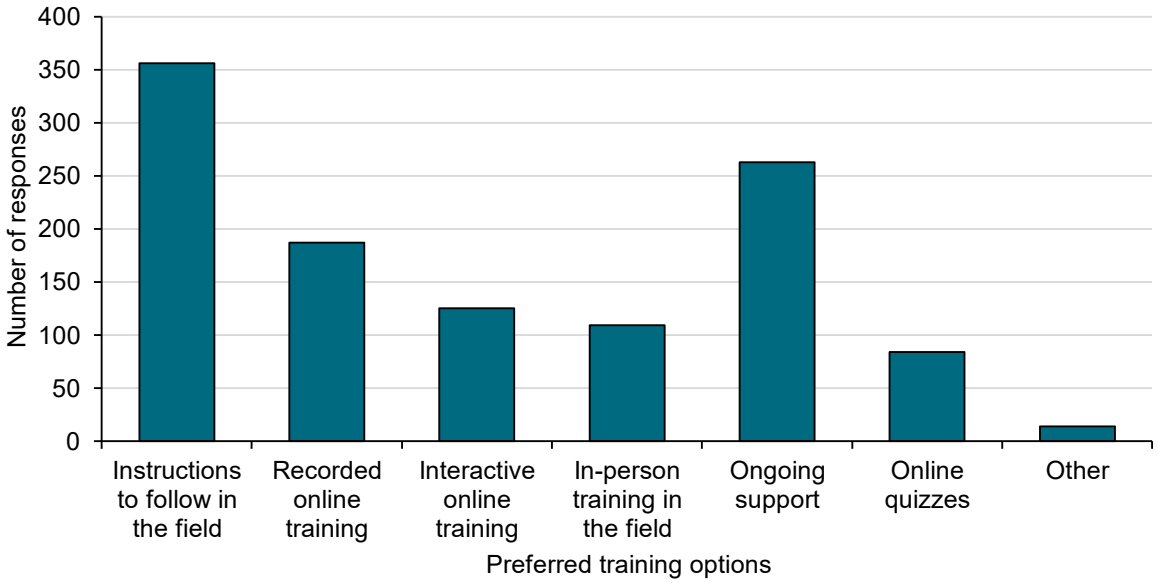

Figure 9. Responses to the survey question "Which of the following would you find most useful as training if you wanted to improve your confidence in recording habitat data?" Participants could select up to three options. Where more than one option was selected, each response was counted separately, therefore there were a total of 1138 responses to this question.

3.1.7. Feedback preferences

The most popular feedback options for volunteers to receive if recording habitat data were: i) graphs showing how habitat is changing over time (26% of the 1171 total responses, where each individual could select up to three responses), ii) case studies (25% of total responses), iii) information about the habitat recorded (24% of total responses) and iv) validation of results through an online community (17% of total responses - Figure 10). Leaderboards (0.5% of total responses) and tracking of personal achievements / contributions (6% of total responses) were the least popular feedback options. This suggests that the respondents to this questionnaire are more interested in what their habitat data means, how it can be used, and if it is correct, rather than any personal gain from collecting the data. This may again be linked to the likely bias in respondents towards those already interested in habitats. Only 0.04% of total responses stated that they would not be interested in receiving feedback, providing a strong justification for scheme organisers to ensure that feedback is included when running schemes involving habitat data collection by citizen scientists. The percentages did not differ notably by scheme (see Annex 2).

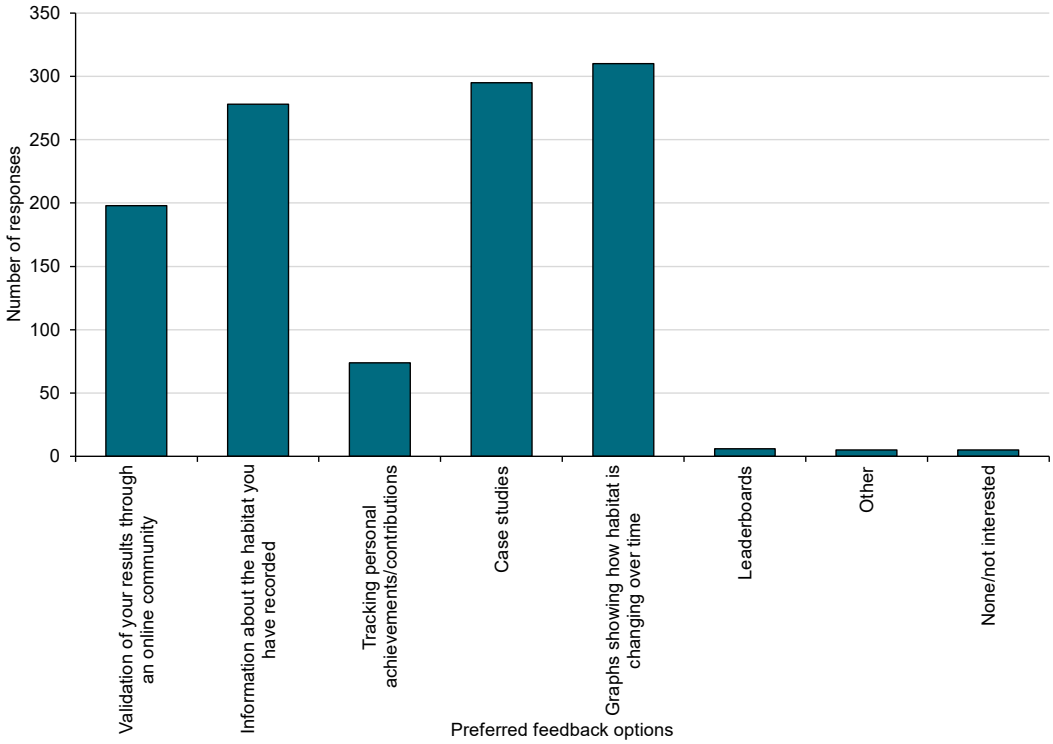

Figure 10. Responses to the survey question "If you collected habitat data, what kind of feedback would you be most interested in receiving?" Participants could select up to three options.

3.1.8. Preference on when to collect habitat data

Respondents who had said they already recorded for a species monitoring scheme were then asked about their preferences on when to collect habitat data in relation to their recording for their current scheme. The majority (74%) preferred recording habitat as part of an existing visit for their current recording, either alongside or as a discrete activity directly beforehand or afterwards (Figure 11), saving time for the volunteer, which was a key barrier in Section 3.1.4. However, to avoid detracting from the original scheme's recording, organisers would have to highlight the need to dedicate separate time to the habitat survey, rather than attempting to fill in habitat information during an existing survey, which may lead to distraction.

Participants were told to assume recording habitat data at a site would take no longer than five minutes. Collection of habitat data beyond a superficial high level classification (which may be easier to ID) is likely to take longer than this and would also depend on the size of the survey area, which should be noted as another potential caveat when interpreting results.

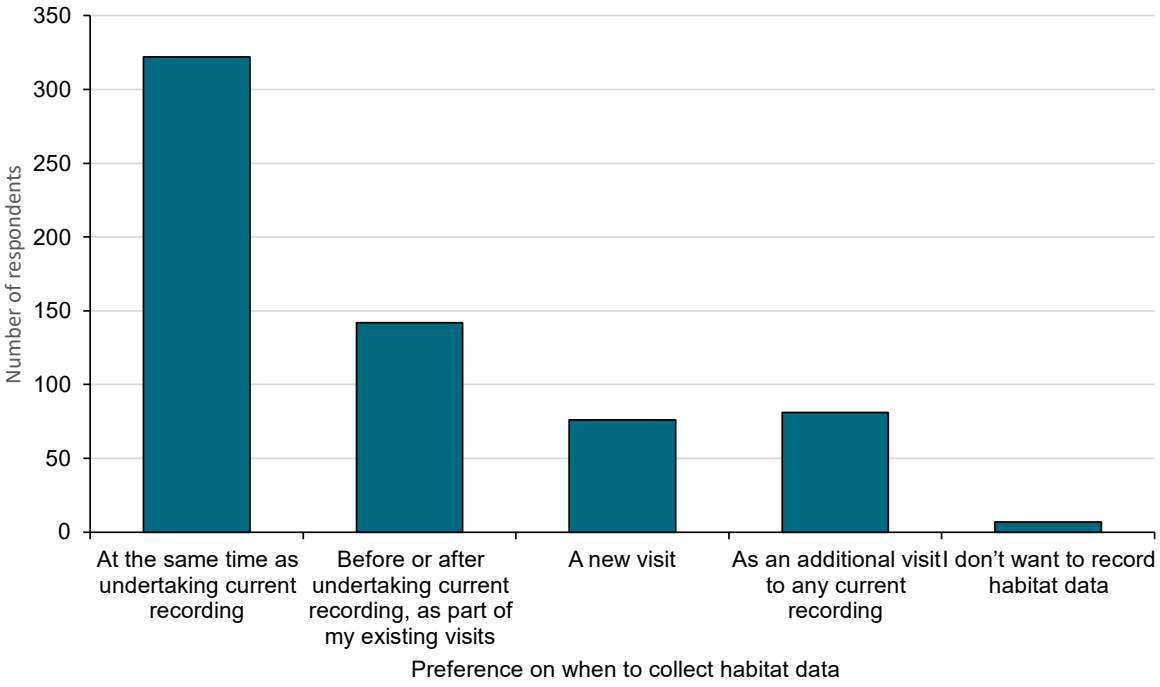

Figure 11. Responses to the survey question "If we invited you to collect habitat data (or collect more habitat data), when would you like to do this? Please assume recording habitat data at a site would take no longer than five minutes.

3.2. Feedback on a habitat recording app

The EarthTrack mobile application is a multi-module mobile application that was developed through Living Earth (Owers *et al*. 2021) to record information routinely, consistently, and globally on land cover (including vegetation strata and species) and land cover change. Additional modules also focus on recording country-specific habitats (currently available for the United Kingdom), dominant plant species (to date, full species lists have been integrated for both Australia and the UK) and fire. EarthTrack was developed to support the validation of thematic maps (e.g. land cover and change) generated primarily from earth observation data and using globally applicable taxonomies. Further information about the app, including instructions for its download, can be found in Appendix 2.

3.2.1. User friendliness

Respondents considered the app to have a mid-level of user friendliness (Figure 12), with 38% giving a rating of 3 on a scale of 1–5, and 29% giving a rating of 4. This suggests that whilst the app in its current version is relatively user friendly, there is definite scope for improvements to be made to develop it to be more so.

Interestingly, non-expert users (those considering themselves to have no knowledge of / experience in recording or distinguishing habitats, plant species, or environment) were more likely to consider the app to be user friendly than expert users (those considering themselves to have good knowledge/experience in recording or distinguishing habitats, plant species, and/or environment; Figure 12). Experts may be more biased by their previous recording experience (finding methods like the way they are used to recording to be the most user-friendly) than non-experts who are approaching the app with a blank slate. Similarly, it may be due to experts interpreting 'user friendly' as 'user friendly for the general public', and harbouring gatekeeping biases about what the public are capable of. Another explanation could be related to those who are older and so have more years of experience being more

likely to classify themselves as expert but may be less likely to use mobile apps and technology for recording or in everyday life. However, another explanation could be that 'non-experts' are not aware when they are providing an answer that is inaccurate or not useful. For example, some further comments from 'expert' respondents (which were not reflected in comments made by 'non-expert' respondents) included "It took 15 minutes to enter partial and misleading information." – whereas a 'non-expert' may not be aware if the information they are providing is partial or misleading, as they have no reference point.

Practical suggestions that were made in the free text comments that could help improve the user friendliness of the app included:

- A more explicit option to stop at a higher taxonomic level of identification (e.g. grass or flowering plants, rather than the species) for those less confident in identification skills (or explanation of this feature through training modules).
- Clearer descriptions of how to undertake estimates of, for example, percentage cover.
- Including the option to enter more than three indicator species where appropriate.
- Provision of online courses or webinars to train people in how to use the app (plans are now underway to provide these soon).
- A clearer ability to save and edit before submitting (this can be done already by clicking the save button at the end instead of the submit button, but it was clear from survey results that some respondents did not understand this was possible).
- Provision of a compass on the map.
- Feedback on answers, for example using Artificial Intelligence to provide a percentage likelihood that the answer given is correct.
- Avoiding duplication across habitat and phenology modules, for example by autocompleting responses in the other module if already completed in one of them.
- A search function for entering the species identification, instead of having to look through all the subheadings.
- A clearer explanation of how the app works, for example how to take photos.
- Being able to select 'I don't know' (currently users can skip questions, but this would make it clearer that they can do so).
- Including clear habitat classification definitions.
- Including the option for users to upload data via a laptop later, to give flexibility for those who do not have or struggle to use a smartphone.

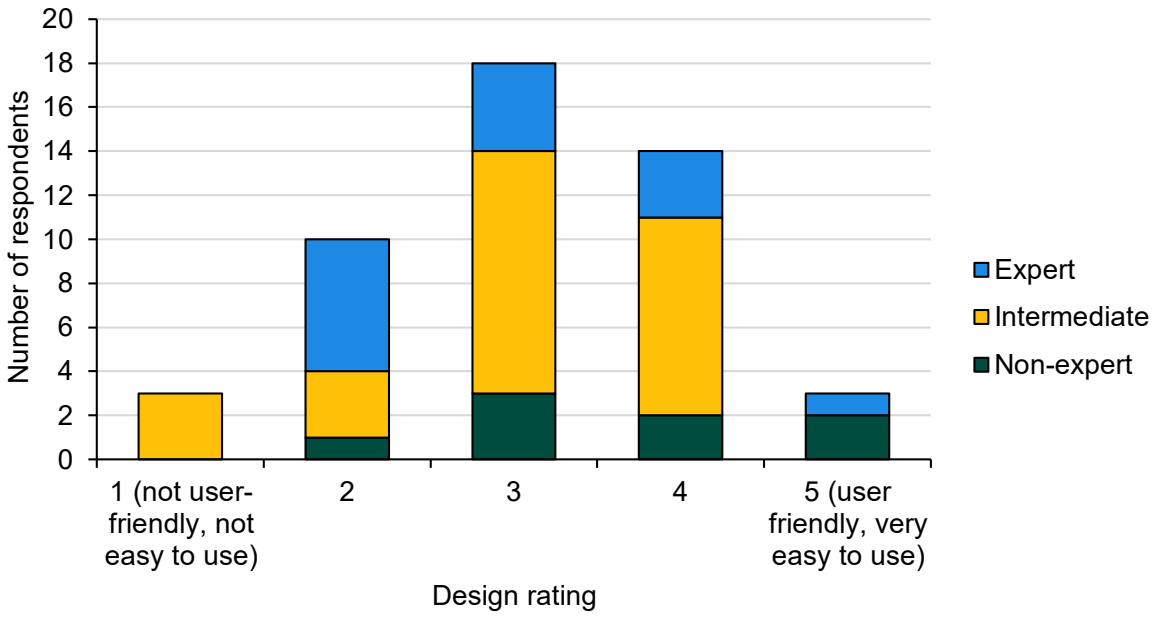

Figure 12. Responses to the survey question "How would you rate the design of the EarthTrack mobile app?", broken down by self-assessed level of expertise of respondents.

3.2.2. Confidence

Respondents were found to have varying levels of confidence when responding to questions asked in different parts of the app. Confidence in answering the questions on the opening screen of the land cover module was relatively high, with 54% of volunteers responding with a 4 or 5 on a scale of 1–5 (where 1 was 'not confident', and 5 was 'very confident' – Figure 13). Confidence in the remaining questions within the land cover module varied, with wetness and leaf type standing out as questions that users had high confidence in responding to, and low confidence in factors such as phenology and plant species (Figure 14). Confidence in answering questions within the habitat module was lower than that for the land cover module, with 37.5% responding with a 4 or 5, 23% responding with a 3, 27% responding with a 1 or 2, and 12.5% not completing the land cover module (Figure 15). Respondents found the change module the most difficult to answer, with only 8% responding with a 4 or 5, 25% with a 3, 29% responding with a 1 or a 2, and a substantial 44% not completing the change module at all (Figure 16). Although reasons for not completing modules were not given, struggling to answer the first few questions is likely to be a reason for at least some of the respondents. Across all parts of the app, those self-assessing as experts had a higher level of confidence than those self-assessing as non-experts, as would be expected. It should be noted that a respondent's confidence may not necessarily align with their accuracy. These responses provide further evidence towards conclusions drawn from the general habitat survey in section 3.1.5, which suggested relatively high levels of confidence for general habitat types but decreasing confidence levels for more specific habitat types and finer details.

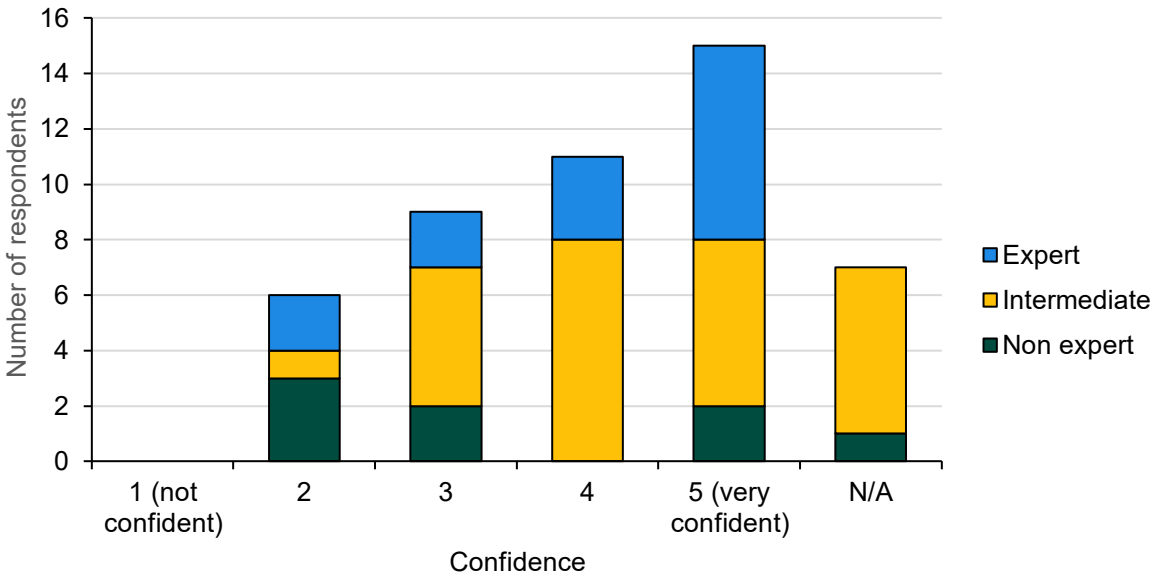

Figure 13. Responses to the survey question "How confident did you feel when answering the first three questions of the land cover module?", broken down by self-assessed level of expertise of respondents. N/A refers to those who did not complete this module of the survey.

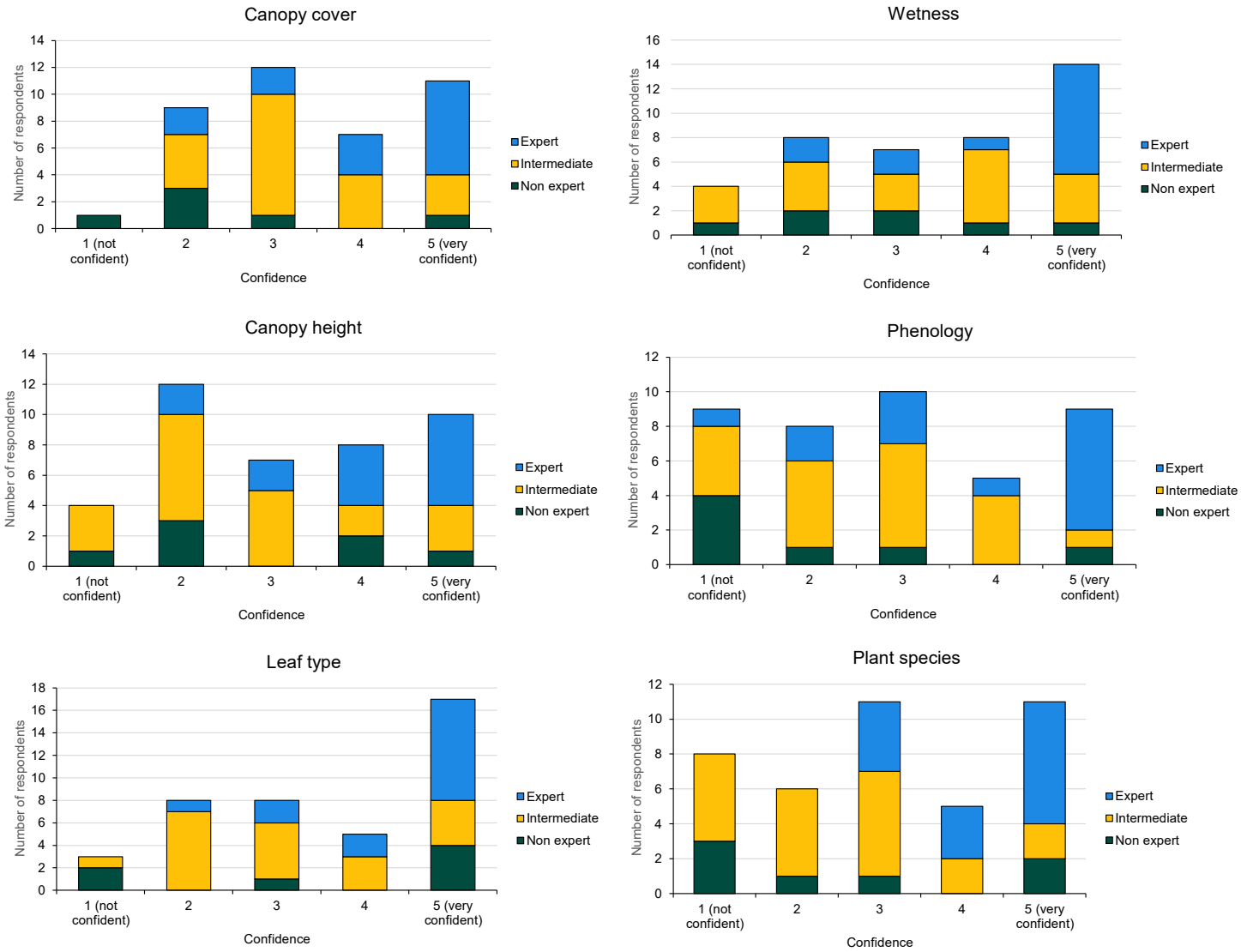

Figure 14. Responses to the survey question “How confident did you feel when answering the questions on the last screen of the land cover module?”, broken down by self-assessed level of expertise of respondents.

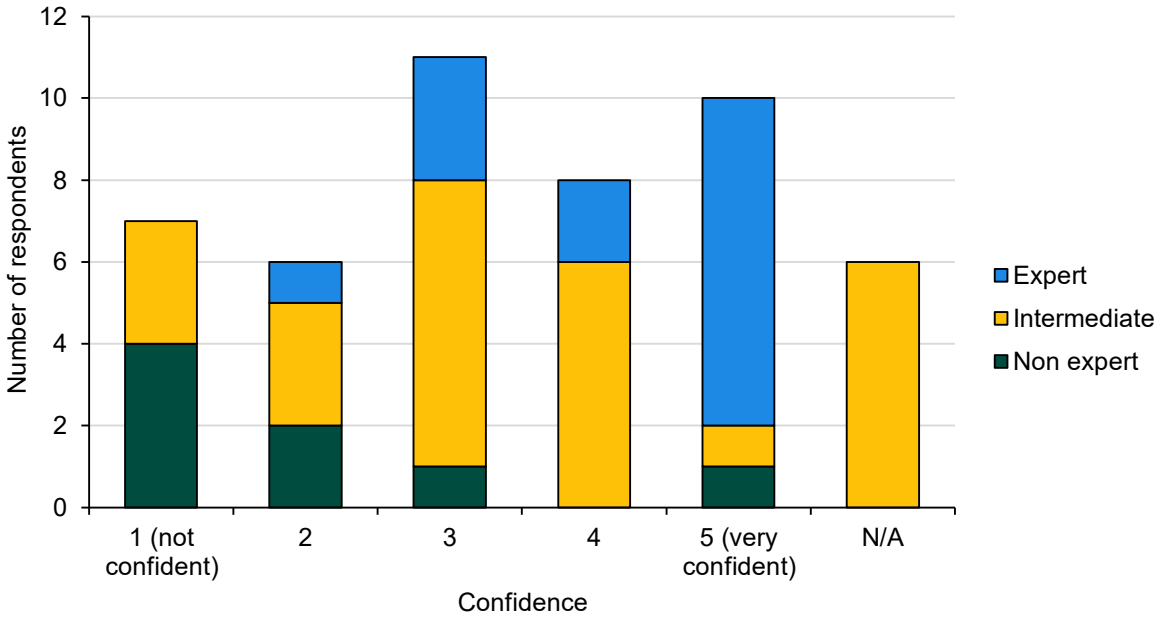

Figure 15. Responses to the survey question "How confident did you feel when answering the questions in the habitat module?", broken down by self-assessed level of expertise of respondents. N/A refers to those who did not complete this module of the survey.

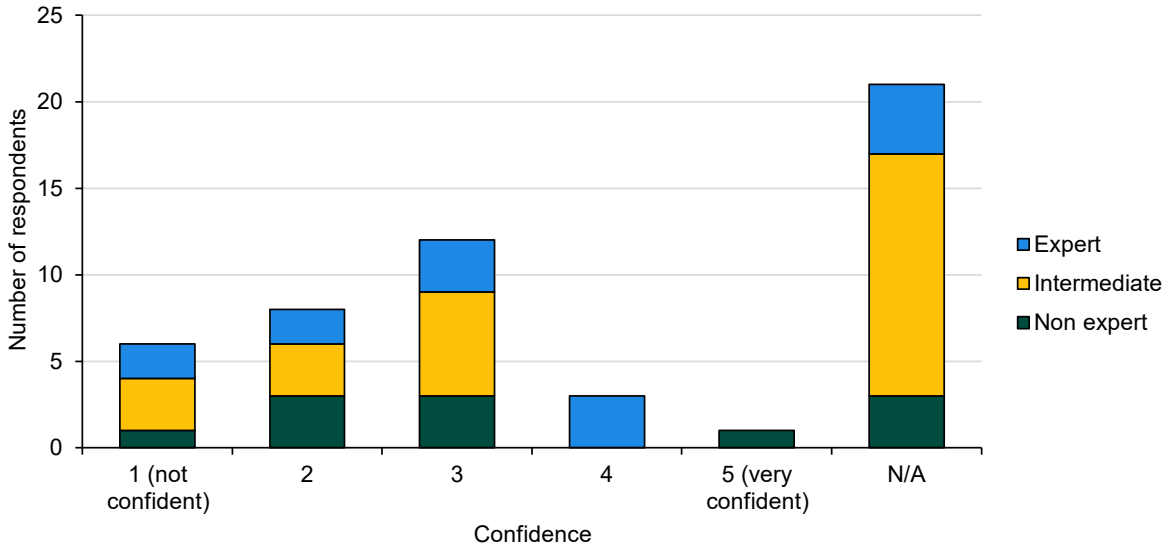

Figure 16. Responses to the survey question "How confident did you feel when supplying information within the change module?", broken down by self-assessed level of expertise of respondents. N/A refers to those who did not complete this module of the survey.

3.2.3. Training

Results showed strong support that provision of training would help to improve respondents' confidence in using the app, with 44% saying it would do so specifically (Figure 17). Suggestions in the free text comments at the end of the survey suggested online or recorded webinars, and feedback on submissions as potential ways to provide this.

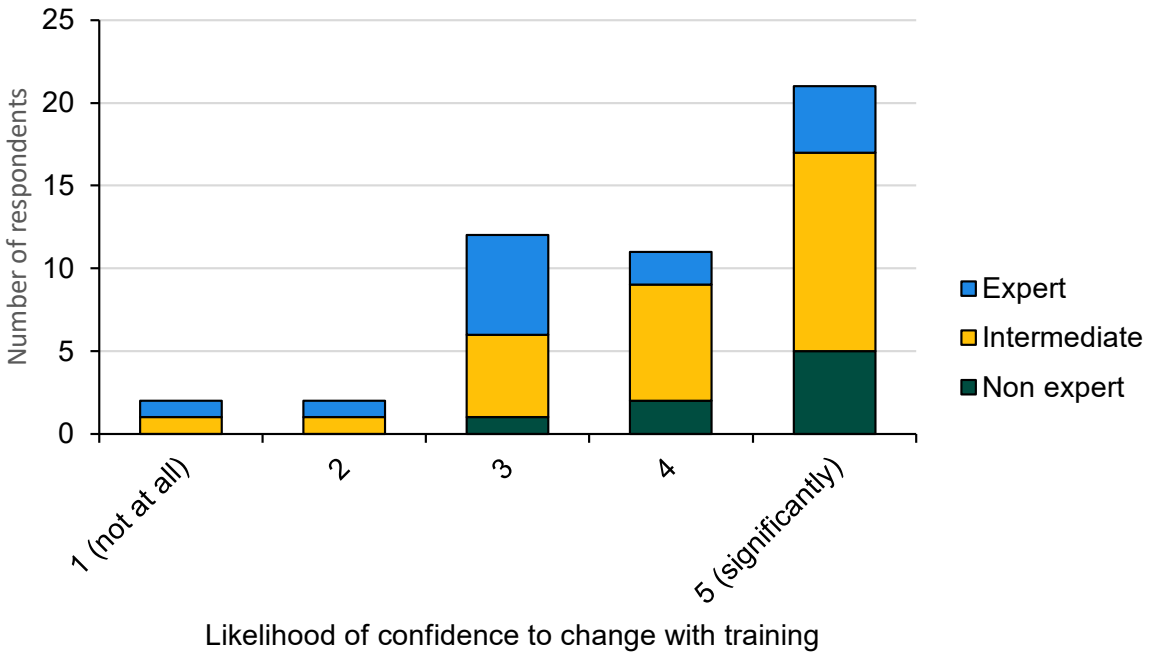

Figure 17. Responses to the survey question "Do you think your answers to the previous questions might change from less confident to more confident if you were given specific training?", broken down by self-assessed level of expertise of respondents.

3.2.4. Likelihood of re-use

Very few (6%) respondents said that they would use the app 'very often' (Figure 18). However, the most common response to this question was a 3 (31%), suggesting that a considerable proportion of people would reuse the app sometimes. Given the nature of the app, occasional use when out and about in a new environment is probably a more realistic expectation of users than regular and repeated engagement in locations visited regularly, so these findings are not surprising. However, a high percentage of respondents (27%) stated that they would not ever use the app again outside of this survey. Overall, findings suggest potential for some degree of volunteer recruitment and retention in terms of using the app but noting that not everyone who tries it out will be interested in continuing to do so, especially if the app remains unchanged (e.g. without improvements such those suggested by respondents).

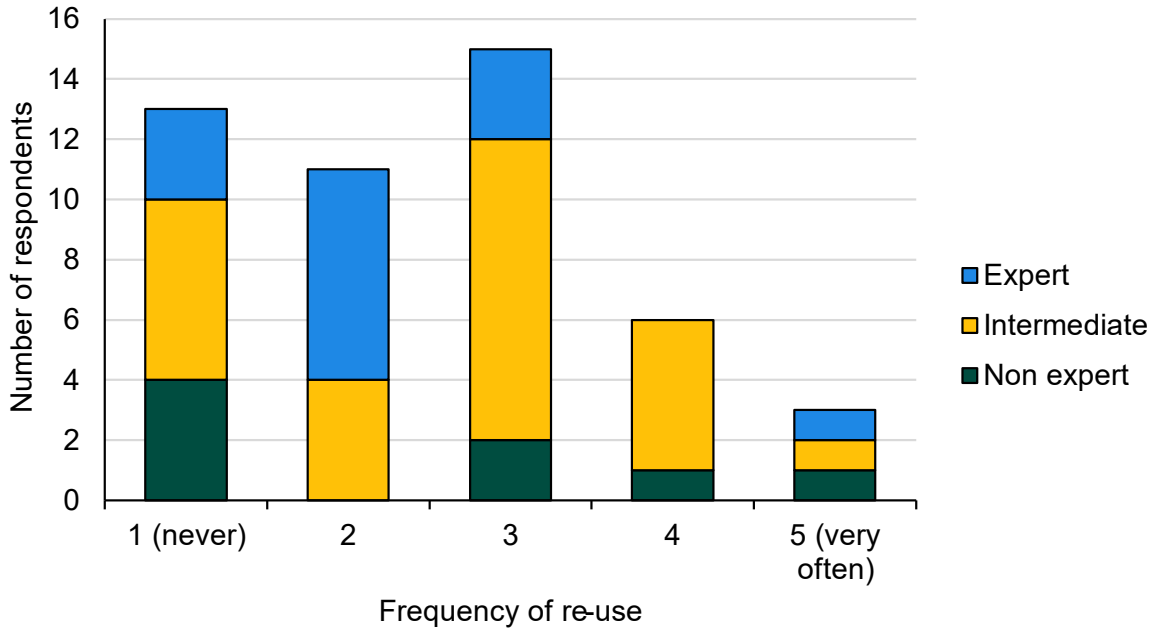

Figure 18. Survey responses to the question “How often do you think you will re-use the EarthTrack mobile application outside of this survey?”, broken down by self-assessed level of expertise of respondents.

4. Conclusion

Overall, the surveys demonstrate a relatively high level of interest and self-assessed confidence in recording habitat data. This would suggest that it could be feasible to make use of citizen scientists to collect more habitat data. However, there may be a bias in those who responded, with those who are already interested in habitat being most likely to choose to complete the survey. Confidence and interest are also dependent on the level of skill required and the difficultly of the task. For example, the results of the survey show that there is high confidence and interest in recording high level habitat categories, although we cannot easily assess capabilities of those who responded to the questionnaire, nor whether they would be able to accurately identify habitat, particularly on finer details and habitat descriptions. However, we are encouraged by the high number of respondents to the survey, which provides evidence supporting the potential feasibility of increased collection of habitat data by citizen scientists. If taking forward these findings to develop approaches to support volunteers with collecting habitat data, the survey also provides evidence (which also supports the framework developed in a previous TSDA project by Barnes *et al.* (2022)) for:

- The importance of minimising the time commitment required to collect habitat data, for example through simple protocols, the use of apps that volunteers may already be using/have to hand and combining habitat recording with existing visits for other recording schemes, without detracting from the core survey if this is additional.
- The importance of training, especially through a combination of instructions to follow in the field and ongoing support.
- Providing feedback to volunteers about how the habitat is changing over time, what their habitat data mean (information about the habitat recorded), what they are used for (case studies), and if they are correct/how they can improve (validation though an online community).

It also suggests that investing effort into explaining the uses of habitat data may not be as effective a method for recruiting those with low current levels of interest, but that it may be a useful tool to retain and reinforce the interest of volunteers who already have higher levels of motivation.

The app survey provides a practical demonstration of this interest in an applied example, as well as several specific recommendations around how to improve the app in future.

The results of this survey contrast somewhat to the prior evidence on volunteer perceptions of habitat recording described within the rationale section of this report. This demonstrates the value of exploring these questions directly with a wide range of volunteers who may be willing to work with the biological recording community to gather valuable habitat data.

The next phase of work on this topic will involve developing a forward plan for how best to implement the collection of additional habitat data with citizen scientists across the UK, based on engagement with relevant stakeholders and results from the survey.

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Weblinks

Table 1. Full URLS for weblinks used in the text.

Weblink text	Full URL
Workshop summaries of the 2018 Terrestrial Evidence Partnership of Partnerships Meeting	https://jncc.gov.uk/our-work/uktepop/#2018-tepop-meeting
Recording of the 2021 Terrestrial Evidence Partnership of Partnership Festival Habitat Recording Workshop	https://www.youtube.com/watch?v=KRzOyRNb-jw
JNCC's Privacy Statement	https://jncc.gov.uk/about-jncc/corporate-information/data-protection/privacy-statement/
Download the EarthTrack app for iOS/iPhone	https://apps.apple.com/fr/app/earthtrack/id1610357134
Download the EarthTrack app for Android	https://play.google.com/store/apps/details?id=com.natural_apptitude.earthtrack

Appendix 1 – Questions asked in the volunteer interest survey

The text below is taken directly from the Microsoft Form that was sent out to respondents, including the introductory information that they received and all questions that were asked.

“We (JNCC) are interested in understanding perceptions about recording habitat information. Habitat information is important for conservation, so we would like to explore the feasibility of increasing the amount of it collected by members of the public in the UK, as volunteer citizen scientists. Whether you are completely new to recording, or already record for a scheme that collects some habitat data, we are interested to hear from you.

The survey shouldn’t take more than 10 minutes of your time and we’d be really grateful for your input. It will close to new responses at midnight on 31st July 2023.

For the purposes of this survey, we consider habitat information to be anything relating to:

- General habitat type (e.g. woodland or grassland)
- More specific habitat type (e.g. oak woodland, calcareous grassland)
- Management (e.g. grazed or ungrazed)
- Specific features (e.g. presence of dead wood, evidence of pollution)

Your participation in this survey is entirely voluntary and you are free to withdraw at any time, without reason. All data provided will be treated in strict confidence. Any personal data you choose to provide will be anonymised from the other survey questions. Please note that the Data Controller for responses to the questionnaire will be JNCC. Further information about how we process your personal data is available via JNCC’s Privacy Statement: https://jncc.gov.uk/about-jncc/corporate-information/data-protection/privacy-statement/

Consent and eligibility

1. I confirm that I have read and understood the information above. I have had the opportunity to consider the information, ask questions and have these answered satisfactorily. I understand that my consent to participate in this research project is voluntary and that I am free to withdraw this consent at any time without giving any reason. I understand that relevant sections of my data collected during the research may be looked at by authorised individuals from JNCC, where it is relevant to my taking part in this research. I give permission for these individuals to have access to these records. I understand that data from me may be used within reports and shared with other organisations interested in habitat recording, and that I will not be identifiable from this information. I understand that the data collected from me will be used to support other research in the future, and may be shared anonymously with other researchers, for their ethically approved projects. I agree to taking part in the survey.

    - Yes, I understand all of the above and consent to taking part in the survey

2. To be eligible to complete the survey, you must be based in the UK and be at least 18 years old.

    - Yes, I confirm that I am based in the UK and am at least 18 years old

Interest

3. **On a scale of 1-5, how interested would you be in collecting each of the following types of habitat data?** Please don't worry about whether you feel you would be able to record these types of habitats based on your current knowledge, and respond only based on how interesting you think you would find it if you could. Please assume recording habitat data at a site would take no longer than five minutes. If you already collect these kinds of habitat data, how interested would you be in collecting more?

    - General habitat type (e.g. woodland or grassland)
        - 1 (no interest at all)
        - 2
        - 3
        - 4
        - 5 (very interested)
    - More specific habitat type (e.g. oak woodland, calcareous grassland)
        - 1 (no interest at all)
        - 2
        - 3
        - 4
        - 5 (very interested)
    - Management (e.g. grazed or ungrazed)
        - 1 (no interest at all)
        - 2
        - 3
        - 4
        - 5 (very interested)
    - Specific features (e.g. presence of dead wood, evidence of pollution)
        - 1 (no interest at all)
        - 2
        - 3
        - 4
        - 5 (very interested)

Informed interest

Habitat data can:

- **Help land managers understand what conservation actions to take and whether they are working**. For example, it can be used to understand which species depend on which habitat types and how species will change across the landscape.

- **Help provide decision makers with evidence and national trends to inform policies**. For example, it can be used to assess what is happening against policy targets, highlight where habitat changes are taking place and what is driving them, and identify which types of habitats are in decline or poor condition to target restoration efforts.
- **Help species surveys be more informative**. For example, it can be used to ensure recording takes place in habitats representative of the wider environment and to confirm species records.
- **Help analysts provide maps that can more effectively feed into all of the above.** For example, it is needed to confirm the habitats identified by satellite imagery, which can be used to create detailed country-wide habitat maps.All of these applications can be helped with any of the types of habitat information listed below. The more detail that is collected (e.g. information on more specific habitat types, management and features), the more of these applications it is possible to use the data for.

4. Having read this information, have your answers to the previous question changed at all?

- General habitat type (e.g. woodland or grassland)
    - 1 (much less interested)
    - 2 (a bit less interested)
    - 3 (no change in opinion)
    - 4 (a bit more interested)
    - 5 (much more interested)
- More specific habitat type (e.g. oak woodland, calcareous grassland)
    - 1 (much less interested)
    - 2 (a bit less interested)
    - 3 (no change in opinion)
    - 4 (a bit more interested)
    - 5 (much more interested)
- Management (e.g. grazed or ungrazed)
    - 1 (much less interested)
    - 2 (a bit less interested)
    - 3 (no change in opinion)
    - 4 (a bit more interested)
    - 5 (much more interested)
- Specific features (e.g. presence of dead wood, evidence of pollution)
    - 1 (much less interested)
    - 2 (a bit less interested)
    - 3 (no change in opinion)
    - 4 (a bit more interested)

- 5 (much more interested)

Training and barriers to participation

5. **If you already collect habitat data, would any of the following factors prevent you from collecting more habitat data?** Please select at most 3 options.

    - Lack of personal interest
    - Lack of time
    - Lack of transport
    - Not clear why it's needed/valuable
    - Lack of confidence in identifying/assessing habitats
    - I feel I already do enough by recording species
    - I didn't know I could record habitat data
    - None of the above
    - Other

6. **Would you feel confident in your ability to record the following types of UK habitat data?** This is your confidence based on your current levels of knowledge with no additional training.

    - General habitat type (e.g. woodland or grassland)
        - Yes, for all habitats
        - Yes, for some habitats
        - No, for no habitats
    - More specific habitat type (e.g. oak woodland, calcareous grassland)
        - Yes, for all habitats
        - Yes, for some habitats
        - No, for no habitats
    - Management (e.g. grazed or ungrazed)
        - Yes, for all habitats
        - Yes, for some habitats
        - No, for no habitats
    - Specific features (e.g. presence of dead wood, evidence of pollution)
        - Yes, for all habitats
        - Yes, for some habitats
        - No, for no habitats

7. **Which of the following would you find most useful as training if you wanted to improve your confidence in recording habitat data?** Please select at most 3 options.

    - A set of written instructions to follow in the field, including written descriptions of each habitat aspect to be distinguished and visual aids such as photos
    - An online training session, such as a recorded video tutorial
    - An interactive online training session, such as a webinar where I would have the ability to ask questions
    - An in-person training session in the field
    - Ongoing support, such as an ability to submit photos and questions to someone ora community who could help throughout the field season
    - Online quizzes to test your knowledge
    - Other

8. **If you collected habitat data, what kind of feedback would you be most interested in receiving?** Please select at most 3 options.

    - Tracking personal achievements/contributions (e.g. how many records you've submitted that year)
    - Leaderboards (e.g. how many records have you submitted compared to others)
    - Case studies detailing how the data collected is being used
    - Graphs showing how habitat is changing over time, according to results of the data collection
    - Validation of your results through an online community (e.g. if you flag that you are uncertain about a record, others could look at photos you have taken to confirm or suggest a correction)
    - Information about the habitat you have recorded, e.g. what species you might expect to see in the habitat you have recorded and the benefits that this habitat provides
    - Other

Current recording

9. **Within the last year, have you taken part in an environmental recording scheme or coordinated recording effort, and if so which one(s)?** If there are any schemes you are involved with that are not listed below, please specify within the "Other" box.

    - No, I have not taken part in any environmental recording within the last year
    - Breeding Bird Survey
    - Waterways Breeding Bird Survey
    - Wetland Bird Survey
    - UK Butterfly Monitoring Survey or Wider Countryside Butterfly Survey
    - National Plant Monitoring Scheme

- National Bat Monitoring Programme
- Seabird Monitoring Programme
- Goose and Swan Monitoring Programme
- Ringing schemes (e.g. Ringing Adults for Survival, Constant Effort Sites)
- Nest record scheme
- Pollinator Monitoring Scheme – 1 km square survey
- Pollinator Monitoring Scheme - FIT counts
- National Amphibian Survey
- Natterjack Toad Monitoring Programme
- National Reptile Survey (including participation through Snakes in the Heather)
- National Water Vole Monitoring Programme
- National Dormouse Monitoring Programme
- Living with Mammals survey
- National Harvest Mouse Survey
- Volunteer Mountain Hare Survey
- Nature's calendar
- iRecord
- iNaturalist
- BirdTrack
- Record Pool
- Garden Dragon Watch
- Other

10. **If we invited you to collect habitat data (or collect more habitat data), when would you most like to do this?** Please assume recording habitat data at a site would take no longer than five minutes.

    - At the same time as undertaking current recording
    - Before or after undertaking current recording, or on the way to or from my current recording, as part of my existing visits
    - As an additional visit to any current recording (to the same or a different site as current recording) to focus on habitat recording specifically
    - A new visit (I don't currently take part in environmental recording)
    - I don't want to record habitat data

Focus groups

11. This survey is part of a bigger project to support and develop biological recording in the UK. We will be running focus groups on different topics in the coming years, who we will be consulting for views on biological recording developments. **Would you like**

to join the mailing list to receive invitations to join focus groups? We expect to give 2-3 invitations per year, and you will be under no obligation to join a focus group. Focus groups may be virtual or in-person. The project is led by the Joint Nature Conservation Committee (JNCC), the British Trust for Ornithology (BTO) and the UK Centre for Ecology and Hydrology (UKCEH), but JNCC will be the data controllers for this mailing list.

- Yes
- No

[Those who signed up to focus groups were asked additional questions, but as the results of these are not reported on in this report those questions have not been included here.]

Experience

22. **How often do you currently participate in biological recording?** If you record for more than one scheme, please total your participation across all schemes. If you record for a taxa that is seasonal (e.g. butterflies, fungi), please only consider frequency during the typical recording season. (Optional)

    - Usually weekly, or more often
    - Usually between weekly and monthly
    - Usually between monthly and quarterly
    - Usually between quarterly and annually
    - Usually less frequently than annually
    - Never

23. **How long have you been a regular participant (annually or more often) in biological recording?** If you participate in more than one scheme, please answer in relation to the scheme that you have had the longest continuous involvement with. (Optional)

    - Less than 1 year
    - 1-2 years
    - 3-5 years
    - 6-10 years
    - More than 10 years
    - I don't regularly participate in biological recording

24. **How confident are you in your identification skills for the type of organism (e.g. birds, plants or butterflies) that you record for?** If you record for more than one type of organism, then please answer only for the type that you have highest confidence in. (Optional)

    - Low confidence – I consider myself to be a beginner recorder
    - Medium confidence – I consider myself to be an intermediate level recorder
    - High confidence - I could be described as an expert recorder

- I don’t currently participate in biological recording

Conclusion

25. Thank you for taking the time to complete the survey – your input is very valuable to us. **If you have any additional comments about habitat recording that you would like to let us know about, please feel free to add them here.”** (Free text responses were accepted for this question.)

Appendix 2 – Questions asked in the EarthTrack app feedback survey

The text below is taken directly from the Microsoft Form that was sent out to respondents, including the introductory information that they received and all questions that were asked.

“Through this survey, we are aiming to understand the user-friendliness of a new app called EarthTrack, which has been designed to help record habitat data. The app is one of several options being explored to help volunteers collect habitat data in the UK. We (JNCC and Aberystwyth University) would be very grateful if you could follow the instructions below to test out the app, and then complete the survey to help us understand how to improve the app and habitat recording in general. Whether you are completely new to recording, or already record for a scheme that collects some habitat data, we would be interested to hear from you.

Testing the app should take no longer than 5 minutes once you are in your chosen location with the app downloaded and have GPS signal. Filling in the survey should take no longer than 5 minutes. It will close to new responses at midnight on 31st July 2023.

Your participation in this survey is entirely voluntary and you are free to withdraw at any time, without reason. All data provided will be treated in strict confidence. Any personal data you choose to provide will be anonymised from the other survey questions. Please note that the Data Controller for responses to the questionnaire will be JNCC. Further information about how we process your personal data is available via JNCC’s Privacy Statement: https://jncc.gov.uk/about-jncc/corporate-information/data-protection/privacy-statement/

Background

The EarthTrack mobile application is being developed by Aberystwyth University to record ground level information routinely and consistently on land cover, habitats, and change. This information is used to help validate (improve the accuracy of) map products for the UK and worldwide. Accurate habitat information is important for conservation. We would love your feedback on this app to help improve it further.

We encourage anyone with a smartphone to try out the app and fill in the survey - next time you’re out, why not give it a go? If you already record for other projects, your current site visits might be a good opportunity to try it out (for example on the way home from your recording site), but please don’t let it disturb your current recording in any way.

Consent and eligibility

Instructions

1) Download the application – search for EarthTrack on the App Store (iOS) or the Google Play Store (Android). Please note that there are several EarthTrack apps – the one you are looking for has the logo you can see here (to the right or below depending on your device). Alternatively, use one of the following links:

- iOS/iPhone users: https://apps.apple.com/fr/app/earthtrack/id1610357134
- Android users: https://play.google.com/store/apps/details?id=com.natural_apptitude.earthtrack

2) Choose and go to a location to record habitat. This could be anywhere that's outside and has a 15 m radius (the length of a bus) with consistent habitat/landcover (as long as you are not accessing private land without permission or hazardous areas - see the app's terms and conditions).

3) Record the habitat at your chosen location, following the instructions on the app. Please note that you don't need to answer everything – if you don't know how to fill in a particular section, just leave it blank.

1. Please return to this survey after having tried out the app.
    - I confirm that I have tried out the app
2. To be eligible to complete the survey, you must be at least 18 years old.
    - I confirm that I am at least 18 years old
3. I confirm that I have read and understood the information above. I have had the opportunity to consider the information, ask questions and have these answered satisfactorily. I understand that my consent to participate in this research project is voluntary and that I am free to withdraw this consent at any time without giving any reason. I understand that relevant sections of my data collected during the research may be looked at by authorised individuals from JNCC, where it is relevant to my taking part in this research. I give permission for these individuals to have access to these records. I understand that data from me may be used within reports and shared with other organisations interested in habitat recording, and that I will not be identifiable from this information. I understand that the data collected from me will be used to support other research in the future, and may be shared anonymously with other researchers, for their ethically approved projects. I agree to taking part in the survey.
    - I understand all of the above and consent to taking part in the survey

Expertise

4) How would you rate your level of expertise?

- Non expert (no knowledge/experience about recording or distinguishing habitats, plant species, or environment)
- Intermediate (basic knowledge/experience about recording or distinguishing habitats, plant species, or environment)
- Expert (good knowledge/experience about recording or distinguishing habitats, plant species, and/or environment)

User feedback

5) How would you rate the design of the EarthTrack mobile app?

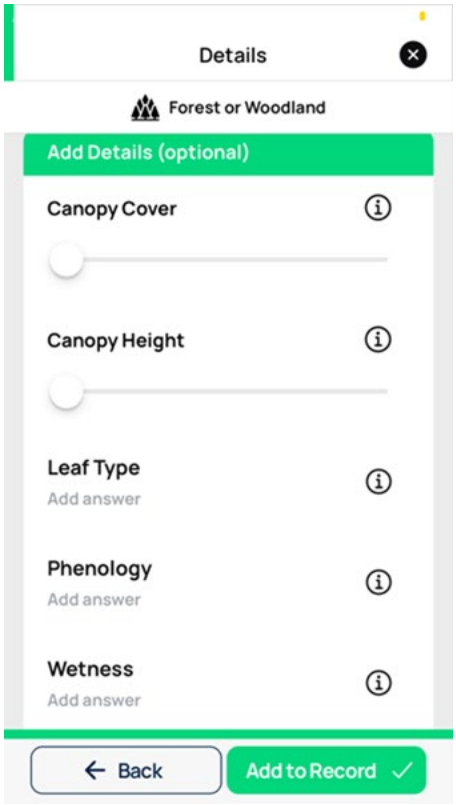
- 1 (not user-friendly, not easy to use)
- 2
- 3
- 4
- 5 (user friendly, very easy to use)

6) How confident did you feel when answering the first three questions of the land cover module (illustrated below)?

- 1 (not confident)
- 2
- 3

- 4
- 5 (very confident)
- Na - I did not answer the questions in the land cover module

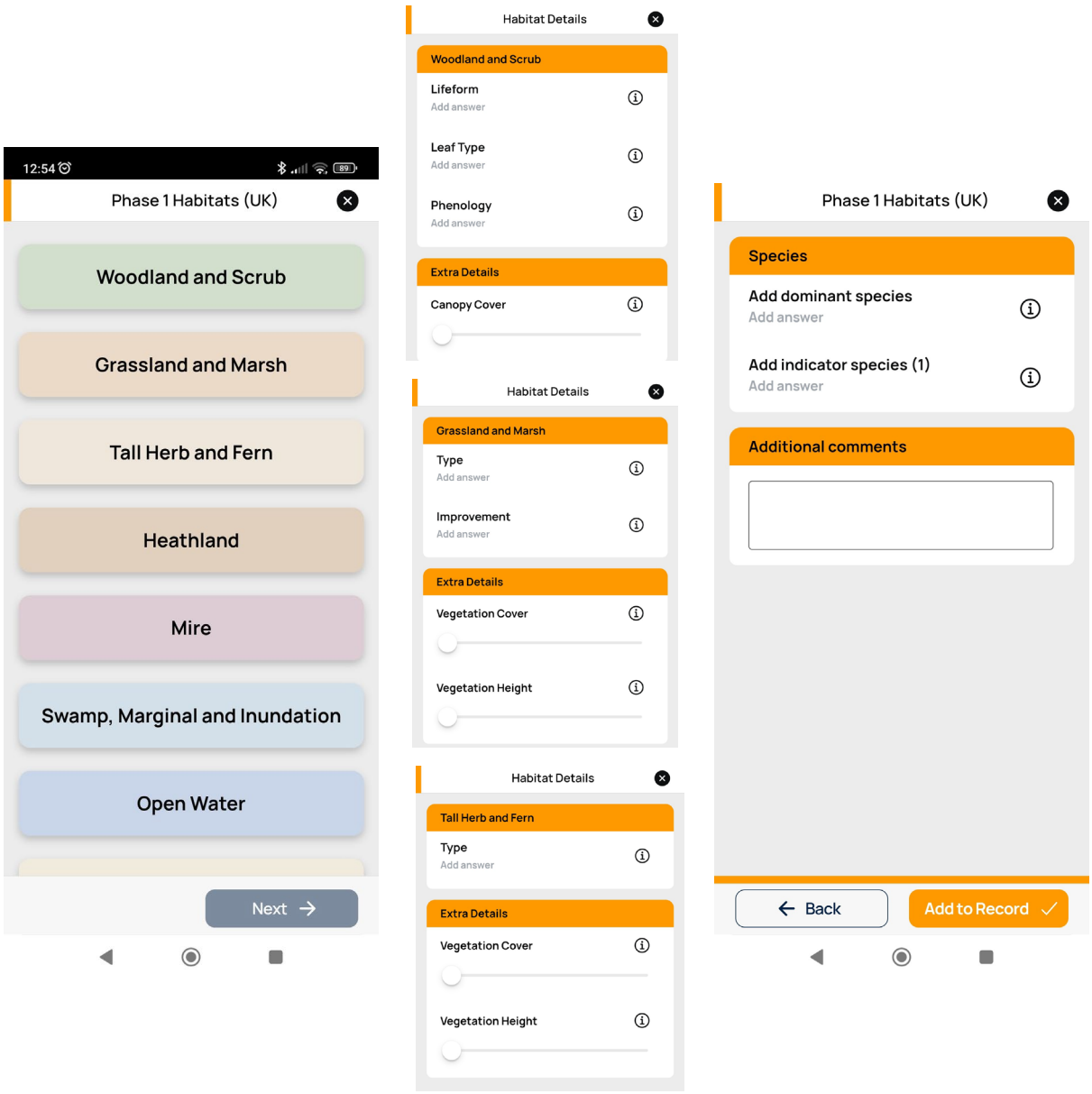
7) How confident did you feel when answering the questions on the last screen of the land cover module (illustrated below)?



- Canopy cover
    - 1 (not confident)
    - 2
    - 3
    - 4
    - 5 (very confident)
- Canopy height
    - 1 (not confident)
    - 2
    - 3
    - 4
    - 5 (very confident)
- Leaf type
    - 1 (not confident)
    - 2

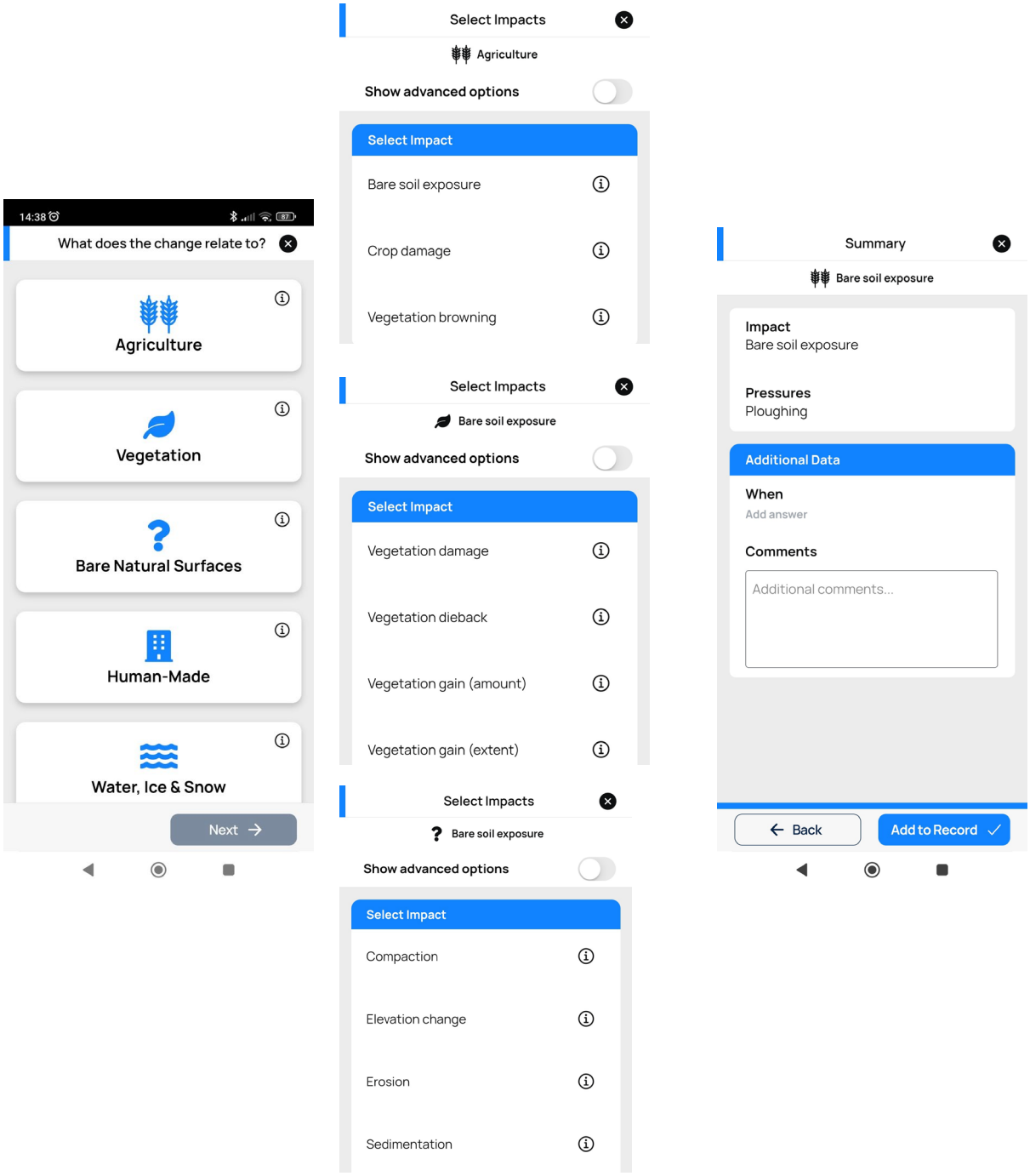
    - 3
    - 4
    - 5 (very confident)
- Wetness
    - 1 (not confident)
    - 2
    - 3
    - 4
    - 5 (very confident)
- Phenology
    - 1 (not confident)
    - 2
    - 3
    - 4
    - 5 (very confident)
- Plant species
    - 1 (not confident)
    - 2
    - 3
    - 4
    - 5 (very confident)

8) How confident did you feel when answering the questions in the habitat module (illustrated below)?



- 1 (not confident)
- 2
- 3
- 4
- 5 (very confident)
- Na - I did not answer the questions in the habitat module

9) How confident did you feel when supplying information within the change module (illustrated below)?



- 1 (not confident)
- 2
- 3
- 4
- 5 (very confident)
- Na - I did not answer the questions in the change module

10) Do you think your answers to questions 6 to 9 might change from less confident to more confident if you were given specific training?

- 1 (not at all)
- 2
- 3
- 4
- 5 (significantly)

11) How often do you think you will re-use the EarthTrack mobile application outside of this survey?

- 1 (never)
- 2
- 3
- 4
- 5 (very often)

12. Thank you for taking the time to complete the survey – your input is very valuable to us. If you have any additional comments about the app, how it could be made more user friendly, any specific training you think would be useful or any reasons that you would/would not use the app again, please feel free to add them here." (Free text responses were accepted for this question.)