EMBEDDING CITIZEN SCIENCE WITHIN LANDSCAPE-SCALE NATURE-BASED RECOVERY INITIATIVES

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DECLARATION

This project was completed for the MSc by Research in Environmental Science at the University of Gloucestershire, Cheltenham.

The work is my own. Where the work of others is used or drawn on, it is attributed.

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Abstract

This project investigates the development of a community science-based, local nature recovery research project, that forms part of a larger land use change project, based on farmland surrounding the village of Sapperton in Gloucestershire. It follows the setup and initial surveying of farmland hedgerows by community scientists, across a one-hundred-and-fifty-hectare site.

The aim is to investigate community scientists actively producing quality data to support nature at the site, and to understand better the impact of participating in community science. This will be achieved by exploring current research ideas and perspectives, relevant to wider environmental science and societal debate. This is investigated through empirical work including semi-structured questionnaires and interviews, observations in the field, and a desk-based study of existing literature on the subject area.

By exploring the impact of engagement in community science on the participant, the project will address a gap in existing research and provide useful insight into participant motivations and wider environmental behaviour. Investigating these important aspects of community science broadens our understanding of the complexities, barriers, and benefits of co-designing local nature recovery projects with local communities.

There are several approaches that are well suited to support long-term community science nature recovery projects, including continuous learning and training for

community scientists, and meaningful communication and engagement between stakeholders, which the co-design process can support. The research addresses the challenges in measuring social as well as environmental outcomes but equally recognises the potential added value it can bring for impactful community science nature-based recovery if carried out as an integral part of the co-design process.

There is scope to continue to build on the hedgerow project over time, as part of cyclical surveying of the hedgerows at the site, using the methodology and findings of this research as a framework and baseline. This will support a stronger evidence base on which to base land management decisions, provide further insight into community scientists and promoting positive change at a local level.

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I have thoroughly enjoyed working with the fantastic Sapperton Wilder Team and the committed community scientists who have supported this project. I would like to wish Sapperton Wilder all the very best for the future.

CHAPTER 1. INTRODUCTION

1.1 Introduction to the research

Climate change and ecological loss and degradation are the main challenges facing human health, society, and the environment, including the places we live, work, and enjoy (Myers and Patz, 2009). Recognising the extent of the global climate and ecological crisis, this research explores the engagement of local citizen scientists in nature recovery, to seek responses, contributions, and potential solutions to these crises, at a local level.

This MSc records the development of a citizen science, local nature recovery project, surveying farmland hedgerows at the land use change project, 'Sapperton Wilder', based in Sapperton, Gloucestershire. The hedgerow project includes the exploration of both natural (biological) and social (human behaviour) science. This project focuses on the social science element, with a separate Masters by Research discussing the natural science aspect of the project.

Better understanding citizen scientists and exploring the impact of engagement with them will provide the opportunity to reflect on the motivations and drivers of involvement in citizen science. This will allow the consideration of effective approaches, and the potential of citizen science to influence the long-term pro-environmental behaviour of participants.

The study of human behaviour can be complex and unpredictable. This can differ from the natural sciences which are based on fact and can often be calculated consistently, whereas social science must take account of human differences and subjectivity. While it produces rich, valuable data it is significantly more complex to set measures, assess impact, or draw conclusions within social research.

The following two aims will guide the research, with one overarching aim and a second, more specific aim.

The overarching aim is;

> To generate best practice for impactful citizen science monitoring and evaluation approaches for landscape-scale, nature-based recovery projects.

This is focused by a further, second aim:

> To consider the transformative potential of citizen science to influence related normative behaviour among participants in local nature-based recovery initiatives.

1.2 Case study and surrounding area

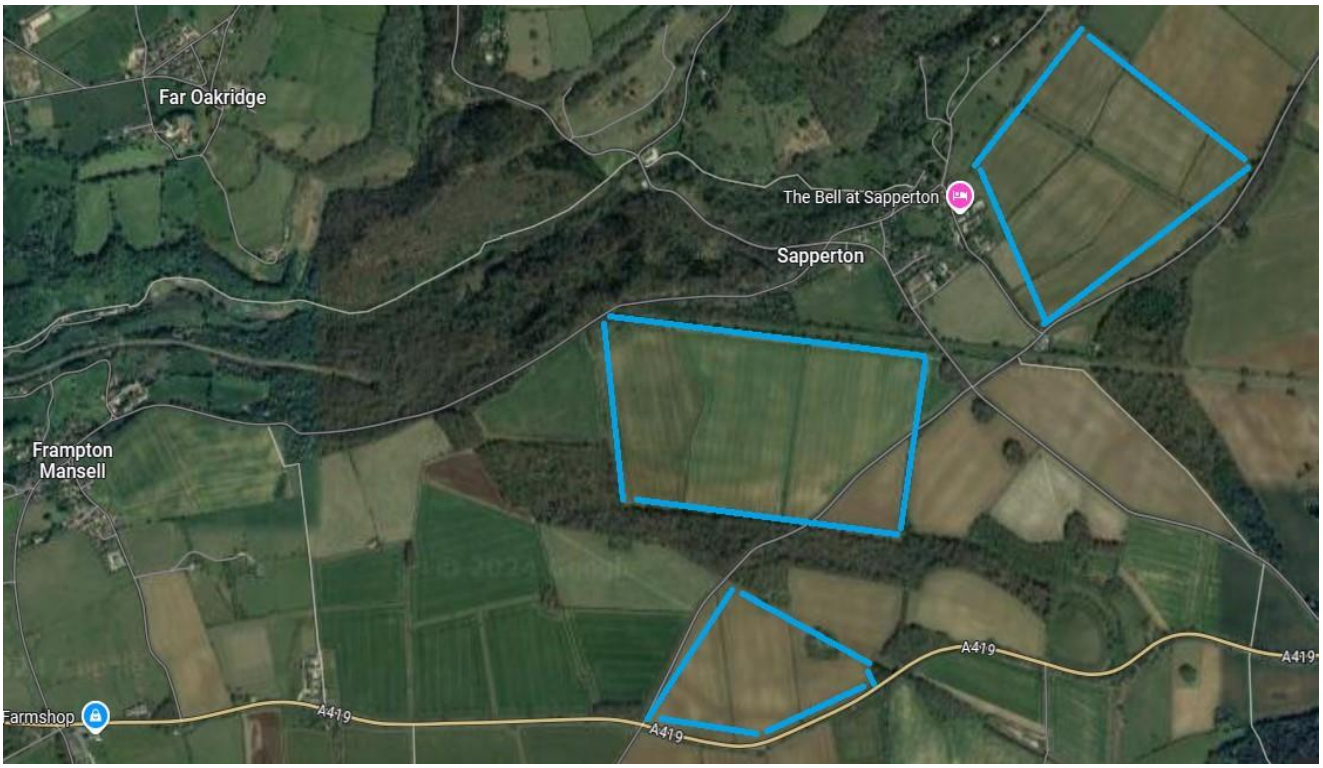
Sapperton Wilder is a land use change project that manages three parcels of agricultural land surrounding the village of Sapperton in Gloucestershire and was the case study area for this research.

Sapperton Wilder land is marginal agricultural land, that has been previously farmed using traditional methods. Sapperton Wilder was set up to improve the farmland across the three parcels of land, through nature-based farming approaches. It aims to investigate how we can farm more sustainably in the future, using nature-based solutions to improve biodiversity, while mitigating against climate change, producing food, and supporting rural communities.

Sapperton Wilder land is surrounded by flood meadows and woodland, near the rural villages of Sapperton and Frampton Mansell, within the Cotswolds Area of

Outstanding Natural Beauty, designated for its natural beauty and landscape quality. Its character and special qualities are afforded significant weight through this designation (Cotswolds Conservation Board, 2018). It is also part of the Gloucestershire Wildlife Trust's, Golden Valley Nature Recovery Zone, which recognises cultural value, natural heritage, and biological diversity. The Recovery Zone aims to increase connectivity between competing land uses while supporting the special qualities of the area. Figure 1 shows Sapperton Wilder land within the surrounding landscape.

Figure1: Location map showing Sapperton Wilder land (highlighted in blue) and surrounding area



Source: Google (2024)

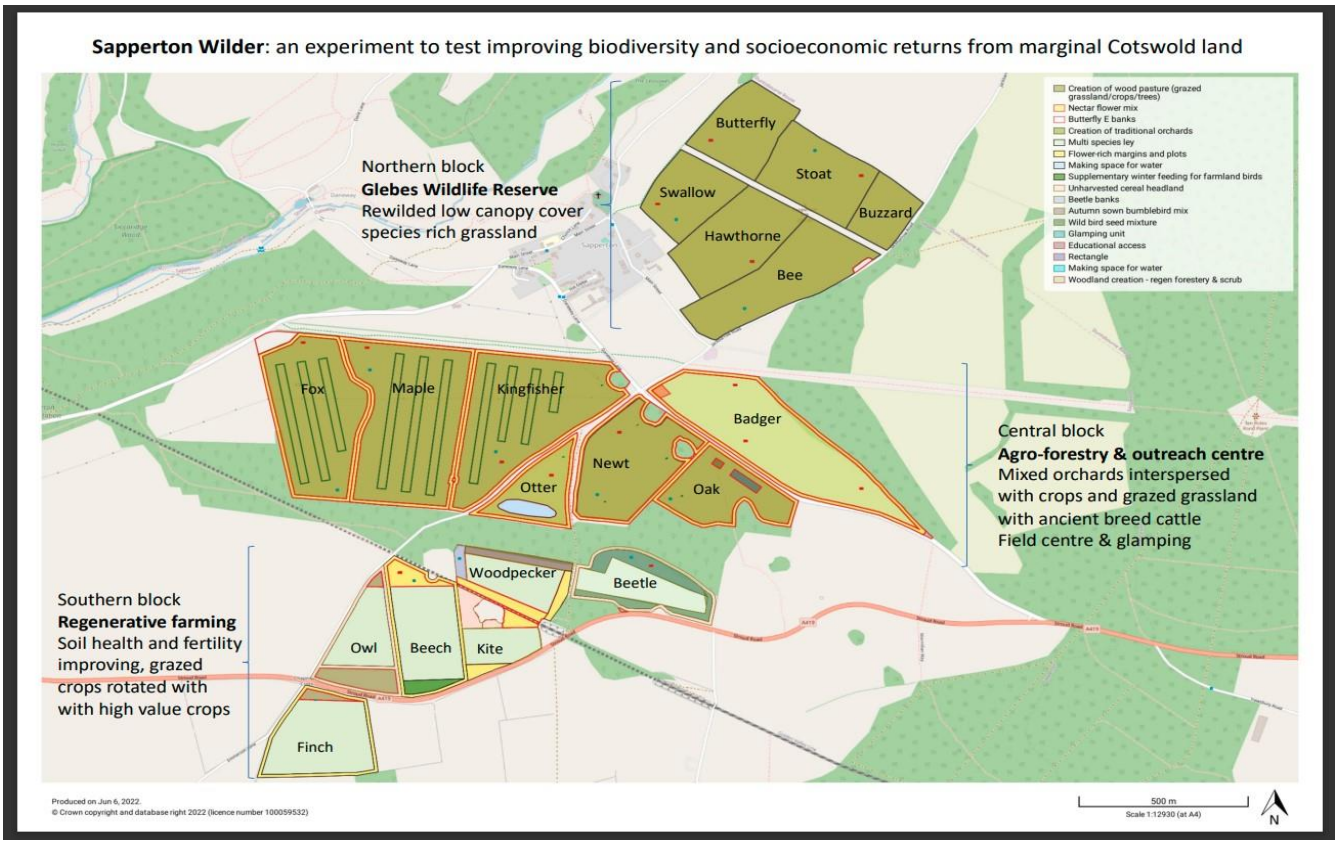
Figure 2 shows the village of Sapperton, to the right of the picture, which sits close to part of the Sapperton Wilder land, known as Northern Block. Northern Block is highlighted in Figure 2 in blue.

Figure 2: Aerial photograph of the village of Sapperton (right of the picture) and part of the Sapperton Wilder site (Northern Block, highlighted in blue)

Source: Nash, C (2023)

Figure 3 provides further information on the management of Sapperton Wilder land. The land comprises three separate blocks, Southern, Central, and Northern Block. Figure 3 provides a short explanation of the management plans and ambitions for the individual blocks

Figure 3 – Map of Sapperton Wilder land and future management plans



Source: Sapperton Wilder, 2023

Rewilding, agroforestry, and regenerative farming practices are being applied across the three blocks of farmland (as shown in Figure 3). To support the practical exploration of a stronger balance between food production and nature through sustainable farming practices, Sapperton Wilder is encouraging participation from a range of stakeholders, including academics, professionals, experts, and community scientists, in implementing nature-based solutions across the site.

> “If we are to achieve the project aims and better understand and nurture our local biodiversity we are going to need community support, both in terms of goodwill and in a very practical sense. The scale of the sampling and observations required for monitoring ecological change over time would be impossible without volunteer help. We know too that community science is an important tool in engaging the public in rural environmental issues and we intend to become a case study in best practice, testing the boundaries and providing activities that are educational and fun, but importantly also really in generating the data we need”.
>
> (Andy Donnelly, Programme Manager, Sapperton Wilder)
>
> (Donnelly, personal communication, May 2023)

1.3 MSc by Research and project partners

This MSc by Research was a studentship offered by the Countryside and Community Research Institute (CCRI), at the University of Gloucestershire, following a grant award from the Evolution and Education Trust. The partners involved in this MSc project were the Gloucestershire Wildlife Trust, who offered guidance in its development, and Sapperton Wilder, who provided the case study area and wider support for the project. The MSc was supervised by the CCRI, working with colleagues in the School of Natural and Social Sciences at the University of Gloucestershire.

The MSc by Research developed a citizen science project, surveying agricultural hedgerows across the three blocks of Sapperton Wilder land, over a six month period, from May 2023 – to October 2023. The framework and baseline information in this dissertation can be used to continue cyclical hedgerow surveys at Sapperton Wilder in the future.

Background

1.4 Agricultural land management and environmental awareness

With an increasingly limited timeframe to act, policy and practice are shifting towards a more balanced approach to meeting climate, environmental, social, and economic goals (Campbell et al, 2018). Balancing these interlinked, competing interests in decision-making and practice on the ground.

"For a long time, it was held that supporting agricultural activity was sufficient safeguard of the countryside in itself but more recently the fundamental nature of conflict has been recognized" (Rydin, 1996). A policy-driven focus on agricultural productivity in the second half of the twentieth century met the increased need for food at the time yet led to land management practices that have "progressively and cumulatively" (Brotherton, 1992) taken their toll on nature and the environment. As a result, the agricultural industry is now viewed as a major contributor to climate change (Balogh, 2020), employing farming practices that are having devastating effects on biodiversity. "The evidence from the last fifty years shows that on land and in freshwater, significant and ongoing changes in the way we manage our land for agriculture, and the effects of climate change, are having the biggest impacts on our wildlife" (State of Nature Partnership, 2023).

The loss of agricultural hedgerows is a contributing factor in the loss of farmland plants and species. Research commissioned by Hedgelink (2012) found that the extent of hedgerow removal since the Second World War has had a devasting effect on wildlife and the wider environment, which they support. "Despite being one of the most extensive semi-natural habitats in England, hedgerows have faced numerous threats over the last 75 years, resulting in a dramatic loss in their length between the 1940s and 1980s, and more recently a loss in structure and condition due to changes in management practices" (Staley et al. 2012).

Over time, different environmental practices and approaches have sought to address nature loss. However, a steady shift in policy over the last twenty years now recognises the need for sustainable agricultural practices as essential globally, given agriculture's "huge potential … to slow climate change" (United Nations, 2019). The United Nations International Sustainable Development Goal 15 guides this strengthening policy position. It provides a framework for global change concerning the sustainable use of land, protection of ecosystems and biodiversity loss (United Nations, 2015) while holding inclusivity at its core. Dr Grthel Aguilar, Director General of the International Union for the Conservation of Nature recently addressed the 28th United Nations Climate Change Conference (2023), calling for global recognition of the link between climate change and biodiversity loss; and the vital role of healthy ecosystems in supporting "nature-based solutions for both adaptation and mitigation" (Aguilar, 2023) against climate change. This led to a global declaration on sustainable agriculture and climate action endorsed by one hundred and fifty-nine countries. The declaration is clear on the urgent need for global action in this field and commits to strengthening efforts to support "science and evidence-based innovations - including local and indigenous knowledge", (COP28 UAE, 2023) recognising the potential impact of science, farming, and nature working with local culture and society, towards a shared vision.

This international policy position is echoed at a UK level, through the 25-Year Environment Plan (2018) which commits to recovering nature and resilient, richer natural environments in the future. The Plan stresses the importance of landscape scale, nature recovery for enhancing wildlife and ecosystems in addressing climate change (UK Government, 2018). The importance of nature for the health and well-being of society is also recognised at this national policy level.

This global and national policy narrative is also emerging at a local, practice level through Local Nature Recovery Strategies in England. These strategies not only have a significant role to play in the wider sustainability agenda, supporting "environmental objectives (like carbon sequestration to mitigate climate change or managing flood risk)" (Defra 2021, p.7), but equally providing wider social and economic value, protecting our cultural heritage, communities and landscapes. Nature-based solutions are the practical tools, supporting these local strategies. They are developing as a concept and a way of addressing climate change at a localised level, (International Union for the Conservation of Nature, 2020) providing a unique approach that encompasses environmental, place-based solutions with an intrinsic link to social and economic resilience (Science and Technology Select Committee, 2022). Nature-based solutions can contribute to, and strengthen natural capital and resources, for example improving water courses to help mitigate against flooding in our towns and villages. As well as protecting our homes and communities, this is fundamental in meeting society's health and well-being ambitions and providing economic and environmental benefits to local areas. The strong link between local nature-based solutions and societal sustainability means that engaging with and supporting the implementation of these solutions is an important role for communities.

1.5 Citizen science: A tool for measuring and monitoring environmental science and building social capital

Citizen science seeks to involve non-professionals or members of society in collective action that can bring together a range of different stakeholders, working towards a shared vision or common goals, which includes:

- Producing robust scientific data;
- Promoting learning across society, and ;

- Impacting on policy, practice, and outcomes on the ground.

The Dasgupta Review (2021, p.487) called on policy and practice to recognise that "we are embedded in nature; we are not external to it", making the active role of citizen science in environmental projects increasingly relevant. As a result, there is a need to explore community science approaches and better understand their effectiveness and contribution. This includes understanding why individuals become involved, the role citizen science can play in developing longer-term connections with local environments and influencing our wider environmental behaviours.

Environmental science is recognised as a field that compliments a citizen science approach, with "enormous potential for advancing and addressing complex social and environmental problems" (Paajanen et al., 2021, p.7). Consequently, citizen science is a "powerful instrument" (Cárdenas et al., 2018) in conserving and supporting the natural environment. While it is not a new concept, it is "experiencing a considerable upswing in both quality and scale of projects" (European Commission, 2022). Ongoing advancements in technology and connectivity provide opportunities for members of the public who are interested in hands-on science, and equally decision-makers requiring evidence and data. However, there are limitations and complexities surrounding the movement. The term citizen science itself, along with other associated terms have developed interchangeable definitions and scope, causing broad and inconsistent application, in practice. There is also a lack of evidence and understanding of participants involved in citizen science.

1.6 Purpose of the research

There is extensive literature on citizen science and its role in environmental projects. However, there is little research on the detailed elements of the approach, including the participants, their motivation to participate, and how that participation influences and impacts individuals.

A framework will be developed that will support the continued engagement of citizen scientists in nature recovery at Sapperton Wilder over the longer term. This attempts to address the gap in existing research, reviewing and evaluating the role of citizen science in nature-based recovery. The following research questions have arisen from the findings of the literature review.

> What citizen science approaches are best suited to the long-term citizen science engagement needs of landscape-scale nature recovery projects?
>
> How can citizen science initiatives on landscape-scale nature recovery projects impact other areas of environmental behaviour change?

To address these research questions, several more specific tasks are required that are measurable and attainable and will provide a preliminary structure to the research. The tasks are set out below.

- Identify and engage with local participants interested in citizen science nature-based recovery initiatives;
- Identify stakeholders/groups that can support citizen science development and recruitment in local nature-based recovery projects;
- Research and develop ideas on citizen science monitoring and evaluation;

- Identify motivational drivers in citizen science;
- Understand existing environmental behaviours of participants involved in citizen science nature-based recovery initiatives;
- Gain insight into long term involvement and environmental behaviour and aspiration of participants and recipients involved in citizen science nature-based recovery initiatives;
- Produce a framework for future citizen science monitoring.

1.7 Dissertation structure

The following structure is used to address both the aims and research questions.

Chapter 1 of the research has provided an introduction and context, setting out the research aims and questions of the project.

Chapter 2 sets out where the research project fits into the wider literature, setting a base for the research approach.

Chapter 3 describes the research approach, which was chosen by referring to the research questions and outcomes of the literature review.

Chapter 4 is the interpretation stage, which analyses the findings of the research, taking into consideration the research questions.

Conclusions are developed in Chapter 5, referring directly back to the research questions. Chapter 5 also addressed the limitations of the project and opportunities for further research.

Chapter 6 reflects on the practicalities of the project.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction to literature review

This review will investigate past research on the development of citizen science as a movement in supporting landscape scale, nature-based recovery. To gain a broader understanding of the field, the literature review will also briefly explore current UK national policy and practice in relation to citizen science.

The structure of this literature review is derived from the project aims and research questions and is based on research, policy, and practice over the last fifty years.

Citizen science

2.2 Socio-cultural evolution and climate change

The way that society and individuals recognise newfound challenges and address these as part of everyday life, through social activity and interaction is an important part of our socio-cultural evolution. Understanding societal adaptation and evolution is a crucial basis on which to develop thinking on the role of citizen science in nature recovery and the wider challenges of climate change and the ecological crisis. “The impacts of climate change have changed and will continue to change society's relationship with the environment” (Drolet, 2021) and thus can be seen as a major influence on socio-cultural evolution.

The UK is a leader in climate adaptation, driven by a strong research and policy framework, supporting government initiatives (UK Government, 2020). This framework recognises that local, community-driven action has a crucial role to play in addressing global issues, while nurturing a sense of belonging, connection and responsibility within our local communities and places (UK Gov, 2018).

Adger et al. (2009) recognises the positive impact of community-led, bottom-up action on climate change. "When actors perceive adaption to and the risk of climate change as being within their powers to alter, they will be more likely to make the connection to the causes of climate change, thereby enhancing their mitigative, as well as adaptive capacity".

Having an impact at this level is dependent on individuals and communities working collectively, towards a shared vision. However, different pressures and challenges including demographics, geographies, topographies, and economic contexts will influence social and cultural responses to climate change, affecting "a community's ability to take greater control" (UK Gov, 2018). These issues are explored further throughout the literature review and findings chapters, through consideration of individual motivations, attitudes, and behaviour of citizen scientists engaging in local nature recovery.

2.3 Citizen science: Definition

The term 'citizen science' has broad and often inconsistent meaning, having become increasingly blurred over time, through varying definitions and purposes. The term originated in the 1990s, after being developed separately by two different authors, Alan Irwin and Rick Bonney (Hecker et al., 2019), around the same time. While the authors both founded the term 'citizen science', Irwin's definition focused on social science and the role of society and participatory engagement in influencing research agendas, while Bonney's definition was grounded in natural sciences, where members of the public provided data for scientific analysis, in a supporting role. These two purposes are still present in numerous definitions today, and are both still considered valuable aspects of the movement (Hecker et al., 2019).

A global study (Hecker et al., 2019) reviewed the different citizen science definitions

used in forty-eight national policy documents, many of which were based on the natural environment. Of the forty-eight reviewed, only ten definitions recognised the social development benefits citizen science can bring to society. While some noted the opportunity for collaboration between science and communities, there was little supporting explanation of this partnership approach. Adding to the breadth and complexity of the definition, the study also found the term used to describe projects that solely gathered data, with no further links to science or specific scientific projects (Hecker et al., 2019).

There is significant literature on the definition of the term and the reason for its inconsistent interpretation, from the "quick expansion of citizen science as a notion and a practice" (Fan et al., 2019, p.181), to the extent of the research fields it spans (Hecker et al., 2019). While it is likely that there are many contributing factors responsible for the different definitions, Irwin and Bonney's original dual meanings, are likely to be a significant factor in the way we define and interpret citizen science today. However, recognising the sheer breadth and potential of citizen science as a vehicle for positive change in the long term will support the development of projects. "Having an awareness of the current broad set of definitions in use in citizen science can also help practitioners and policymakers to navigate and support its diversity, as it continues to increase in its scope and scale" (Haklay et al., 2021). Although this does highlight the need for clarity and communication with all stakeholders throughout the process.

In its simplest form, citizen science actively involves non-professionals or members of the public in data gathering, usually as part of further scientific research. Recognising the scope and potential of citizen science, international professionals have produced guiding principles for citizen science projects (Robinson et al., 2018). They considered the factors that contribute to best practices in citizen science,

producing a list of principles to encourage excellence in citizen science. The principles are summarised below.

Citizen science projects should aim to:

- Promote the sharing of knowledge and understanding;
- Link to scientific impact;
- Offer benefits for all parties involved;
- Involve citizen scientists as full partners through various stages of the process;
- Give feedback to contributors and stakeholders;
- Strengthen and promote citizen science as a research approach;
- Communicate evidence and data;
- Acknowledge contributions; and;
- Consider legal and ethical issues.

While these principles are not intended to replace a clear definition, they do provide a focus on the fundamental elements that should form part of the citizen science process. These principles could provide a useful steer in helping to define individual projects and set a definition that aligns with the specific project, recognising the needs and ambitions of all parties engaged in the project.

2.4 Citizen or community science?

Recent debates around citizen science have focused less on the definition of the term, instead questioning the meaning of the word citizen. Arguably, the word citizen has broad meaning and is an unfamiliar term when used in a local spatial context. Site-based projects that promote the use of citizen science are beginning to argue that the term community science provides a clearer and more “inclusive” (Audubon,

2018) description than citizen science. “Participation in volunteer data-collection initiatives … are, at their best, communal experiences that bring us together as a caring community of people … The term community science better reflects these social and relational realities” (Audubon, 2018).

While the term citizen, might suit a national or online-based citizen science project, it is not a word often used in a local, community context. Wandersman (2003) believes the terms to have the same meaning, but community to be a more appropriate word for a local project. Bonney (2021) recognises the recent trend in the use of the term community rather than citizen, noting the word community can “feel more inclusive”, but stresses the importance of using it within the right context and as part of an inclusive, local project to avoid misuse of the term. Bonney (2021) suggests that larger scale, data gathering projects should not be classed as community science, until the point they are applied in a local context, geographically smaller in scale, and supported by meaningful and inclusive community engagement.

Consideration of the scale and context of a citizen science project starts to develop a distinction between local, site-based projects and those that are spread over a wider geographical area. It equally requires defining and understanding the term local in relation to geographically based projects. The term itself can be considered complex when measured against globalisation, connectivity, and advancing technology. Savage et al. (2004) suggest that personal interaction is no longer the measure of local and we need to re-address how we understand local communities in a global and changing world. This research also suggests that local can no longer solely be linked to culture or tradition, or the term born and bred, which may have historically influenced the meaning of local. Instead, it should be recognised as a reflexive exercise, where the individual is content in their feeling of belonging or attachment to a place. This develops discussion around the measure of local, and the development

of links with place attachment and connection. This is discussed further, later in this chapter.

To ensure clarity for stakeholders, consideration should be given to the most appropriate term to describe citizen science. Like the definition, the most appropriate term should be based on the individual project, taking into consideration the context and geographical remit. From this, an appropriate measure for the term local should be set for individual, site-based projects.

Existing citizen science practice guides recognise the need to take into consideration both the geographic and time-based scale of a project (Tweddle et al., 2012). However, there is generally little exploration of the differences in impact experienced by those participants engaged in local, site-specific projects, compared to participants engaging in wider geographically based projects, possibly online based, where there is less, or little face to face interaction, compared to site specific, local projects. A comparative study of the motivational drivers and impact on participants themselves engaged in these different types of projects would be interesting and develop our understanding around the social component and drivers of engagement in diverse citizen science projects.

2.5 Citizen science: science and society

The Stockholm Environment Institute's (2018) guiding principles for citizen science recognises the importance of linking citizen science outputs with scientific outcomes. However, combining factual science with communities social and cultural views and experiences potentially brings together differing outlooks and ideas of reality. Schnegg (2021, p.260) witnessed these differing viewpoints in relation to "indigenous and scientific explanations for the lack of rain in Namibia". Both parties agreed there was less rainfall, however scientists believed carbon dioxide was

responsible, whereas indigenous people felt government failures were responsible for the lack of rain. This example is relevant to citizen science and demonstrates the potential for land managers, contractors, and citizen science views to differ, depending on their experiences and relationship to the land and place. For example, land managers and contractors will need to consider economic factors that will not impact on citizen science/scientists.

Understanding and planning for differing views is an important part of citizen science. It highlights a need for a clear understanding of attitudes and motivations and "allows us to detect misunderstandings that would otherwise be overlooked" (Schnegg, 2021, p.270). In turn, this understanding and recognition of differing views can support a wider outlook, for example citizen scientists often participate to be part of action or impact, this can demonstrate to scientists how their work can lead to visible change on the ground (UK Gov, 2023).

2.6 Citizen science: Participation in nature-based solutions

Citizen science projects can cover a breadth of subject areas, involving a wide range of participants, processes, tasks, and outcomes. While some projects involve participants on a co-designed basis, other projects employ citizen science in a more limited, contributory approach. Bonney et al (2009) have categorised public participation in scientific research as falling under one of three categories.

Table 1: Public participation in scientific research categories

Contributory projects:	Designed by scientists, with citizen scientists primarily contributing information to the project.
Collaborative projects:	Largely designed by scientists. Citizen scientists provide information but may also support other project activities such as analysing findings.
Co-created projects:	Are designed through an inclusive partnership approach, where citizen scientists are involved in many of the project stages

Source: Adapted from Bonney et al (2009)

While the flexibility in the definition of citizen science allows for these broad approaches, it can accommodate a mix of more than one, depending on the specific project needs. There is also scope to develop the approach over time for projects that intend to be repeated or are longer term. For example, projects could start as a 'contributory project', but with training and commitment from participants, evolve into a collaborative approach between parties. The meaningful involvement of local communities in early project design and throughout the stages of the project can arguably impact on community acceptance and longer-term engagement in a project.

Participant type

Data from the CS Track Project (2021) and Defra Plant Health Project (2015) revealed that it is mostly white, middle-aged, males, involved in environmental citizen science. The CS Track Project (2021) found those participants also, typically had an interest in science. This information can be used at a local level, to encourage a wider mix of participants and groups, beyond those that are most likely to get involved. However, there are limitations when applying these wider findings at a local level due to local demographics which can vary significantly.

2.7 Citizen science: Motivation

While there is significant research on the role of citizen science, there is a lack of literature on participants involved in citizen science and their motivation to engage. “To date, many studies have focused on the effectiveness of citizen science in facilitating traditional scientific processes. Yet the meaning of citizen science for the individual has been regarded as less significant. The impact of involvement upon the individual, the local school or community groups appear to have been considered as secondary” (Dunkley 2017, p.222).

Due to the lack of data and evidence around citizen science motivation and impact, wider literature on environmental volunteering has often been used to provide insight and understanding of this research gap. Yet this data and information is a critical element of a project, having a direct impact on the recruitment and retention of participants and ultimately the quality of the outcomes (West and Pateman 2016).

Existing research has found motivations to be intrinsic, individually satisfying, or extrinsic, providing further benefits, beyond the project itself (Geoghegan et al., 2016). “This highlights the point that different people have different motivations for participating” (Geoghegan et al., 2016). The UK Defra Plant Health Project (2015), explored engagement in environmental citizen science projects in the UK. The research found the key motivation was showing support for the cause, however, motivations that benefitted individuals, such as career development were also identified. The European, CS Track Project (2021) found similar motivating factors to the UK, Defra Plant Health Project (2015), identifying the following common reasons for participating in citizen science.

Table 2: Motivational factors identified in the European CS Track Project (2021)

CS Track Project (2021): Motivational factors identified	**Scoring by participants** (1 unimportant – 5 very Important)
Interest in the subject or field	4.6
Opportunity to contribute to science	4.3
Affinity with the project aims	4.2
Learning opportunities	4.2
Willingness to support	4
Opportunity to share knowledge	4
Recreation and/or hobby	3.9
Personal development	3.8
Working closely with others	3.2
Social benefits and opportunities	2.5
Career development	2.2
Incentives/Reward	1.6

Source: CS Track Project (2021)

There may be several reasons that motivate engagement in citizen science. Fischer (2021) suggests that motivations may change over the lifetime of the project, with an interest in the topic area often not being sufficient to retain participants. This highlights the importance of following motivations throughout a project, not just focusing on the initial motivation to join a project. The transformative potential of citizen science, in relation to individual learning and development, is "often based on assumption rather than empirical observation" (Bela et al., 2016). Bela et al. (2016) conclude, to fully understand the transformative potential of citizen science, there must be clear and transparent measurement of the effects and impact on citizen scientists.

2.8 Monitoring and measuring participation and impact

It is vital that local nature recovery plays its part in addressing the climate and ecological crisis and can be shown to deliver long-term environmental improvements on the ground.

Measuring and evaluating a project in terms of numbers or quantity, such as the number of community science participants attending a surveying event, is useful, but if used as the sole measure, it can result in a project becoming systematic and procedural and does not always take account of quality, experiences or outcomes. While measuring outcomes and impact is not a new idea, it is often overlooked. Sprinks et al. (2021) recognises the challenges of measuring citizens science contributions to the United Nations Sustainable Development Goals in terms of impact. "Whilst citizen science's potential to contribute towards SDGs is well documented, limitations exist when measuring the impact that citizen science has made toward SDG progress" (Sprinks et al., 2021).

Measuring impact is a challenge that raises many complex questions, such as how quality and improvement can be recognised and measured, and what data sets will support this type of measuring. Research suggests that personal values, ethics, perception of risk, knowledge, and culture can all influence and restrict social adaption to climate change, however, these factors are individually subjective and changeable, (Adger et al., 2009) which means measuring social capital and collective action at any level is not an "easily quantifiable phenomena" (Adger et al., 2009). Nevertheless, if we are to add value to the environment and nature is to thrive rather than just survive, then measuring impact and quality is important. A better understanding of impact could support nature, place, societal, and wellbeing outcomes, as well as providing a broad evidence base.

There is a growing range of social and environmental value tools available to support the measurement of a project or process. Many tools are topic based while others have a more strategic focus, such as the SolVES tool (Sherrouse, Semmens and Ancona, 2022), designed to evaluate and map the social value of ecosystem services, or the Environmental Benefits from Nature Tool (Natural England, 2021), supporting the UK Government's 25 Year Environment Plan (2018). Many online measuring tools are standarised, with set themes and indicators that either measure or score, using specified evidence and data. While this is helpful for the wider application of the tool and comparisons across different sites, the use of a standardised tool for measuring impact could result in the loss of place identity in the process. The RTPI's Measuring What Matters: Planning Outcomes Research and Toolkit (2020) is a basic spreadsheet recording system that provides flexibility to tailor it to each project. It sets out a process to support the cyclical monitoring of impact. This or a similar, flexible toolkit could be adapted to measure and evaluate the contribution of community science at Sapperton Wilder over time.

Geohegan et al. (2016) found that "deeper levels of evaluation, considering outcomes (such as learning and attitudinal change) and impact (such as behavioural change or difference in management or policy) is rarely undertaken". Geoghegan et al. (2016) suggested that this is due to poor monitoring and evaluation of participants and suggested a deeper evaluation should be fully integrated into projects. The monitoring of impact, activity, and contribution will become increasingly useful and meaningful over a longer period, as more data is collated. Time and increased data on citizen scientists will allow the identification of patterns over time.

The relationship between those committed participants and those that show interest, but do not actively engage is potentially interesting. It requires consideration of initial motivations and how those motivations evolve throughout the project. Are non-active

participants happy with a basic understanding or lose association with the project, not needing to become more involved? Does project training result in more committed participants? The differences between those who are actively committed and those who are less active participants “might be in motivation and opportunity, but both may appreciate the program and its value” (Fischer et al., 2020).

There are several ways to understand or categorise participants and their contribution or commitment to citizen science or a project. The Nibble and Drop Framework (Fischer et al. 2020) attempts this by allocating participants to groups that define their contribution.

2.9 Citizen science and pro-environmental behaviour

Engagement in citizen science is a complex area. While little is known about why participants engage in projects and the longer-term impact of this involvement, it is considered by some to provoke a possible change in attitudes and behaviour (Hart et al., 2021). It is believed that these changes could reach beyond a study and impact on other areas of participants lives.

The words attitudes and behaviour are used regularly in the existing literature on engagement in citizen science. Somerwill and Wehn (2022) discuss the meaning of attitude and behaviour in the context of environmental citizen science. The research differentiates between the two words, and discusses the word attitude, as a system that links and orders views, with environmental behaviour set out as practical actions. A “significant overlap” (Somerwill and When, 2022) between the terms is recognised. Research (Dunlap and Jones, 2002) has suggested that attitudes are a key factor and influence of environmental behaviour. “It is generally agreed, however, that while environmental attitudes are linked to behaviour, strong pro-environmental

attitudes do not necessarily lead to corresponding behaviours (as other influencing factors are often present)" (Somerwill and When, 2022).

It is likely that the growing interest in citizen science, at a governmental level, is driven, in part by the possibility of engaging members of the public, for wider, positive environmental impact. However, literature suggests that there is often a disconnect between expectation and reality in terms of impact (van Noordwijk et al., 2021). Sustained behaviour change is required to address climate change (Newell et al., 2021), and meet environmental goals, however, bringing about that change in behaviour may not result in a long-term, sustained change (Whitmarsh et al., 2021). A study by Scottish Government (2012) found that changes in farmers environmental behaviours were unsustainable over time unless they experienced a change in attitude. This suggests that engagement in citizen science alone, may not support a sustained change in environmental behaviour, considering other influencing factors such as lifestyle. However, engaging in citizen science could form part of a package of broad measures, alongside ongoing education and incentives that together influence long term, positive behaviour change.

Monitoring the pro-environmental behaviour of participants relates to the aims of this project. A guide to support behaviour change could support the future development of this work at Sapperton Wilder. For example, the Centre for Behaviour and the Environment's Behavioural Science Toolkit for Practitioners (2019) provides strategies to support the change to more pro-environmental behaviour, including motivating, socialising and easing change. These strategies can support citizen science projects, encouraging pro environmental behaviour, over time, for all stakeholders.

2.10 Citizen science nature-based recovery: Policy

While citizen science is regarded as important in UK environmental policy (UK Gov, 2023) there remains a disconnect between the collection of data and the work of citizen scientists and policymakers. Roundtable research led by the University College London (DITOS Consortium, 2019) found that citizen science projects often arise from policy needs, yet citizen science outputs rarely support policy and strategy development. The research recommends that policymakers become more involved in the design of citizen science projects, to ensure that outputs from the work are relevant to policy and can be incorporated into future policy revisions, strengthening the evidence base on which policy is formed and decisions made.

Better communication between the key parties was considered essential to support stronger relations, trust, and joint working, alongside adequate infrastructure, including funding, to support citizen science engagement in policy making.

The opportunity citizen science provides, to strengthen policy making must be better understood and appropriately resourced so that policy ambition can be delivered on the ground. This will support a stronger feedback loop from data collection, monitoring, and future policy revision.

2.11 Environmental organisations and citizen science

There are several prominent environmental organisations that actively support citizen science as part of their daily operations. Each has a different approach, over different geographic scales. Many with a national approach, that calls for local input from citizen scientists (Lynn, 2020).

The following provides a summary of key environmental organisational approaches along with the resources available to citizen scientists engaging with that organisation.

Environment Agency: The Environment Agency is one of several environmental public bodies working with community-based, citizen scientists on site-specific, monitoring programmes. An example is the citizen science, water quality monitoring programme in the Wye River catchment. This project supports the Environment Agency's statutory monitoring, providing further evidence to support decision-making on priority areas. "The inclusion of citizen science data in our latest monitoring report is a fantastic step in combining more data sources and is already helping identify where measures can be targeted to reduce the inputs of pollution to the river" (Environment Agency 2022). There are over four hundred citizen scientists involved in testing water quality along the river, which has led to the identification of polluted areas. The information produced by citizen scientists was used directly to inform the work of the Environment Agency and has resulted in several media campaigns drawing attention to the citizen science findings.

The Wildlife Trust: The Wildlife Trust has a strong track record of successful engagement with the public through its regional networks and national projects. Citizen science opportunities are advertised via their website and focus on the need for citizen science data to support their ongoing monitoring projects (The Wildlife Trust, no date).

The Woodland Trust: The Woodland Trust's Nature's Calendar project engages with thousands of citizen scientists recording seasonal events across the UK, contributing to the largest phenology database in the UK. This is an engaging and interactive resource that provides useful supporting information to potential volunteers along

with a live species map that showcases citizen science data (The Woodland Trust, no date).

The British Ecological Society: The British Ecological Society encourages interested members of the public to become citizen scientists. It sets out the opportunities available including career development and learning through its citizen science hub, which focuses on national and international citizen science projects (British Ecological Society, no date).

Nature Based Solutions

2.12 Nature recovery: Definition

Approaches and practices addressing the protection and enhancement of nature have changed significantly over time, led by research, politics, and debate, along with the practical need to address habitat loss and climate change. Du Toit et al. (2019) suggest that the different approaches have a role to play, offering different solutions, and should be considered and selected in relation to the needs of the project. This research uses the term nature recovery. The following section will discuss nature recovery within the context of other approaches and practices.

Conservation is a widely used term, which traditionally aims to prevent the loss of a species or habitat within a specific area. More recently, conservation practice has developed its focus, from smaller site conservation to larger scale conservation, allowing the wider monitoring of species within their natural habitat.

Ecological restoration aims to restore sites where species or habitats have been destroyed, in an attempt to regain their value. This differs from conservation as it actively seeks to repair and restore nature. However, this raises the debate around the acceptability of human intervention to restore nature. "Many people are …increasingly concerned about the depth and extent to which our technological prowess now allows humans to modify nature" (Kaebnick, 2013, p.ix) reintroducing species and habitats. This is equally the case concerning rewilding. Like ecological restoration, rewilding focuses on environments that have been damaged or lost and seeks to restore those environments. While rewilding often has broad meaning, it generally sets out a "long-term aim of maintaining, or increasing, biodiversity, while reducing the impact of present and past human interventions through the restoration of species and ecological processes" (Pettorelli et al. 2018, p.1117). While other approaches such as conservation are human led, rewilding ultimately supports a

nature led approach. However, different stages or levels of rewilding have contributed to the complexity around the term. “Rewilding can operate at multiple levels from genes to ecosystems” (Du Toit et al,. 2019, p.2468), from reintroducing species to allowing land to return to an unmanaged state. Monbiot (2013) suggests rewilding offers “positive environmentalism”. This suggests that rewilding can provide optimism and a change in thinking, towards positive environmentalism with rewilding being the practical response. This starts to suggest important differences between environmentalism and conservationism. Environmentalists believe that nature and our environment require protection from human impact whereas conservationists recognise human use of the natural environment, and therefore the need to continue to look after that environment for the future. In Blythe and Jepson’s (2020) view, there is a “need for a new, hopeful, and empowering environmental narrative”, reconsidering the field, which the rewilding debate can offer. “Rewilding invites and requires a willingness to reassess, revise and reimagine deeply held beliefs on what is natural, what species should and should not be where, and what constitutes ‘best’ conservation practice” (Blythe and Jepson 2020).

Nature recovery recognises a historical landscape yet suggests the need to strengthen and build resilience within the natural environment, going beyond conserving. This starts to develop links with the quality of nature, which is missing in discussion on other terms, yet is vital in meeting sustainability goals. In 2022 a joint statement by the UK’s Statutory Environmental bodies set out the “critical role of nature recovery in our survival, prosperity and wellbeing” (Joint Nature Conservation Committee 2022). At a local level in England, the term is linked to a government agricultural scheme, that replaces the former Countryside Stewardship scheme (Defra 2022). As part of this, funding incentives support the implementation of improvements to biodiversity, habitats, water, air and climate emissions.

Nature Based Solutions are the practical tools that support nature recovery and are ways of addressing challenges through nature, that consider the needs of society. For example, planting trees or providing wetlands and green spaces support the reduction of pollution and flood risk, while also providing a natural community asset, that can improve health and well-being within society. Nature-based solutions are widely discussed within literature and practice as an effective response to social, environmental, and economic problems (Knowledge for Policy, 2022). Where participatory approaches to nature-based solutions have been supported in rural areas, research has found this resulting in a more inclusive and joined-up approach, including communities, private landowners, and decision-makers, which in turn has supported longer-term planning, upscaling, and expansion of nature-based solutions. "Overall, co-creation is expected to lead to socially accepted place-based solutions that contribute to sustainability" (Soini et al., 2023). This links to the discussion on citizen science and place attachment at 2.15 and Figure 4, which sets out the Tripartite Framework for Place Attachment.

2.13 Local, landscape scale, nature recovery

Landscape scale can often have different meanings, depending on context. Selman (2006) describes it as "a framework for analysing inter-relationships and delivering joined-up policy within a comprehensible and identifiable space". While more recent research has linked it with social and cultural factors, "to produce knowledge relevant to society, it must include considerations of human culture and behaviour, extending beyond the natural sciences to synthesize with many other disciplines" (Opdam et al. 2013). However, landscape-scale nature recovery does have limitations and was found to be non-transferable on a larger scale, because of differences in place and locality (Jones, 2011).

Place and nature

2.14 Topophilia and biophilia

Fitting with discussion around the terms local and community, and resonating with many of the reasons for participating in citizen science, is the notion of biophilia and topophilia. These terms describe an affiliation with ecology and living things (biophilia) or landscapes, nature, and places (topophilia).

Much of the existing literature focusing on biophilia addresses the loss of nature and green space in urban environments and therefore discussion around the subject is often linked to health. While some believe that biophilia has links with genetics and human evolution (Wilson, 1984), others suggest that as humans, we are naturally attracted to other life. Topophilia has a slightly different focus to biophilia, and is the term used to explain an individual's connection to place. The definition of topophilia has developed over time and is now accepted to incorporate culture as a fundamental element of place attachment. Beery et al. (2015) suggest topophilia could support local sustainable development, with positive impacts witnessed on a wider global scale.

2.15 Citizen science and place attachment

The importance of place in local citizen science projects has developed throughout this chapter, closely linked to the measure of local, the feeling of belonging and community connectedness.

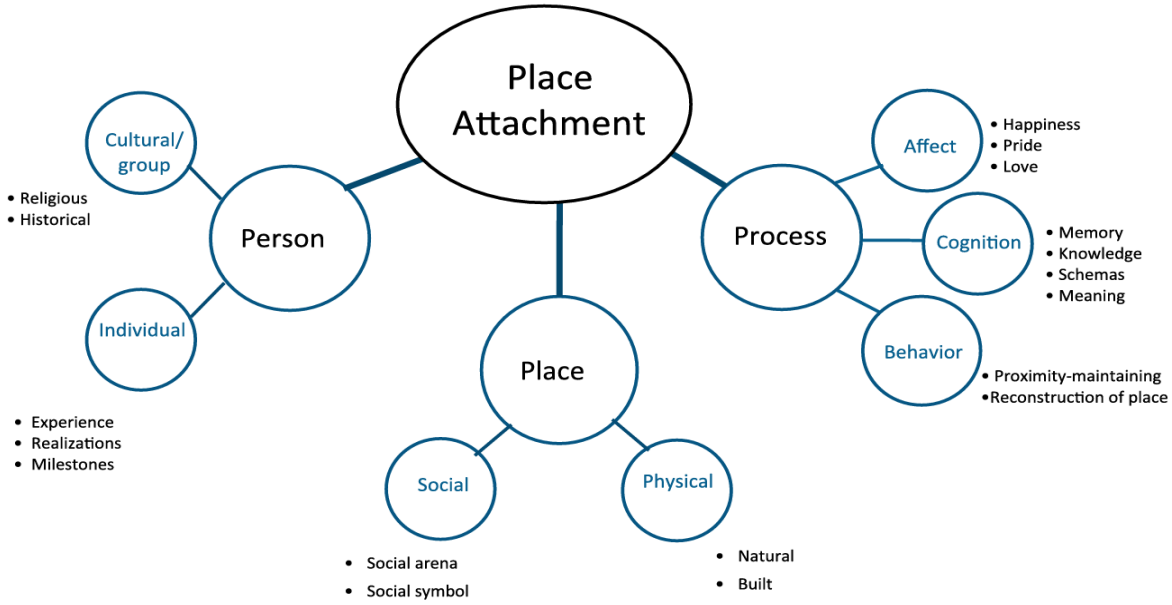
Dasgupta (2021) in his Review of the Economics of Biodiversity discussed the importance of empowered communities and individuals that can instigate positive change. Dasgupta (2021) recognised that "interventions to increase people's contact and connectedness with nature would not only improve our health and well-being,

(equally) there is a growing body of evidence to suggest that those interventions would also motivate us to make informed choices".

Research has found that place attachment and a connection with the environment can have direct links to citizen science (Dunkley, 2017; Hart et al., 2022). "A relationship with a particular place can be heightened through relationships with people who share that particular topophilia" (Hart et al., 2022, p.3). Although it is recognised that place connection is individually subjective, encompassing factors including, culture, identity, tradition, belonging and dependency (Ilovan and Markuszewska 2022).

Scannell and Gifford (2010) developed the Tripartite Framework that breaks down place attachment into three key elements, "person, process and place" to provide clarity in defining and understanding place attachment.

Figure 4: Tripartite Framework for Place Attachment



Source: Scannell and Gifford (2010)

The human (person) element of the framework addresses the individual or group focus of place, this might include background, cultural or personal connections to place, including belonging to a particular church group or having family ties to an area. The process aspect explains the impact of place attachment on the individual and on an individuals thinking, behaviour and feelings towards a place. Finally, the place factor acknowledges the connections to the natural and built environment and social interaction within those places (Scannell and Gifford, 2010). This framework is considered in relation to Sapperton in the findings chapter.

The power of place

Newman et al (2017) explored the link between the power of place and citizen science, finding that decision-making, along with community resilience and sustainability "can be strengthened by leveraging the power of place in citizen science" (Newman et al., 2017). They concluded, when carefully done, local, geographically based citizen science projects can "transform humans and their environment". However, citizen science efforts are not always translated into decisions on the ground. The study went on to suggest a set of recommendations to support local projects leverage the power of place, at different stages in the project, incorporating local enthusiasm and data into decision-making on the ground. The recommendations are summarised below:

Table 3: Leveraging the power of place in citizen science projects

Design and Implementation • Incorporate 'place' into project design • Utilise place attachment to co-create project vision, goals, and objectives
Accessible data and systems • Accessible and shareable project platforms and data, supported by protocols, metadata and standards
Collaboration • Creation of place-based communities of interest for collective impact • Sharing of information and resources • Make links with decision-makers • Small-scale projects can support the training and development of citizen scientists

Source: Newman et al (2017)

Research suggests a range of positive outcomes can be gained by recognising the power and potential impact of place connection or attachment in citizen science. This includes developing the feeling of stewardship of an area or project and encouraging an individual's sense of place to inspire engagement and active participation in decision-making (McKinley, 2017).

2.16 The literature review in the context of the project

The literature review has highlighted several issues for consideration. There is significant debate over several definitions that are key to the success of a citizen science project. To ensure clarity these terms require definition and will be discussed further in the research methods chapter.

The literature review has indicated, in general, that there is little known about why participants engage in projects and the longer-term impact of this involvement on the participants. The aims and research questions will address this gap in knowledge and understanding. This was in part attempted by the CS Track Project (2021) and the UK Defra Plant Health Project (2015); however, this project will go beyond these, exploring in greater depth citizen science approaches and the impacts of engagement on participants.

CHAPTER 3. RESEARCH APPROACH AND METHODS

3.1 Introduction to the research approach

The research approach was guided and influenced by several factors, including the type of study and information required, the scale of the research, and the timeframe and resources available (Bell, 2018).

Different researchers or projects will use different styles, approaches, and methods. Guided by Sapperton Wilder's collaborative ethos and goals, this research worked towards a co-design approach, to encourage joint working amongst stakeholders.

The purpose of the research is exploratory, "to find out what is happening, to seek new insights, to ask questions, to access phenomena" (Robson 1993). Therefore, the research needed to produce factual information, giving a wider perspective in addition to descriptive evidence which can clarify views, opinions and the reasons for these. Yet the findings must be able to be sufficiently evaluated to ensure that the objectives of the project are met and allow conclusions and recommendations to be made from the evidence gathered.

The following section sets out the research approach and methods employed in data gathering.

3.2 Mixed methods approach

A mixed methods approach utilises both quantitative and qualitative data, collected and analysed as part of the project. This approach is recognised as having much to offer social science research and is widely considered to sit alongside quantitative and qualitative research as a third key research framework (Johnson et al., 2007). "Mixed methods research provides the citizen science community with an avenue to generate deeper understanding of programme impacts and may prevent novel

outcomes from going unnoticed" (Lynch et al., 2018). A mixed methods approach is therefore considered well suited to the aims of the research, allowing broader insight to enable the researcher to fully investigate the topic and satisfy the objectives and research questions. A mixed methods approach can support inclusive and diverse participants (Lynch et al., 2018), fitting with Sapperton Wilder's engaging ethos.

Quantitative research

Quantitative research collects facts and statistical data. It provides an opportunity to assess correlations, using structured methods. It is considered a more passive role of data collection, as it normally doesn't require one-to-one engagement between the researcher and the participant. For this reason, quantitative methods can generally collect data over a larger scale than is possible using more qualitative methods.

There are various quantitative methods that support a wide variety of research. Opinion polls are growing in trend with digital and technological advancements, allowing on the spot reactions and opinions to be gathered. While such polls do not usually provide an opportunity to unpick the reason for voting one way or another, they can provide potentially large-scale, instant reactions on a subject, which can be both useful and powerful in terms of data, evidence, and impact. However, a deeper insight is required for the social science focus of this research.

There are many different types of questionnaires generally, they collect information in a standardised manner and can support data collection on a wide scale, particularly if disseminated electronically. If standardised questionnaires are repeated over time they can build up a factual evidence base, allowing comparisons to be made. An example is a longitudinal study, which tracks the same participants over a given period, recording data such as health and well-being or travel patterns. Cross-sectional studies, carry out a similar role, repeatedly surveying over time to indicate

changes in wider society. While questionnaires are a well-used, valuable research tool they can have low completion rates, which needs to be considered by the researcher.

Qualitative research

Qualitative research seeks to understand individual perceptions and can achieve detailed material. While this is a scientific approach (Sale and Thielke, 2018) its focus lies in understanding meaning and behaviours, rather than traditional scientific, process-driven data. The methods differ from quantitative approaches, in that they require researchers to focus on specific case studies, stories, or narratives using a variety of different methods and skills.

Interviews, semi-structured or unstructured, which support an open-ended, flexible approach can provide descriptive data, developing the researcher's understanding of a situation or subject. A qualitative method is less structured than the quantitative methods and so researchers must be aware of the consequences of preconceptions, assumptions, or bias.

Open questionnaires provide an opportunity to allow the researcher to gather information from more than one person at a time, by setting out open questions that require a fuller, written response from participants.

Observation is a practical method, requiring researchers to make observations in the field, writing field notes or diaries, and interpreting those notes, to make sense of a situation or behaviour. While this method can provide a unique insight, it requires key skills and experience to properly carry out and analyse the findings.

3.3 Co-design approach

A co-design approach aims to actively involve participants in the project process, providing views and opinions, while project leads take on board participant feedback.

This approach is well suited to a local project that will involve different actors and stakeholders, yet it is equally recognised as a “key concept and approach in global change” (Moser, 2016). Moser (2016) focuses on the “art and emerging scholarship in co-design that could itself be transformative — for the knowledge production process and for the value of science to society” (Moser, 2016).

The literature review set out three categorises of public participation in scientific research (Table 1). Given this is the first hedgerow survey at Sapperton Wilder and the initial setup of the project was progressed by project leads, before recruiting citizen scientists, the approach is classed as collaborative at this stage. Albeit some elements were moving towards a co-designed approach by the end of the six-month period of hedgerow surveying.

3.4 Bias, validity and ethics

There are many types of bias that can appear in research, including in the design, participant selection, procedural, and analysis stages. While assumption is not the same as bias, one can lead to the other and therefore the researcher must have an awareness of both factors. Realistically, neutrality is difficult to achieve therefore to reduce bias throughout the process the researcher referred to the research aims and considered how they sat within the context of the researcher’s personal beliefs. This exercise helped to highlight possible areas of bias. Where researcher bias did present itself the researcher used evidence to interrogate the view or position or triangulate to increase the validity of the research findings.

Validity and reliability are ways of measuring the quality of research. Reliability focuses on consistency and validity in the accuracy of the research. This will support the longevity of the research and the extent to which it can be reproduced or referenced in the future. Validity and reliability needed to be considered throughout the process to minimise bias.

The principles of citizen science (Robinson et al., 2018) discussed at 2.3, recognise the need for project progression to take place alongside consideration of legal and ethical issues. Therefore ethics were considered at various stages throughout the project. The University of Gloucestershire's research ethics guidance (University Gloucestershire, 2022) supported the consideration of ethical issues.

It is the responsibility of the researcher to ensure proper ethical conduct throughout the research. This includes ensuring the well-being of participants is considered and the natural environment is protected.

The research approach was based on freely given information from participants. The researcher was clear and transparent on the aims, purpose, context, duration, and dissemination of the research. The Debrief Form and the Informed Consent Form which supported the project are shown at Appendix 2

Both the Debrief Form and Informed Consent Form along with additional supporting information were provided on the CCRI website, throughout the fieldwork. The Debrief Form provided information to the participants on withdrawal from the project, anonymity, confidentially, and the storage of data. While no undue effects were anticipated as a result of being involved in the research, participants were reminded throughout the project of their right to decline to answer specific questions at any

point or withdraw from the process entirely. Participants were also provided with details of the complaint procedure, via the University of Gloucestershire.

3.5 Chosen research tools

The research tools selected for this project are commonly used within the mixed methods approach. They have been chosen to support project goals, data quality, engagement and interaction with stakeholders, and future monitoring and evaluation of the project.

The researcher had regular, direct contact with participants, which is a benefit of a small or local study. Participants were approached in a targeted, yet open and transparent manner to encourage participant buy-in and understanding of the project.

All participants involved in the data collection stage were offered a draft copy of the data analysis when completed to ensure clarity and transparency throughout the project.

Questionnaire

The quantitative method of research took the form of an online, semi-structured questionnaire, sent to individual stakeholders, to provide general, contextual data, facts and figures. The questionnaire was created and designed with the target audience in mind. It produced standardised information that was easily analysed for patterns and comparisons.

Consideration of what needed to be achieved guided question selection. Incorporating the opportunity for additional comments and views provided a valuable addition to the project. The following question types were used in the questionnaires.

Table 4: Question types used in quantitative research

Single selection questions	Respondents select only one response. This question can be supported by a free text option, allowing respondents to expand..
Free text questions	A comment to express opinion.
Likert scale questions	A ranking scale, setting out high and low scores to gauge feelings, attitudes etc.

The early surveying of participants via questionnaire included questions on the following topics.

- Existing understanding and knowledge;
- Motivations to becoming involved;
- Attitudes towards climate change:
- Connections to nature;
- Pro-environmental behaviour, and:
- Socio-demographic information.

A basic manual analysis was employed to identify questionnaire responses that either aligned or conflicted with the findings of the literature review.

Given this is a local study, participant numbers were small which made the testing of the survey difficult. However, it was considered essential to pilot the survey, to allow issues to be identified that might not have been obvious to the researcher, whilst ensuring that all the questions have the same meaning to individuals. A small pilot study of the questionnaires was undertaken on a small group of non-scientific

researchers. This allowed scrutiny of the draft questionnaires and amendments before finalising the survey. The piloting of the project is discussed in further detail at 3.10.

Observation in the field

Using a naturalistic approach to observation at the monthly community science events required the researcher to observe the surveying group, noting how they engaged individually and collectively in the project. Considering the elements of the project that interested and enthused participants and any challenges they found. Field notes were written during the events.

A naturalistic approach did help to mitigate the Hawthorne effect, resulting in participants acting differently due to the fact they are being observed (Oswald et al., 2014).

Interviews

Face-to-face interviews provided the opportunity to address the topics identified in the questionnaires and to expand and explore issues further. This enabled the researcher to press beyond the limitations of a questionnaire, with the expectation that “unanticipated findings will emerge” (Robson, 1993).

Interviewing gave the researcher freedom to modify the order of the questions, allowing the conversation to develop, yet keeping within the parameters of the topic area. Well-organised interviews that followed an interview schedule, were used to explore similarities in participant experiences.

Interviews were arranged at a time and location suitable to the participant. The interview resembled a conversation, and took place, either in the field, as a walking

interview, or over the phone. Participants were informed during the sign-up process that they were not obliged to take part in an interview or discuss anything they were not comfortable discussing. They were reminded of this at the start of the interview. Written interview transcripts were analysed through a process that involved identifying common themes across the data,

To avoid interview/survey bias, questions were formed to ensure there was no leading or steering of responses, ensuring that all participant groups were treated the same, in terms of questions asked. The researcher addressed all possible ideas or options, ensuring that any omissions were recorded and clear. The wording was precise to avoid ambiguity and generalisation. Interviewees were asked if there was anything that wasn't covered during interviews, making data gathering an open and accountable process.

3.6 Project Advisory Team

A Project Advisory Team comprising representation from the University of Gloucestershire, and Sapperton Wilder provided directional input to the project from the early stages. Membership of the group included Professors from the CCRI and the wider University of Gloucestershire, along with the Sapperton Wilder Programme Manager, Engagement Officer and Ecologist. The MSc students/researchers also formed part of this team.

The Project Advisory Team held fortnightly meetings from January – May 2023 to discuss the development of the hedgerow surveying project at Sapperton Wilder. Discussions included the focus of the project (hedgerows), and regular updates on issues including the recruitment plan, health and safety, event logistics, and risk management. The Gantt chart at Table 5 sets out the key issues discussed by the team in the run-up to the commencement of the hedgerow surveying.

Table 5: Project Advisory Team Gantt chart

Project Advisory Team: Discussion	**Jan '23**	**Feb '23**	**March '23**	**April '23**	**May '23**
Project focus (hedgerows)					
Recruitment plan					
Risk management Administration/GDPR Sign up process					
Event logistics and health and safety					

3.7 Definitions

The literature review highlighted the importance of early discussion and clarification of definitions and terms. Where necessary, definitions were discussed and agreed by the Project Advisory Team. These definitions were set out for participants as part of the sign-up process, to ensure clarity for participants.

Table 6: Definitions

Term	Definition
Nature recovery	Informed by existing literature, nature recovery will be understood to balance environmental, social, cultural and economic considerations.
Nature-based solutions	Nature-based solutions are the practical tools that support nature recovery and are ways of addressing challenges through nature, while considering the needs of society
Landscape-scale	Supporting the position set out in the literature review, landscape scale will incorporate an inclusive, multi-disciplinary, joint working approach.
Local	The feeling of belonging of the individual, will form the measure of what/who is considered local.
Community science	To ensure clarity and encourage stewardship of the project, the term community science will be used rather than citizen science. Community is considered a more appropriate and relatable word in practice, at a local community level.
	Informed by existing literature and Project Advisory Team discussion, community science will be defined as: A form of local, collective action that supports the advancement of scientific knowledge, learning and understanding through engagement with diverse communities and individuals, utilising their capacity and interest to provide scientific data that can provide baseline and on-going monitoring data, to directly inform long term planning and practice at Sapperton Wilder.

3.8 Stakeholder profiling

The tasks listed at 1.6 require the identification of stakeholders/groups that can support citizen science development and recruitment in local nature-based recovery projects. To determine the level of involvement and influence of individual

stakeholder groups, a stakeholder profiling exercise was carried out. The method of stakeholder identification was adapted from the Consultation Institute's (2005) stakeholder profiling framework and attempts to categorise groups by their influence and interest in the project. The matrix was been adapted to incorporate the level of communication required across these groups.

This stakeholder profiling exercise supported the categorisation of those parties involved. Certain groups scored higher in terms of interest and influence than others. For example, citizen scientists might have high interest but score poorly in terms of influence, if they have a weaker relationship with policy or decision-makers, as discussed in the literature review. Local wildlife/amenity groups were considered influential as they hold a significant amount of local information on flora and fauna and their membership is likely to hold strong connections to the local area and place. Land managers are a key stakeholder, with responsibility for implementing the project findings. This group often has unique ties with the land, significantly different from the connections experienced by local communities. Landowners and managers have a unique, first-hand perspective of land management. As a result, they may have individual ideas, based on culture, ownership rights, traditional farming practices or economic viewpoints which may or may not align with evidence-based, scientific data, collected by non-professionals.

Identifying and understanding the level of interest and influence of stakeholder groups helped to clarify the different relationships, including those directly involved or those that simply required updating on project progress. The results of the stakeholder profiling exercise undertaken at the start of the project fieldwork (May 2023) are set out in the bullet points in Table 7.

Table 7: Influence/interest matrix for stakeholder identification

High Influence	Need regular communication This group requires regular communication to ensure a wider understanding and impact of the project outcomes: • Land manager/contractor	Easy engagers This group will willingly engage in regular meetings. Often an easy-to-reach group: • Local experts • Local wildlife groups • Sapperton village residents with an interest in nature recovery
Low Influence	Requires the right approach Communication has to be right in order to include this group. Not an easy-to-reach group: • Sapperton village resident that do not currently have a connection with nature	Need support to engage This group requires support to be recognised: • Community scientists outside the local area
	Low interest	**High interest**

Source: Adapted from the Consultation Institute (2005)

3.9 Sapperton Wilder Community Science Goals

The development of citizen science across Sapperton Wilder's land is a clear aim of Sapperton Wilder. The researcher encouraged Sapperton Wilder to consider their long-term plans for developing citizen science through a written plan that could support their aims and be referred to and measured against. In response, the Sapperton Wilder Team produced a 10-Year Plan that sets out short to long-term goals and targets for community science. These ambitions are set out in the table below, with the key terminology, that contributed to the research approach and methods of this project indicated in bold.

Table 8: Sapperton Wilder: Community Science 10 Year Plan

Sapperton Wilder: Community Science 10 Year Plan
1 Year
Retain community science **numbers** attending the hedgerow surveying events in 2023.
Build upon a suite of citizen science activities to help support and contribute to the building of this **evidence-based** case study at Sapperton Wilder.
Observe **continued connection** to the landscape, wildlife, habitat and mission of the project through direct interaction.
Volunteers benefit mutually through **learning** and deepening of knowledge and curiosity and feeding back to help improve their experience.
Social connections amongst the community strengthening though volunteering activities.
Adapting to **ways of working that suit all involved** and **documenting** all of this including negative feedback to help improve better decision making.
An **interest in other survey activities** such as soil sampling, earthworm study, butterfly transects, moth trapping, reptile monitoring and beetle study for example.
Increased understanding of the most **efficient balance** of **volunteer management and integration of citizen scientists** into the land management protocols.
5 years
All of the same principles would apply from year 1 to year 5.
Dependent on **well-maintained engagement** and **stakeholdership**, we would expect our **community core** (despite the fluctuations of interest and availability) to have accrued many more **skills and interest** and still be loyal to the project and its mission.
Citizen science **monitoring is a core part of recording** evidence for Biodiversity Net Gain (BNG) metrics.
Over time we would expect to **expand our community group** through hearsay, outreach and volunteer calling.
Citizen science contribution by year 5 to have played a vital role in capturing the data that represents a **core evidence base.**
Our **2-way communication channel** to **listen and respond to the community of citizen scientists** to drive new avenues of research or streamlined and improved processes and problem solving that will play a part in the ‘playbook’ in the long run.

Sapperton known as a **hub for excellence** in citizen science and land management.
10 years
Short term ambitions remain the same **consistently**. **Repetition of data sets** should be taken very seriously year on year and so should the way we **engage and communicate** with the community to achieve our collective goals.
With carefully structured **survey events that answer valuable questions and build scientific understandings** and shared learning, then our work together **alongside the successful execution of land management and farming methods**, we would expect the project to be on track to reach its goal.
After 10 years we should be becoming **significantly influential**, and our **core citizen scientists will have developed significantly**.
Being influential to local landowners is a key goal, but if we are on track, after 10 years we should be a **case study consideration with regards to the wider agricultural government policy.**
The **community science learnings as a whole will present its own case study** for other landowners to build their own communities around their own projects just as much as the faming aspects and conservation management aspects of the project.
Research findings and experience have helped establish a **field centre base** at Sapperton known as a national centre of excellence for citizen science.

Source: Sapperton Wilder (2023)

To assist Sapperton Wilder in its aspirations to engage community scientists in its work, the volunteer role of Community Liaison was created. This role acts as a link between Sapperton Wilder and the local Parish Council, supporting communications between the two parties. This is a new position, and it will take time to shape and define this new role. However, the benefits and future potential of a Community Liaison representative bridging the gap between the local community and decision-making on the ground is already clear. This is shown in the high levels of interest from the local community in the general work and ambitions of Sapperton Wilder.

3.10 Sapperton Wilder Hedgerow Project: Research Plan

Table 9 sets out the research plan for the hedgerow project fieldwork, setting out the practical steps followed. These are discussed in detail below.

Table 9: Hedgerow Project Research Plan

Hedgerow Project Research Plan	
Advertising and recruitment process	
Hedgerow project: Recruitment Plan	The project recruitment plan (Appendix 1) was agreed by the Project Advisory Team. The recruitment plan set out aims and tasks required to attract a diverse range of local volunteers to act as community scientists. The recruitment plan specified an anchored and staged approach to recruitment. • Anchored means, making contact with individuals, through one contact point, so individuals are anchored to an organisation or group, rather than an open invitation to participate in the project. • Staged means, a continuing process of recruitment, moving through stages 1 to 3, to increase numbers and/or revisiting stages and re-advertising for participants when necessary. The recruitment of the volunteers was guided by the Recruitment Plan, using the staged and anchored approach from March to August, with the fieldwork events and surveying taking place from May to October.
Sign-up process	
	Community Scientists were asked to sign-up for the project via an online process, incorporating GPDR, ethical consent, risk assessment, and filming permissions (Appendix 2). The online information also included details of the project partners, explanations of definitions, key dates, arrangements for actively participating, along with the withdrawal and complaints procedure. Participants were also guided to the initial questionnaire, as part of this sign-up process.
	Paper information packs were made available to interested parties, providing all online details to ensure those that were unable to access the online sign-up process could still be included.
Attending the Sapperton Wilder site to survey	
	Community scientists were asked to visit the Sapperton Wilder site(s) (during May – October) to survey sections of hedgerow.

	Participants were able to survey the hedgerows as part of a group at the monthly events or were able to visit the site at a time most suitable to them.
	Participants were provided with maps, hedgerow surveying tables, and guidance notes to record their observations. (Appendix 3)
Attending the monthly community science events to survey	Monthly group events were arranged on the last Sunday of every month, between 2pm and 4pm from May to October. The following standard event format was agreed by the Project Advisory Team and followed at each event: • 14:00 meet at central block car park for event registration; • 14:05 congregate to listen to an invited speaker on a relevant or related topic; • 14:30 – 15:45 survey hedgerow sections across the three Sapperton Wilder field blocks; • 15:45 meet at central block car park for refreshments and socialising; • 16:00 end of the surveying event.
Attending the site individually to survey	For participants who preferred to survey at a time suited to them, a standard process was agreed and followed: • Maps, what3word locations, recording table and guidance notes were emailed to the participant (Appendix 3). • If the participant had not surveyed previously they were met on-site by a member of the Sapperton Wilder team who talked them through the process. • Participants were asked to submit their completed forms, by email, within 2 days of surveying on-site.
Hedgerow surveying method	
	Hedgerow sections were marked out, on-site, across the three blocks.
	Participants were allocated sections (30-metre stretches) of hedgerow and asked to answer several questions about the hedgerow section(s). The questions were set out in the hedgerow surveying table. (Appendix 3).
	Paper copies of the recording table were provided along with a reference number, map, and what3word location of the hedge section (Appendix 3)
	Participants were asked to submit, via email, their completed hedgerow survey table within 2 days of visiting the site so citizen science results could be compared to the project expert's results.

Advertising and Recruitment process

The Project Advisory Team agreed between twenty-five to thirty participants was a manageable and realistic number to expect to sign up for hedgerow surveying, given

its local focus. This took into account the potential for fluctuation in participant numbers over the six months of hedgerow surveying, aligning with the Nibble and Drop Framework theory, shown in Figure 5. This framework accepts and plans for the fact that some participants will sign up for a project, but not contribute as much as others.

In line with the project recruitment plan and its staged and anchored approach, local community members were invited to sign up to participate in this community science project. Appendix 5 shows the project information sent to the organisations/anchor points in the Recruitment Plan. The recruitment process targeted local volunteers, encouraging them to become more engaged with nature and their local area and contribute to research. In all cases, direct contact was made with the organisations/anchor points listed in the Recruitment Plan, to build relations and promote the project, as well as recruiting citizen scientists.

Sign-up process

To ensure compliance with data protection requirements, Sapperton Wilder provided administrative support and was the first point of contact for participants engaging in the hedgerow project.

Participant sign-up was an online, tick-box process, incorporating the risk assessment, ethical consent, project debrief form, and filming permission forms.

Participants were also asked to fill out the initial online questionnaire at this stage. This collected further information on engagement in the project, motivations and behaviours.

Piloting the project

A small, select group was invited to test the process. The pilot event was carried out in the field and run as an informal survey event. The pilot event provided useful feedback on the process of hedgerow surveying and the running of the events, before hosting the first event. The pilot event flagged up several issues including:

1. The need for further guidance notes on identifying species and plants. It highlighted the fact that although people felt they had a good knowledge of local plants, shrubs, and trees, they became less confident in their identification in this more formalised, scientific situation;

2. While people were allowed to use online identification apps while surveying, it became clear through the pilot that many people didn't carry a phone or didn't want to use technology in the field. Paper guidance notes were needed to support these participants;

3. Participants wanted further instruction, including how long to spend surveying hedgerow sections and what to include in their recording;

4. Scientific/ecological terminology was also identified as a potential issue for some participants, requiring further explanation.

Following the pilot, further changes were made to both the recording table and guidance notes to address the need for further detailed guidance on identification and the process of hedgerow surveying.

Attending the site to survey

The monthly events ran between May and October 2023, and followed the same format each month. The events allocated time for discussion, with the aim of developing the project into a co-designed project, with citizen scientists providing feedback on the project. A summary of the issues discussed during the monthly events is set out below:

- On-going improvements to the hedgerow recording table over the project period;
- Recording percentages of species within a hedgerow section and the introduction of the DAFOR Scale in hedgerow surveying;
- Preferred mapping tools (paper map, What3words, OS grid reference);
- The most effective method and material for marking out individual hedgerow sections;
- Identification of species;
- Date and timing of events, and;
- Communicating the wider work of Sapperton Wilder.

Participants surveying in their own time were not part of these co-design discussions, however they were asked for feedback via email, as part of the sign-up process.

3.11 Conclusion of research approach and methods

A mixed methods approach was used to gather data on the community scientist's views and experiences during the hedgerow surveying. The questionnaires and interviews provided valuable data; however, the second questionnaire had a significantly lower response rate than the initial questionnaire. Observing the community scientists in the field and how they approached surveying supported the

information gathered via the questionnaires and interviews. Combined, this provided a range of quantitative and qualitative information and data for analysis.

CHAPTER 4. FINDINGS

4.1 Introduction to findings

Following the collection and analysis of the fieldwork and data, the project findings were analysed and interpreted. Referring to the aims of the project, research questions, and literature review at this stage, provided a focus for the analysis.

This chapter brings together the examination of existing literature and data from the project's fieldwork to achieve a better understanding of engagement and impact in local community science, nature recovery initiatives.

4.2 Findings developed from the literature review

The literature review revealed several considerations that required further thought, taking into account the case study area. These matters are discussed below, setting the context for the findings.

Applying the Tripartite Framework (discussed at Figure 4) and its people, place, and process factors to the case study area in the early stages of the research gave a useful insight into the characteristics, history, and dynamics of the village of Sapperton. This provided a set of data on which to consider further evidence gathered through the project.

The village has a strong cultural heritage, having developed as an Arts and Crafts community around 100 years ago, under the patronage of the Bathurst Estate. This Arts and Crafts movement was driven by the growing number of local craftsmen and workshops in the village and surrounding area. This resulted in a unique, local architectural style, which later became known as the 'Sapperton style', and still characterises the village today (Gordon 2020).

Ernest Gimson, was a local architect and craftsman, and a pivotal figure in the local Arts and Craft movement at the time. Gimson, lived and work in Sapperton and was said to enjoy the sense of local community. It was recorded that “his social life revolved around the local community,” (Sapperton - Ernest Gimson: The Arts and Craft Movement, no date) enjoying singing, dancing, and music as part of rural village life. Today, the village of Sapperton is afforded conservation area status, recognised for its historic character and identity.

The Local Insight Profile (2019) for Sapperton reported a population of around four hundred and five inhabitants, the majority of which identified as white British (94%), leading largely healthy, active lifestyles. Several homes in the village were recorded as second homes, and while second homes can often have a negative impact on community cohesion, due to their limited occupation (Royal Town Planning Institute (RTPI), 2021), over half of Sapperton residents (68%) reported that they belong in the area. Villagers largely felt positive about their social connections in the community. A small percentage of residents responded that they had been involved in local decisions (20%) and/or volunteered locally (32%) (OCSI 2019).

This assessment reveals historical connections between the built environment and social connections and interactions, which in turn, has impacted residents' thinking and feelings towards the village. This shows the interlinked nature of the three elements of the Tripartite Framework, shown at Figure 4.

The findings from the literature review provided a basis for the research approach and informed the direction of the project. The following section will discuss the findings of the fieldwork, considering the impact of local engagement in community science, nature-based recovery.

4.3 Fieldwork observation

While it was anticipated that observing the participants in the field would provide useful insight into the procedural aspects of the project, it wasn't appreciated how useful this method would be in providing an understanding of social dynamics, enthusiasm and drivers to participate in the project. Notes were written following each event, which recorded numbers attending, and topics and issues raised throughout the events.

Convening the multi-disciplinary Project Advisory Team in the early stages brought steady momentum to the project. The Team's broad range of specialisms supported an inclusive approach from the outset, which provided a strong basis on which to develop a co-design approach with community scientists.

The Sapperton Wilder Engagement Officer and Community Liaison played a vital role in attracting local interest and volunteers, rallying a core group of Sapperton residents that supported each citizen science event, in addition to surveying in their own time.

The number of citizen science participants steadily grew to thirty-nine between May - October 2023. Event attendance remained consistent across the six months of hedgerow surveying, with ten to fifteen participants attending each event. Despite some extreme weather, participants often stayed beyond the closing of the events, socialising with other participants and the Project Advisory Team. Interestingly, the opportunity to socialise was not specified as a motivation to get involved in the project, in the initial questionnaire, however, it is considered that this social/team element built into events, quickly became an important part of the project for many of the participants.

A core group of thirteen participants attended almost every event and were committed to getting the hedgerow surveying process right for the best possible data as well as maximising their opportunity to learn.

While participants were able to withdraw from the project at any time, no community scientists asked to be removed from the hedgerow project database. However, there were different levels of engagement in the project, which provides useful baseline evidence for the future monitoring of citizen science contributions, discussed below in relation to the Sapperton Wilder Community Science 10 Year Plan.

The Nibble and Drop Framework (Fischer et al. 2020) was adapted and applied to classify citizen science participation at Sapperton Wilder. Figure 4 sets out categories (initial droppers, nibble droppers, nibblers, hooked droppers, hooked), with hedgerow project-specific definitions and measures.

Figure 5: Nibble and Drop Framework

	Inactive participants	Active participants
High contribution	**Hooked-droppers** Participants that have been high level contributors, before leaving the project.	**Hooked** Participants that are high level, regular contributors
Minimal contribution	**Nibble-droppers** Participate for a short time, before leaving the project	**Nibblers** Participate but not a high level of contribution
No contribution	**Initial-droppers** Sign-up to project, but do not participate after receiving introductory information	

Source: Adapted from Fischer et al. (2020)

The core group of thirteen participants showed significant commitment to the project and inspired a further category to be added to the framework. This is titled 'Hooked +' and recognises the contribution of those that not only contributed to hedgerow surveying but also collaborated, providing feedback on the process and involving themselves in learning and development opportunities offered through the project.

Hooked +

Attendance at the majority of events;

Surveying in the participants own time;

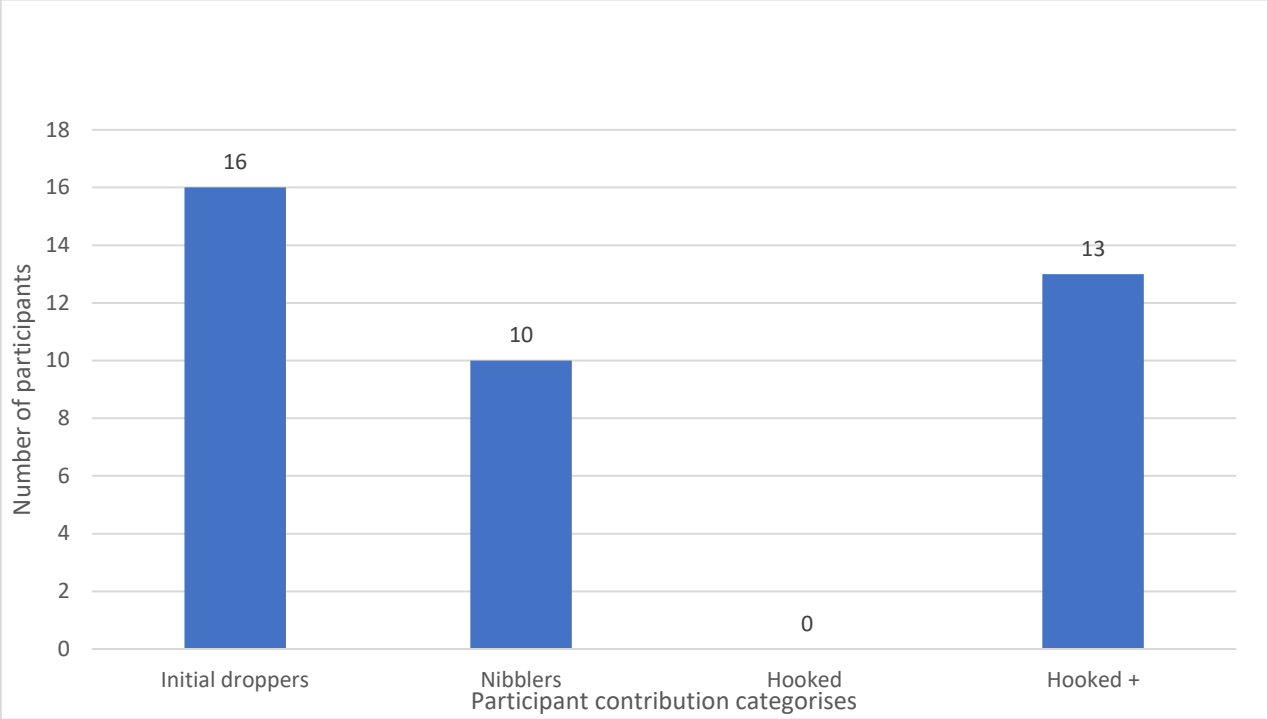
Actively contributing ideas and suggestions through the co-design process;

Taking up learning/training opportunities.

Accurately categorising participant contribution requires longer timescales, which go beyond this project, however, the exercise has been attempted using the data collected

from this first hedgerow project to demonstrate what the comparison of contribution categorises might look like. To ensure a consistent approach to measuring contribution this exercise was completed by one person (the researcher).

Figure 6: Participant contribution graph: Hedgerow survey May – October 2023



4.4 Co-design fieldwork findings

The hedgerow project was assessed against the three categories of public participation in scientific research, set out in Table 1 and discussed in the literature review. It is considered that the hedgerow project started as a contributory project, with community scientists contributing information to the project. This is largely because this was the first year of the project and community scientists were not recruited until after the project was designed. However, the ambition to achieve a more participatory process meant that the project soon started to develop from a contributory project to a collaborative project, with community scientists informing ongoing changes from the start of the six month hedgerow surveying, in May 2023.

Time for group discussion was built into each monthly event, which provided an opportunity to discuss the project as a group and listen to feedback. Feedback was then actioned over the following month before the next event took place.

There were several co-design methods used in the hedgerow project to encourage public participation in the project design, including:

- Open events/discussion;
- Surveys, with the opportunity to provide views and feedback;
- A newsletter, providing information and encouraging engagement;
- Inviting expert speakers to the monthly events to support community science learning, and;
- Testing and feedback.

4.5 The initial questionnaire results

An initial questionnaire was sent to all community scientists as part of the sign-up process. This questionnaire received twenty-five responses, out of a possible thirty-nine. However, some questionnaire responses were submitted on behalf of a couple or family unit, responding on behalf of more than one person. Nevertheless, these responses have been counted as one response, to avoid confusion during analysis.

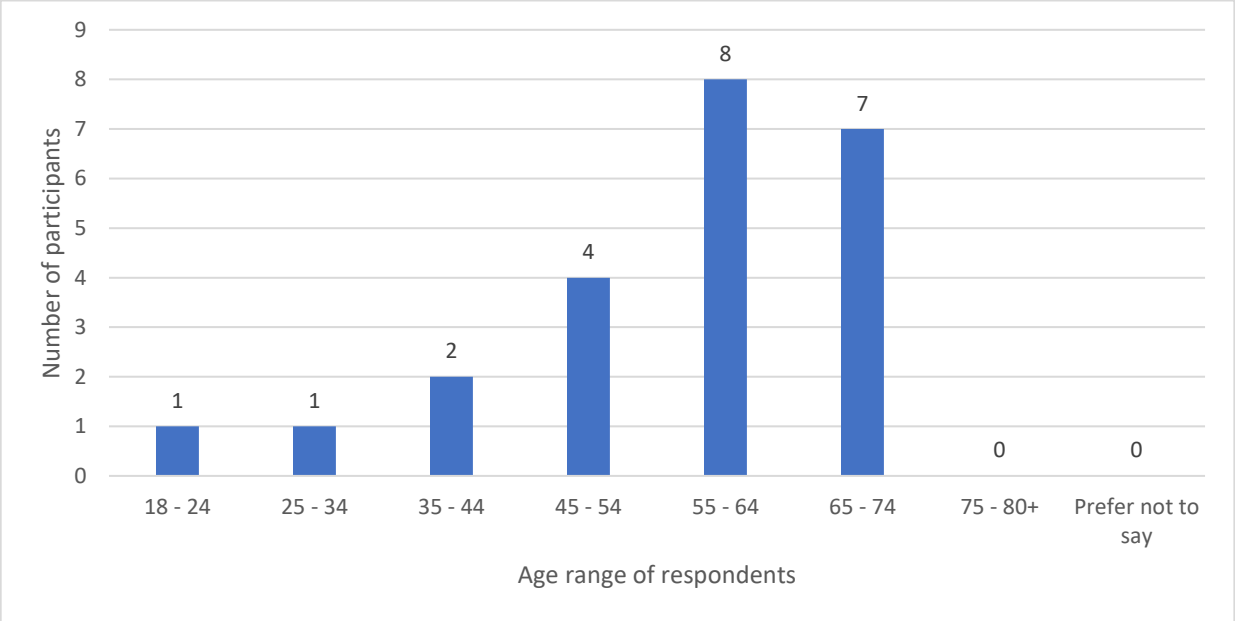
The initial questionnaire delivered a wide and general overview of the participants, providing valuable baseline data for the project. The following section introduces the key questions and outlines the responses.

<u>Socio-demographics of respondents</u>

The age spread of participants (Figure 7) was particularly varied, possibly due to the events being held on the weekend, which made them accessible to students and

those of working age, as well as retired members of the community. This in turn impacted the mix of individuals who were able to get involved, attracting professional ecologists, academics, and water specialists, alongside the fifteen respondents who had no professional link to nature or the countryside.

Figure 7: Age range of respondents to the initial questionnaire



How did you first hear about this community science project?

Word of mouth was an effective way of recruiting participants to the project, with eight respondents having been told about the project locally. This shows the important role of the Community Liaison and Sapperton Wilder Engagement Officer in communicating with local communities and their role in the longer-term recruitment and retention of community scientists. Beyond this, six respondents learned of the project via the information (Appendix 5) sent to the anchor points identified in the recruitment plan (Appendix 1).

Please rank your motivations to participate in the project

Participants were asked to rank their motivation(s) to become involved in the project, from most important to least important from the following list:

- Interest in the subject,
- contributing to science,
- personal development,
- supporting a local project,
- improving individual sustainability,
- sharing knowledge,
- meet new people,
- career development,
- or other.

Nineteen respondents ranked an interest in the subject area (citizen science/nature/hedgerows/ecology) as their driving motivation. Other motivations scoring highly included the opportunity to support a local project (13) and contribute to science (11). The opportunity to share knowledge (8) was the fourth highest motivation.

The additional free-text comments in response to this question highlighted some interesting motivations, going beyond the ranking question. These referred to the positive benefits of being involved in the project, not only for the environment but also for individual participants' health and well-being.

"There is a desperate need for biodiversity enhancement and environmental education at this point in history, and in the creation of wildlife corridors. I'm absolutely drawn to such projects, both as a lifelong conservation advocate and as

someone suffering from longstanding chronic depression who needs to be involved in positive action." (Participant 114)

Existing research, discussed in the literature review (2.7), found motivations to be either intrinsic, satisfying to the individual, or extrinsic and driven by other goals such as professional development. The findings from the first questionnaire would align with this theory. The group of thirteen participants that attended most events and surveyed in their own time, were considered as 'hooked+' using the contribution matrix set out in Figure 5. This high contribution group was made up of environmental professionals and non-professionals. All but one of the thirteen participants cited the opportunity to support a local project as the most important motivation for getting involved in the hedgerow project, suggesting the core group has a strong link with place attachment.

How far will you need to travel to participate in this community science project?

The idea behind the project Recruitment Plan was to attract local community scientists via small, local anchor points. This helped to secure a local focus for the project while keeping recruitment a manageable task.

Most people travelled between three and ten miles to the site, with only four respondents traveling over ten miles. Given the rurality of the area, this would take in neighbouring towns and villages close to the village of Sapperton, keeping the local focus, which was integral to the overall design of the project, as discussed in the literature review.

How would you like to be involved in the community science fieldwork?

Participants were given the option of hedgerow surveying in a group or individually. Nineteen participants indicated they would like to survey both as part of a group and

individually. Only three respondents answered that they would like to survey alone, at a time most suitable to them. Most participants were happy to attend the planned events on the last Sunday of each month between 2pm and 4pm.

Please rate your confidence in your ability to accurately identify hedgerow species

Before surveying commenced on site, there was a high number of respondents that rated their confidence in their ability to accurately identify hedgerow species as confident or very confident. However, in practice, the researcher observed that participants appeared less confident in a formalised situation, where identification accuracy was important to the project. This was witnessed through community scientists questioning themselves and seeking guidance and second opinions from experts, including members of the Project Advisory Team and other professional community scientists. This was addressed by the researchers in several ways, including improving guidance notes, providing verbal explanations at the start of the events, and investing in the wider learning of community scientists, with a different expert speaking at each event.

It was also observed that some less experienced community scientists chose to survey, at the monthly events, close to professionals, who were able to provide support and guidance in the identification of species. This created an interesting mix of professionals and non-professionals in an informal sharing of information and learning. One professional (ecologist) commented that hedgerow surveying in this way provided a useful source of continuous professional development for professionals, recognising the importance of learning for all participants.

Would you like to spend more time outside in green and natural places?

Almost all respondents (22) indicated they would like to spend more time outside in the natural environment. While that wasn't recognised as a motivation for joining the

project by any respondents, this is a high percentage and may be an unconscious motivation for some people, as an opportunity and reason to spend time in nature.

Do you engage in the following pro environmental activities?

Participants were asked to indicate from a list of pro environmental behaviours the activities they already participate in, would like to participate in, or were not in a position to participate in. The list included composting, recycling, buying products with an environmental label, making fewer car journeys, using public transport, investing in renewable energy at home, buying an electric vehicle, and reducing air travel. All respondents appear to have an existing awareness of individual environmental responsibilities with many engaging in pro-environmental behaviours as part of their everyday life. Some key findings are set out below:

- All respondents compost and recycle at home;
- Sixteen respondents consider the sustainability of the food they purchase;
- Seventeen respondents have reduced their air travel, with six respondents planning on addressing reducing their air travel in the future;
- While only three respondents currently have an electric vehicle, thirteen have aspirations to own one in the future; and;
- Eleven respondents make fewer car journeys, with seven planning to make fewer journeys in the future.

Interestingly many of the respondents noted aspirations to pursue pro-environmental behaviours further in the future. However, it is noted that some of these commitments, such as owning an electric car or using public transport require significant time or financial investment and should therefore be considered as a longer-term aspiration, beyond the timescale of this project.

It was noted that all the core group had aspirations to improve their environmental behaviour and sustainability in the future. This, together with their dedication to the project suggests a strong commitment to environmental improvement.

4.6 Conclusion of initial questionnaires

Geoghegan et al. (2016) recognises that different people are driven by different motivations, to become involved. Given the wide range of motivations raised through the initial questionnaire, this research concurs with Geoghegan et al's (2016) view. Changes to these initial motivations will be discussed in further sections in this chapter.

Participants were clearly aware of environmental issues and responsibilities and already displayed some pro-environmental behaviours. Participants equally have longer-term environmental aspirations to improve their existing pro-environmental behaviours. It is noted that these aspirations are likely to require individual investment and/or time and therefore need to be tracked over a longer timeframe, beyond the time scale of this project.

4.7 Interview results

Ten respondents were randomly selected from the list of participants and were approached during the second half of the project, between August and October 2023 to participate in interviews. Eight interviews were carried out face to face and two by telephone. The interviews provided an opportunity to explore the feedback from the initial questionnaire, and observations from the fieldwork more thoroughly. The open and friendly nature of the project lent itself to a relaxed style of interviewing, including walking interviews.

The interview schedule covered the following topic areas:

- Place attachment and a sense of belonging;
- Motivations;
- Barriers to engaging in community science, and;
- Pro-environmental behaviour.

Key findings from the face-to-face interviews are set out below:

All interviewees recognised and valued the opportunity to access Sapperton Wilder land and be involved in this innovative project. The opportunity to learn was raised as a driver for engaging in the project by all interviewees. While personal learning didn't score particularly highly in terms of motivations to join the project via the initial questionnaire, it was something that appeared to develop in importance over the course of the project. This was supported by regular expert speakers, event training and newsletters. One interviewee commented, "I am learning more than I expected" (Participant 108), adding, "It's fun being involved, it's like the university of the third age!" (Participant 108) This shows that while older or retired participants may not get involved for career development purposes, continued learning and personal development are still important for this age group. Another participant explained they had been inspired to carry out their own research on a particular topic, following one of the monthly events, to learn more about the subject.

As well as an opportunity to learn, the Sapperton Wilder community scientists were very keen to be involved and witness positive change in their local area. This is encouraging for land managers and decision makers, who are responsible for implementing that change through land management processes and procedures. Two interviewees commented that they felt a responsibility to the project and the land, to ensure other users were respectful of nature when using the land for

recreation (for example, respecting ground-nesting birds) and fully understood the important work that is taking place at the site. This makes links with the discussion around place attachment and suggests the developing role of stewards/stewardship within the community or a feeling of responsibility over the land and Sapperton Wilder project.

The initial questionnaire confirmed that most participants had already established pro-environmental behaviours, yet many had ambitions to improve these behaviours in the future. Interviewees did not feel that their environmental behaviour was particularly impacted as a result of participating in the hedgerow project. One participant commented, “the project hasn’t had an impact on my sustainability or environmental awareness, but it has defined it and made it more meaningful”. (Participant 107). It should be noted that this was the first hedgerow surveying project, which ran for six months. Monitoring pro-environmental behaviour over a longer term may provide further evidence and data in this respect.

Very few barriers were identified by interviewees, with some considering there were no barriers to engaging in local nature-based projects. Three respondents raised the need for further guidance at the first event on the identification of species and the process of hedgerow recording. A further two respondents considered the scientific process of some of the other Sapperton Wilder projects as a barrier to engaging. For example, the process of surveying earthworms was considered too scientific, for some. This relates to the importance of support and training for community scientists.

4.8 Conclusion of interview results

The interviews raised two issues that had not already been picked up via the first questionnaire. Firstly, the feeling of responsibility or stewardship over the land and

the work of Sapperton Wilder; and secondly, the development of the importance of learning as a driver to becoming and remaining involved.

It is considered that both these factors were unlikely to be present or recognised at the outset of the project, but have developed throughout the project, as participants became more involved.

4.9 The closing questionnaire results

The closing questionnaire was an opportunity for respondents to make any comments once the surveying had come to an end. This was a short questionnaire that was primarily made up of free text questions to give as much freedom to the respondent to reflect on the whole project, process and their experience.

The response rate was significantly lower than the first questionnaire, with eight responses. However, the first questionnaire was part of the sign-up process and therefore was likely to gain more responses. The closing questionnaire was sent to participants in the monthly newsletter and they were asked to access it via an online link. While there was a significantly lower response rate to this questionnaire, the overall feedback was extremely positive, with no negative comments recorded. The following section outlines the main points raised in the closing questionnaire.

<u>How did you find engaging in the project?</u>

All recorded comments were extremely positive about the project and its ambitions. Community scientists recognised the opportunity to meet other like-minded people, participating in a local project, aimed at improving the local environment.

“Good to meet new people, heartening to see the local community participating and caring about their local environment.” (Participant 110) Equally, the importance of learning for participants continued to be raised:

“Informative, educational and gave a sense of doing something for the wider good.” (Participant 108) and; “I am excited by the wider learning possibilities of the project.” (Participant 114)

What are the main things you have got out of the project?

As people have different motivations, they also have different experiences and take away different things from those experiences. Respondents listed the main things they have taken from the project, as learning about “what’s going on in my patch” (Participant 104), a “sense of accomplishment” (Participant 131) and “increased knowledge” (Participant 128)

Has your motivation(s) for getting involved in this project changed over the course of the project?

The literature review revealed that often little is known about community science motivations. This project aimed to address this gap but also aimed to track any changes in motivations across the six months of the project.

The first questionnaire found that nineteen respondents ranked their most important motivation as an interest in the subject area (citizen science/nature/hedgerows/ecology). This was closely followed by the opportunity to support a local project and contribute to science and share knowledge.

The closing questionnaire asked participants, if their motivation(s) for getting involved had changed throughout the project. Two participants answered that their motivations had changed, while six responded that their motivations had remained the same. For those whose motivations had changed, working as part of a team with

a shared vision, was sited as the change or new motivation that retained their enthusiasm over the course of the project.

One person responded that meeting regularly as a group, added to their motivation. “Being part of a group added to the motivation, if we had met up at the beginning been given plots and not met up again, I would have participated but being part of a group and meeting up with the rewilding team made it more enjoyable.” (Participant 110)

The project findings support the theory set out by Geoghegan et al. (2016) that motivations are either intrinsic or extrinsic. However, when motivations are explored further and tracked over time, changing motivations along with unconscious motivations that develop through a project, make the understanding of motivational drivers more complex.

Confidence in identifying hedgerow species

Following the first questionnaire, participants were asked about their confidence in identifying hedgerow species at the end of the project. While there was high confidence recorded in the first questionnaire, it was observed, that in practice, participants were not as confident in the field, in a situation where accuracy was important. This confidence issue was dealt with in several ways, by both the project and participants. Firstly, opportunities for explanation and learning were provided for the participants, including improving guidance notes and talking participants through various processes at the start of the survey events. This was supported by guidance in the monthly newsletter and through the expert talks, at the surveying events. Secondly, participants created informal learning groups by surveying in groups or close to others who could provide guidance and share knowledge and information.

How has being involved in this project impacted on your connections with your local area and nature?

This question focused on place attachment, to identify links with topophilia and/or biophilia. One participant responded, that they "always thought of this area as home" (Participant 104), linking to the discussion of topophilia, local and the feeling of belonging, in the literature review. While one person noted their enhanced link to species, "I am more observant of particular species of plant" (Participant 108), suggesting a developing link to biophilia.

"It made us, as a family, feel some hope in what is a particularly disastrous period in history for nature. It also provided further inspiration for our daughter to pursue a career in conservation. We also saw some great species and met some really lovely people." (Participant 114)

The varied responses to this question suggest that different people took different things from the experience, with some feeling closer to nature and place, but this is considered different for every individual, depending on factors that are important to the individual. This reinforces the point made by Geoghegan et al. (2016) noted in the literature review (2.7), that different people have different reasons for participating. It would therefore make sense that different people gain different things from the experience.

Has the project resulted in you considering your environmental footprint or environmental behaviour differently?

Two respondents felt they were already conscious of their environmental impact and tried to live sustainably. Another two respondents suggested that the project had strengthened their desire to reduce their environmental footprint, reinforcing "the fact

that there is only one planet, and by walking the fields thinking about the possibilities it brought home how we have taken soil for granted." (Participant 110)

Do you have any further comments on any aspect of the hedgerow project?

Respondents all valued the opportunity to get involved. Some commented on looking forward to future surveying and noticing change on the ground. One participant commented, "you took an interest in the people, engaged with them on a personal level which was lovely. The talks from different voices were a great way to maintain momentum whilst educating people at the same time. Kindness, warmth and a sense of purpose are what I took home with me. Just looking forward to next year and hopefully seeing diversity improve" (Participant 110).

4.10 Conclusion of closing questionnaire

While there were significantly fewer responses to this closing questionnaire, all comments received were positive in terms of the project, its aims, and engagement with community scientists.

The closing questionnaire revealed a complexity around developing and unconscious motivations that was not present in the first questionnaire. The importance of learning for citizen scientists is a motivation that has developed in importance, throughout the project. Roche et al., (2020) suggest that co-ordinating learning outcomes and project targets in the early stages of the project, through a co-design approach, is a way of empowering participants to take control of their own learning, with ongoing support from the project (Roche et al., 2020). This makes the tracking of motivations over time an interesting and important focus for Sapperton Wilder, which would support them in meeting the needs of their volunteers.

In terms of impact on community scientists pro-environmental behaviour, it is considered that a longer time period than six months is needed to fully understand the impact of being involved in community science on participants themselves and if their involvement encourages positive lifestyle changes. However, the hedgerow project has found that there is the potential for local nature recovery projects such as the hedgerow project to help define and make wider pro environmental behaviour more meaningful.

CHAPTER 5. CONCLUSION

The hedgerow surveying project has contributed to climate and ecological agendas, exploring the contribution of community science in local nature recovery initiatives, considering participants drivers and behaviours and the impact of engaging. It has shown how collective, local action through community science can arguably provide an opportunity to address climate and ecological issues at a local, spatial scale, over time. Community science can provide scientific data that can inform future land management while building social capacity within local communities, fostering informal, learning networks and drawing attention and awareness to individual environmental behaviours.

The aims and objectives of the research set out both practical and conceptual requirements for the project. Together these have provided the opportunity to interrogate key aspects of the community science experience, focusing on areas where there is little already known, setting up a monitoring and evaluation framework for the future, that can support the growth and development of community science at Sapperton Wilder.

The project aims are positioned firmly within the sustainability agenda (environment, economic and societal goals), recognising the potential impact of local nature recovery and the hedgerow project at a local level. The project accepts the subjectivity at local level, recognising that participants, researchers, and landowners will experience aspects of the project differently based on many factors, including demographics, background, life experiences and place attachment.

This project supports a solution-based, multi-disciplinary approach, recognising the complexities and benefits of this inclusive way of working. A well-organised, properly planned and resourced community science project can arguably provide an

opportunity for positive local outcomes. The concluding thoughts are set out below in relation to the research questions.

What citizen science approaches are best suited to the long-term citizen science engagement needs of landscape-scale nature recovery projects?

A number of key approaches were highlighted through the hedgerow project, as being well suited to long-term community science engagement. Interestingly these approaches are all interlinked, impacting on each other. For example, a collaborative or co-design process has a direct impact on target setting, monitoring, and evaluation. Equally meaningful monitoring and evaluation can highlight areas for improvement, with the learning needs of community scientists being an obvious area to address through monitoring.

Knowledge and learning based approach

The hedgerow project has provided a structure and process that has successfully brought together both professional and nonprofessional community scientists together as a team, working towards a common goal, both learning and contributing to local sustainability. While personal learning and development were not ranked as one of the top three motivations in the initial questionnaire, the importance of learning developed for some participants throughout the project. The hedgerow project provided the opportunity for individual learning, offering a unique, practical way of learning, through an informal group approach, including both professional and non-professional peers, that can forge bonds and strengthen local community cohesion. Continuous learning and training for community scientists is a long-term approach that should be developed throughout a project, not only is it essential to collect quality data, but equally contributes to the longer-term recruitment and retention of a project.

Collaborative/co-design approach

Co-design ambitions supported the development of an inclusive and meaningful collaborative process that nurtured strong relations and communication between all stakeholders. There is scope through future revisions of the hedgerow project to develop this approach from a collaborative project to a fully co-design process where all parties are involved in the design of the project, throughout the different stages (See Table 1).

Local, place based approach

A local, place-based focus has allowed the investigation of topophilia and biophilia amongst participants, with links found to the notions of both among participants. While many participants were motivated to join the project because it provided an opportunity to participate in a local project, the research revealed a different focus or driving force behind that motivation. For example, some were driven by their love of place, having established roots and connections within the village and surrounding area, whereas others were interested in supporting local wildlife and species specifically. The interviews revealed the development of these feelings alongside a responsibility to the project and land, empowering community scientists to develop a stewardship role over the land. The benefit of a local project means that the stewardship role can be developed over time, strengthening community links with Sapperton Wilder.

Monitoring and evaluation approach

Monitoring and evaluation are vital to the long-term success of a project. Done well, it can provide evidence and data on which to plan for the future. The literature review identified a link between nature recovery and quality, and while this is critical in terms of impact on the ground, it is not always considered as an integral part of a project.

Monitoring is often carried out using metrics or quantity rather than quality, outcomes and impact on the ground. The literature review discussed the need for the outputs from community science to better inform future policy revisions. This could equally apply to Sapperton Wilder management documents, including their community science aspirations in future reviews of the Community Science 10 Year Plan. Definitions and measures should be set as part of the future co-design process, to tie in with Sapperton Wilder's short to long term goals set out in their Community Science 10 Year Plan. The definitions and measures should consider both the easy to measure, numerical aspects and the more difficult to measure parts of the project, including social impact. The co-design process can support cyclical measuring, to achieve on-going improvement and quality outcomes.

Tracking of community science motivations should be an integral and ongoing part of the monitoring and evaluation process. Individual motivations will differ, due to factors including background and culture. The tracking of motivations throughout the six months of the hedgerow project started to reveal changing and unconscious motivations. This makes the ongoing tracking of motivations, an interesting and important focus for Sapperton Wilder, informing future work on the recruitment and retention of community scientists.

How can citizen science initiatives on landscape-scale nature recovery projects impact other areas of environmental behaviour change?

The hedgerow project has shown that involvement in citizen science and nature recovery can support pro environmental behaviours, making them more meaningful, by providing a physical, local, example of what communities can achieve if they engage and work together, towards a shared environmental vision.

However, it is unlikely that engagement alone in citizen science would support a sustained change in environmental behaviour, considering other influencing factors such as lifestyle, income, and geographic context, given the rurality of the area. The Rare and Behavioural Insights Team (2019) suggests that environmental behavioural challenge requires "behaviourally-informed solutions". To impact environmental behaviour, citizen science would need to work as part of a wider package of measures including broader public education and incentives that work together to influence and support sustained behaviour change. Incentives could be driven from a strategic, governmental level, or locally initiated to develop localised behaviours such as litter picking or growing food locally. Local incentives could take the form of "behaviourally informed incentives" (Rare and Behavioural Insights Team, 2019) which might include tangible recognition or public appreciation. Research has found that this type of incentive is particularly suited to intrinsic motivations, triggering social pressure to act (Rare and Behavioural Insights Team, 2019).

Many participants have the ambition to improve their sustainability further and this would be an interesting aspect for Sapperton Wilder to record in the future. It is considered that a longer period than six months is needed to fully understand the impact of being involved in community science on participants themselves and if their involvement encourages positive lifestyle changes.

Contribution of this research to the Sapperton Wilder Community Science 10 Year Plan

This research has discussed several community science factors that could inform future revisions of the Sapperton Wilder Community Science 10 Year Plan.

A commitment to engaging with, and actively involving local farmers/landowners and contractors in community science discussions would be an important step in

achieving a joined-up conversation and the implementation of scientific findings on the ground, which could be supported through the Plan.

While monitoring and measuring are already included in the Plan, under the 5-year goals, this target could be expanded to include the measuring and monitoring of outcomes. The target could also address appropriate timescales for reporting on their outcomes monitoring and measuring. For example, an annual review is published by many organisations and is often of interest to stakeholders.

The Sapperton Wilder Community Science 10 Year Plan goals could be monitored via an adapted version of the RTPI Measuring What Matters Toolkit (2020). This method of evaluation would support the development of the co-design approach of the project and the wider ambitions of Sapperton Wilder. Appendix 6 shows an example of the RTPI Measuring What Matters Toolkit (2020) with Sapperton Wilder's Community Science 10 Year Plan goals for year 1 and provides suggestions on how the monitoring framework could be developed. It also sets out a scoring chart that could support Sapperton Wilder review and score their progress, feeding back into plans and strategies such as the Community Science 10 Year Plan, and cyclical monitoring.

Like the measuring outcomes framework discussed above, the Nibble and Drop Framework (Figure 5) could be reviewed on a regular, cyclical basis to monitor Sapperton Wilder community science contributions. Over time, as data is collected and patterns emerge, it could be possible to make stronger connections between contribution, training, and retention. Sapperton Wilder should ensure that they continue to collect relevant data on citizen science, to ensure they can continue to monitor impact. This often requires a different type of data in comparison to measuring numbers or metrics. For example, Sapperton Wilder may have a target

number of community scientists, however, it is vital for the success of the project to know how many of these are committed, “hooked” (Fischer et al. 2020) participants, and how many are “initial droppers” (Fischer et al. 2020) and just receive information from Sapperton Wilder, not actively participating.

Tracking pro-environmental behaviour over the longer term would provide interesting community science data for Sapperton Wilder, however it would be important to make any links between engagement in community science and improving pro-environmental behaviour. A guide to support behaviour change, similar to the Centre for Behaviour and the Environment’s Behavioural Science Toolkit for Practitioners (Rare and Behavioural Insights Team, 2019) could support the development of this work.

The co-design aspect of the hedgerow project could be further strengthened over time, through future hedgerow surveying, developing into a fully co-designed/created project. This could provide a continuous feedback and action loop, that would support the Community Science 10 Year Plan and the contribution and impact monitoring frameworks discussed above. The following methods could be used in the future to support a fully co-designed hedgerow survey:

- Workshops to support learning;
- Encouraging different roles for citizen scientists, recognising that individuals have different skills and interests. For example, some community scientists may find it difficult to access agricultural land and the hedgerows but might be interested in collating fieldwork records, this could lead to a more inclusive and engaging community science provision at Sapperton Wilder;

- Shared online documents, to support the broadening of community science roles, discussed above.

Recruitment and retention should be seen as a continuous process, building on diversity and supporting participant needs.

The development of a communications plan to support the proposed hub of excellence would strengthen Sapperton Wilder's strategies and plans. Ensuring impactive communications and wider engagement will be essential in the development of the hub and meeting the long-term goals of the Plan. In this respect, it will be important for Sapperton Wilder to be clear about who their audience is and ensure that their Communications Plan reaches their target audience(s).

Taking this one step further, the Plan could aspire to involve more locally diverse voices in community science over time, (Guthrie 2023) including a wider range of ages and backgrounds from within the local communities.

Limitations of the project

While the six month fieldwork has provided useful baseline data, it is considered that a longer term study tracking motivations, and changes in motivations, throughout a participants involvement would be beneficial to a deeper understanding of community science engagement. Equally, following the longer-term pro-environmental behaviour of community scientists beyond six months would provide a greater knowledge of the impact, of engaging in community science nature recovery projects.

Existing literature revealed mostly white participants engaging in citizen science. The rural context resulted in limitations in recruiting from diverse backgrounds due to local

demographics, with 94% of Sapperton residents identifying as white, British (OCSI, 2019).

Future research areas

Future research could continue to gather data and a stronger evidence base on which to measure community science engagement over the longer term. This should include the monitoring of motivations, including both developing and unconscious motivations and pro-environmental behaviour that is influenced by participating in community science. The collection of further data would allow research into different areas, such as the relationship between committed participants and those who show interest but do not actively engage.

Research that compared the engagement, motivations and impact on participants involved in local projects in comparison to larger, national or regional projects, with an online presence would also support this project and its findings helping to clarify further the unique features, benefits, and limitations of each type of community/citizen science project.

CHAPTER 6. REFLECTING ON THE PROCESS

This project was completed over fifteen months, with the hedgerow surveying fieldwork taking place over six months. The timetable of the process is shown at Appendix 7.

The literature review commenced in October 2022 and focused the project by extensive reading around the topic area. This was also supported by the completion of research methods modules from October to January 2023.

The preparation for the fieldwork started in January 2023. Much of the preparation work was desk-based, including the consideration and application of ethical consent, risk assessment, the community science recruitment plan, and other administrative processes.

The organisation of the on-site fieldwork commenced in May 2023 and primarily consisted of marking out hedgerow sections on-site. While the time allocated for this appeared to be sufficient during the desk-based planning, in practice, given the size and scale of the three blocks of Sapperton Wilder land, this took considerably longer than anticipated. This was further impeded by the consistent removal of hedgerow markers by wildlife, which required further markers to be made and set out.

The co-design process was particularly helpful in sharing ideas for more suitable hedgerow markers. Local community scientists came up with many suggestions for more suitable materials and ways of marking out hedgerow sections. This inclusive, open discussion prompted the change from wooden markers to material markers tied to the hedgerow itself, which helped the smoother progression of the project.

A basic manual technique was used for the recording and analysis of data. Given that there was not a significant number of questionnaires and interviews to analyse this method was considered suitable. If the number of respondents or contributors had been any larger then a more sophisticated method may have been required.

The use of a case study area for the hedgerow project provided useful, site-specific information. Given all communities and places are different, it will be difficult to make generalisations regarding other sites or communities, however, the project, including its processes and learning will be relatable to other community science projects and research.

Those interested in learning from this project will include researchers, community scientists, land managers, and local and regional interest groups. As the project and framework develop further in the future, it could become of interest to a wider audience, including local community groups, environmental networks, local funding streams, and local policy and decision-makers.

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APPENDICES

Appendix 1: Hedgerow Project Recruitment Plan

	A	B	C	D	E	F
1	**Sapperton Wilder: Hedgerow Project Community Science Recruitment Plan**					
2	1. We will take a staged approach to recruitment, reviewing volunteer numbers and diversity during May to October; 2. Verbal contact made with an anchor point (group or group contact); 3. Follow up email to be sent to anchor point, following initial discussion. See template message titled "email to possible groups"; 4. Interested parties will email community science/Sapperton email to register an interest; 5. Record names and contact details of the interested party (Sapperton Wilder); 6. Each person allocated a unique number, to be stored with their name and contact details. The name of the person and unique number will be shared with UoG students; 7. Sapperton Wilder will send out email message on behalf of UoG students. This will include the online questionnaire, monthly event dates and arrangements, maps and attachment for those that want to survey on an individual basis.					
3	**First Approach**					
4	**Anchor point/Local individual or group**	**Contact name**	**Contact**	**Notes**	**Has contact been made?**	**Response following initial contact**
5	Local village residents	XXX	XXX	XXX	XXX	XXX
6	Stroud resident and journalist					
7	Local residents with link to farming					
8	Local groups with an interest in nature					
9	Stroud Naturalists					
10	Local groups with attachment to the area					
11	**Second Approach**					
12	**Anchor point/Local individual or group**	**Contact name**	**Contact**	**Notes**	**Has contact been made?**	**Response following initial contact**
13	Local Women's Institute (WI)	XXX	XXX	XXX	XXX	XXX
14	Parents of Sapperton school					
15	British Trust for Onithology Glos					
16	RSPB Glos					
17	Butterfly Conservation Glos					
18	Stroud U3A					
19	**Third Approach**					
20	**Anchor point/Local individual or group**	**Contact name**	**Contact**	**Notes**	**Has contact been made?**	**Response following initial contact**
21	Social media	XXX	XXX	XXX	XXX	XXX
22	Local media: BBC Glos radio					

Hedgerow project 2023

Appendix 2: Online sign up process forms: Hedgerow project ethical consent, debrief form, informed consent form and feedback sheet

Information Sheet for Participants
May - October 2023

You are being invited to take part in a research study that is being conducted by the Countryside & Community Research Institute (CCRI) at the University of Gloucestershire. CCRI is the largest specialist rural research centre in the UK (http://www.ccri.ac.uk/). Before you decide, it is important that you understand why the research is being done and what it will involve. Please take time to read the following information carefully and then decide whether or not you wish to take part.

What is the purpose of this research?: The aim of the community science, hedgerow surveying project is to firstly measure the changes in characteristics of the Sapperton Wilder hedgerows, and secondly to assess the impact of participation in this activity on the participants relationship with the nature and the environment more widely.

Why am I being asked to participate?: You are being invited to participate because, as a local resident or stakeholder, we are keen to find out about your engagement with nature and the local area and your feelings towards the environment. By involving you in our research, we will be able to gain a better understanding of the future role of community science in local nature recovery projects.

Do I have to take part?: It is entirely your decision whether or not to participate. If you do decide to take part then you will be given this information sheet to read beforehand and keep.

What will happen if I don't carry on with the study?: It is important to remember that even if you do decide to take part in this study you are still free to withdraw at any time and without giving us a reason. However, please let us know within 30 days of surveying the hedgerows, in order for any data that has already been collected from you to be removed before publication of the study results.

If you do decide to withdraw from the study we would appreciate the opportunity to talk to you about your experiences of participating in this project. You are of course free to decline this opportunity if you wish.

What is the procedure if I take part?: If you take part, you will be invited to join hedgerow surveying group events (during May – October) or alternatively you will be offered the opportunity to visit the site at a time most suitable to you.
Prior to your first hedgerow surveying session you will be emailed or sent a questionnaire and asked to complete and return it. Following this, if you decide to attend the monthly events you will be emailed with details of the events. If you decide to participate on an individual basis, you will be emailed all the details you will need, including maps and a recording table etc.

If you are happy to participate in interviews throughout the course of this project, you will be contacted (in person at the monthly events, via email or telephone) to arrange a time and location of your choice to carry out an interview with the researcher(s) from the CCRI. The 'interview' will resemble a normal conversation, in which the researcher and you will talk about the practicalities of the hedgerow project and your experience of participating in the project. The length of the interview and any meetings or workshops is likely to be around 30 minutes. At no time will you be obliged to discuss anything you are not comfortable discussing nor to disclose anything that you don't wish to. As such, any information you give us is completely under your control.

Will my taking part in this study be kept confidential?: All information that is collected about you during the course of this study will be kept strictly confidential (shared only between the research team and the Sapperton Wilder project). Any data used in research outputs (such as academic papers, project reports etc.) will be anonymised and individuals will not be identifiable.

What will happen to the results of this study?: The overall project data will also be summarised for the general public to read on the CCRI website and we may also use aspects of the data to present our findings at seminars and conferences. Following this, CCRI will hand over the data they collected to the Sapperton Wilder project (the data controller). This will include the information you shared in your interviews / surveys in its anonymised format. The CCRI research team will then delete any personal data and raw data from their systems. The CCRI research team will hold a copy of the anonymised data for use in future research outputs. When handed over to Sapperton, the research data will be stored separately to your name and contact details. Sapperton reserve the right to use the data collected for future research purposes, but you can opt out of this if you wish and by participating now, you're not committing yourself to participating in any future research. By storing this data, Sapperton Wilder will be able to undertake research into the long-term development of hedgerows and stakeholder engagement within this environment.

Who is organising and funding the research?: The project is funded by the Evolution and Education Trust.

Who has reviewed this study for ethical clearance?: This study has been reviewed and granted clearance by the University of Gloucestershire's Research Ethics Committee.

What if I want to contact the researcher to ask about this study or my participation in it?: Rhian Brimble xxx & Tamara White xxx 01242 714122
MSc students at the Countryside and Community Research Institute (CCRI), University of Gloucestershire.

What will be done with my data?: Your questionnaire and interview transcript will be analysed through a process which involves identifying themes that emerge across all the data. This will enable researchers to identify the range of perspectives and experiences of different participants.

What are the possible benefits of taking part?: The information you provide will contribute to valuable evidence that will inform, not only the long-term hedgerow and ecological health at Sapperton Wilder, but also the development of best practice in community science, landscape scale, nature based recovery projects.

What might go wrong?: As the research effectively constitutes a conversation with a researcher, either at Sapperton Wilder events or in a publicly accessible venue, no undue effects are anticipated. If you do find any elements of the interview challenging, you're reminded that you can decline to answer specific questions at any point or withdraw from the process entirely. If following the research you wish to complain about any aspect of the way in which you have been approached or treated during the course of this study then you should contact Chris Short of CCRI via email at xxx or telephone on 01242 714550. Alternatively, please contact NSS Ethics Lead Dr Dani Stephens-Lewis xxx.

Project Debrief Form

May - October 2023

Today, you've kindly taken part in a hedgerow surveying activity for this project. We really appreciate your time. As explained, the researchers (based at the Countryside & Community Research Institute (CCRI) at the University of Gloucestershire) are undertaking a hedgerow surveying project at Sapperton Wilder in Gloucestershire. The project will firstly measure the changes in characteristics of the hedgerows at Sapperton, and secondly assess the impact of participation in this activity on participants relationship with nature and the environment more widely. The CCRI will be working closely with the Sapperton Wilder project and other partners to complete this study.

As should have been explained to you, you have up to 30 days from the date of surveying hedgerows at Sapperton to withdraw from the research and you don't have to give a reason. To withdraw, please email Sapperton Wilder xxx.

We hope you've not found this experience challenging, but if you did and you want to access some support, the following contacts might be helpful.

- Mind (About Us - Mind) provide support to empower anyone experiencing a mental health problem. Amongst other things they provide the opportunity to talk to an understanding and sympathetic person. They can be contacted by email info@mind.org.uk or 0300 123 3393.
- Samaritans (Talk to us on the Phone | Samaritans) offer a free helpline. They can be contacted on 116 123

If you have any questions or want to request any further information, please email xxx and xxx or the CCRI on 01242 714122

Alternatively, please contact the University of Gloucestershire NSS Ethics Lead (Dr Dani Stephens-Lewis xxx)

CCRI COUNTRYSIDE AND COMMUNITY RESEARCH INSTITUTE

Informed Consent Form

Embedding Citizen Science within landscape scale, nature-based recovery initiatives

Researchers: Rhian Brimble xxx and Tamara White xxx

I confirm that I have read and understand the project information sheet dated May – October 2023 for the above study and have had the opportunity to ask questions which have been answered fully.

1.	I confirm that I have read and understand the project information sheet dated May – October 2023 for the above study and have had the opportunity to ask questions which have been answered fully.	☐
2.	I have received enough information about this study.	☐
3.	I understand that my participation is voluntary and I am free to withdraw at any time (until such date as this will no longer be possible, which I have been told), without giving any reason.	☐
4.	I give permission for an audio recording of my spoken responses to questions asked as part of the study.	☐
5.	I agree to take part in the above study.	☐
6.	I agree that my anonymised data collected as part of this study will be handed over to the Sapperton Wilder Project and may be archived at the end of the project in a public data repository.	☐

Name of participant Signature Date

Hedgerow surveying project: Feedback sheet

Firstly we would like to thank you for your support and contribution to this important local project.

Your participation in this project is voluntary and you are free to withdraw at any time (until such date as this will no longer be possible, due to publication of the study), without giving any reason.

Please contact Sapperton Wilder at xxx if you no longer wish to be part of this project.

To better understand the participation of community science in nature recovery projects, we would be grateful to receive the feedback of all community scientists on your experiences of participating in the project. If you have previously indicated that you are happy to be contacted by one of the researchers to share your experiences of the project, you will be contacted shortly.

Again, many thanks for your contribution to this important local project.

Appendix 3: Hedgerow surveying information and notes
Example of hedgerow section map and details

Thank you for your contribution to the Sapperton Wilder hedgerow surveying project.
The next section of hedge that needs surveying is:

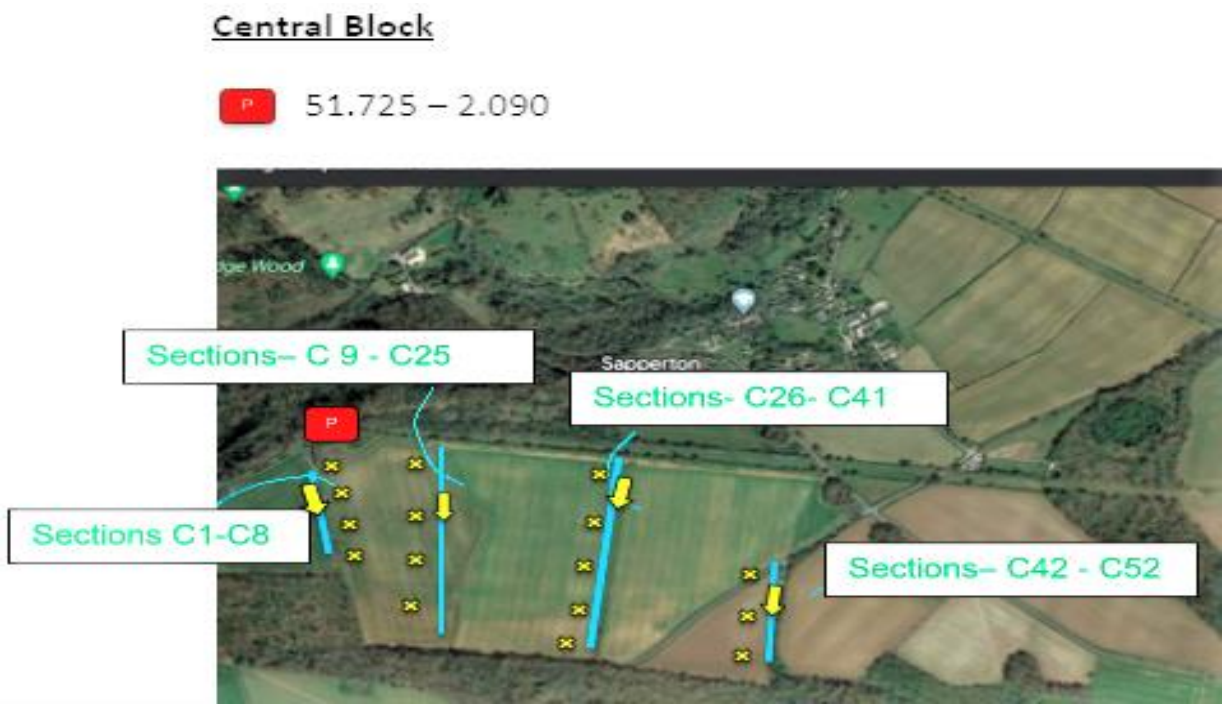
Block: Central
Hedgerow section: C3 What 3 Words location: ///eternally.normal.chatted

Locating and accessing hedgerow sections and Sapperton Wilder blocks:
To support you in locating the relevant blocks, fields and hedgerow sections, we are using the What 3 Words App https://what3words.com/products/what3words-app.

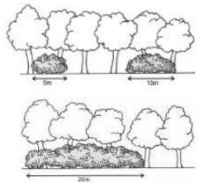
A good parking spot for the **Central Block** is the small carpark/layby
on the Sapperton/Frampton Mansell Road (End of the ride/ by new comms mast).
What 3 Words location: ///forks.skate.rags

You will need:
A copy of the hedgerow surveying table and record sheet, and a pen. Or another way of recording what you see. Please can all completed hedgerow surveying tables be submitted to XXX within 2 days of surveying the hedgerow.

In an emergency please phone: XXXXXXXX



Appendix 4: Hedgerow surveying table and information

Citizen science hedgerow survey data collection. **Please complete one form for each 30m of allocated section of hedgerow.**							
Name of citizen scientist							
Date							
Citizen science event or Ad Hoc?							
Site number **(completed for participants):**							
Start time							
Finish time							
Hedgerow type (Please tick one)  **a) Shrubby hedgerow:** A line of woody hedgerow plants that have some or all of their leafy canopies less than 2m in height from the ground) **b) Line of trees:** This is a line of trees where the base of the canopy is greater than 2m from the ground and the gap between tree canopies is less than 20m. **c) Shrubby hedgerow with trees:** More than 20m of woody hedgerow plants where the distance between the ground and the base of the leafy layer is less than 2m							
General weather conditions (heavy rain, light rain, cloudy, sunny, other). Please give an overall impression of the weather on your visit							
Temperature (degrees C) please circle, below.							
Below 0	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Wind. please circle, below.							
calm	light air	light breeze	gentle breeze	moderate breeze	fresh breeze	strong breeze	
Structure at eye height (Integrity or gappiness) please circle, below. Gaps of less than 20m **OR** Gaps of 20m or greater							
Estimated thickness of hedge at eye height (cm)							
Adjacent land use: (Arable, grass, woodland, road/route, or water)							
Use of apps is optional, please state any identification app/s used to support your **identification of plants** e.g**.,**							

PlantNet, iNaturalist Seek, LeafSnap, Google Lens.	

Species surveys: For the following plant and invertebrate species, please survey across your 30m section, including not only hedgerow species but also hedgerow fronting species and ground species, up to 1m from your hedgerow section.

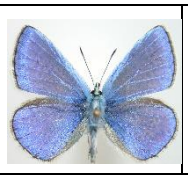
Woody species: Percentage cover <u>by area</u>, across the <u>30m</u> section. Please record percentage cover as if observing the hedge from above, to the **<u>nearest 10%</u>**. Focus on the main bulk of the woody hedge (not the bottom). This may not add up to 100%, due to overlap of species and/or gaps in the hedgerow or other, non woody species.

Plant Species	**Percentage cover (Nearest 10%)**		**Plant Species**	**Percentage cover (Nearest 10%)**		**Plant Species**	**Percentage cover (Nearest 10%)**	
Sycamore (*Acer pseudoplatanus)*			Field elm (*Ulmus minor)*			Common hawthorn (*Crataegus monogyna)*		
Blackthorn (Slow) (*Prunus spinosa)*			Common Holly *(Ilex aquifolium)*			Crab apple (*Malus sylvestris)*		
Elder (*Sambucus nigra)*			Spindle *(Euonymus europaeus)*			Blackberry/ Raspberry *(Rubus species)*		

European Ash (*Fraxinus excelsior)*			English, pedunculate oak *(Quercus rober)*			Hazel (*Corylus avellana*)		
Field maple (*Acer campestre)*			Large leaved lime *(Tilia platyphyllos)*	 		Hornbeam (*Carpinus betulus*)		

Flowering species – Select the relevant descriptor (or leave blank if absent) from the following: DAFOR (Dominant (D), Abundant (A), Frequent (F), Occasional (O), Rare (R).

Plant species	Species abundance (D, A, F. O or R)		**Plant species**	Species abundance (D, A, F. O or R)		**Plant species**	Species abundance (D, A, F. O or R)	
Rosebay willowherb *(Epilobium angustifolium)*			Dog rose. (*Rosa canina)*			Dog's mercury (*Mercurialis perennis)*		
Common field speedwell (*Veronica persica)*			Ribwort plantain (*Plantago lanceolata)*			Hedge woundwort *(Stachys sylvatica)*		

Old man's beard (*Clematis vitalba)*			Cuckoo pint (*Lords-and-ladies*) (*Arum maculatum)*			Ground ivy (*Glechoma hederacea)*		
Cow parsley *(Anthriscus sylvestris)*			Cow parsnip (*Heracleum sphondylium)*			Cleavers *(Galium aparine)*		
Common comfrey (*Symphytum officinale)*			Common stinging nettle (*Urtica dioica)*			Garlic mustard (Jack of the hedge) *(Alliaria petiolata)*		
White deadnettle *(Lamium album)*			Black bryony (*Dioscorea communis)*			Common Ivy *(Hedera helix)*		
Use of apps is optional, please state any identification app/s used to support your **identification of invertebrates** e.g., iNaturalist Seek, Google Lens**.**								
Invertebrate species								
Species	Species abundance (number)			Species abundance (number)		**Other groups**	**Species and abundance (number)**	
Common Blue butterfly *(Polyommatus icarus)*			Buff-tailed bumblebee (*Bombus terrestris)*			Spiders and Harvestmen (arachnids)		

	Male  Female							
Meadow Brown butterfly (*Maniola jurtina)*			Common Carder bumblebee (*Bombus pascuorum)*			Flies (diptera)		
Large/ Small White butterfly *(Pieris brassicae, Pieris rapae).*			Field Cuckoo bumblebee (*Bombus campestris)*			Centipedes or millipedes (myriapoda)		
Speckled wood butterfly *(Pararge aegeria)*			White-tailed bumblebee (*Bombus lucorum)*			Woodlice (isopoda),		
Ringlet butterfly *(Aphantopus hyperantus)*			Red-tailed bumblebee (*Bombus lapidarius)*			Wasps, ants (hymenoptera)		
Orange Tip butterfly *(Anthocharis cardamines)*			Red-tailed Cuckoo bumblebee (*Bombus rupestris)*			Beetles (coleoptera)		

Open data collection: The table below is an opportunity for you to record any extra species you have encountered, however, there is no obligation for you to complete this section.

Plant species	**Species ID**		**Species ID**	
Species 1		Species 5		
Species 2		Species 6		
Species 3		Species 7		
Species 4		Species 8		

Other invertebrate species	**Species ID**	**Number of individuals**		**Species ID**	**Number of individuals**
Species 1			Species 5		
Species 2			Species 6		
Species 3			Species 7		
Species 4			Species 8		

Appendix 5: Recruitment information provided to anchor points as part of the recruitment process

CCRI COUNTRYSIDE AND COMMUNITY RESEARCH INSTITUTE

sapperton wilder

Sapperton local hedgerow survey

Sapperton Wilder is a nature recovery project in the heart of the Cotswolds that is pursuing the long-term vision of reverting conventional arable fields to nature-based farming and creating areas of diverse habitat for wildlife.

As part of the Sapperton Wilder project, students from the Countryside and Community Research Institute and Environmental Science at the University of Gloucestershire are looking for a diverse range of volunteers to act as local community scientists.

Community science is a way of involving local communities in the collection of data for scientific purposes.

In this case, for monitoring and recording hedgerows as part of the Sapperton Wilder project. This will help Sapperton Wilder, firstly to measure the changes in characteristics of the hedgerows at Sapperton, and secondly to explore the impact of engaging in these nature-based activities, on local community members, their relationship with the nature and the environment more widely.

There is the opportunity for participants in this project to survey areas of hedgerow by visiting and recording species in specified areas at Sapperton, from May to October. Local community scientists can get involved in the project either on an individual basis, at a time most suited to the volunteer, or at small monthly events.

This is a great opportunity to get involved in your local area, learning more about the natural environment and the flora and fauna on your doorstep. Over the course of the project we hope to learn together, building our knowledge of local nature, while recording what we see in our local hedgerows. This information will act as baseline evidence for the future management of the hedgerows.

Sapperton Wilder is not currently open access to the public but we aim to open a permissive path in the future. In the mean-time, volunteering is a great way to gain access and become involved in the project and learn about the local natural environment.

To get involved: To get involved in this community science, hedgerow surveying project, please click this **link**, (**http://eepurl.com/iozoYg**) or email **communityscience@sappertonwilder.co.uk**

Appendix 6: Example of a monitoring framework and scoring, adapted for this research project, from the Royal Town Planning Institue's Measuring What Matters Research (2020)

Identify strategic/high level policy links: UN SDG, UK GOV Env Plan etc.	**Goal Ref no.**	**Goal theme**: People, nature, local, economic	**Goal/Target**	**Monitoring indicators**	**Data**	**Score (self-scoring or panel. Scoring method should remain consistent)**	**Progress or review goal**
Note: Make links to any relevant policy etc: For example: UN SDGs Grant funding 25-year Environment plan Sapperton Wilder Business Plan		**Note:** Could be more than 1 theme	**Note:** What does Sapperton Wilder want to do?	**Note:** How will we know if we have achieved it?	**Note:** Record data source here Along with if this is a metric or outcomes measure	**Note:** 1 - 5 See scoring wheel below	**Note:** If scoring up to 3, need to review and work to meet goal/target. Progress: If scoring 4 or 5, progress has been made and look to build on goal
	1	People Nature	Retain community science numbers attending the hedgerow surveying events in 2023.	Compare numbers attending events and carrying out hedgerow surveys in 2023/4 +. Use the contribution matrix to assess contribution levels of participants.	**Metric** measure: Compare 2023 register with 2024 + register. To acheive an **outcome**, a % of 2023 participants would be retained and participate in the 2024 + hedgerow surveying. The		

					contribution matrix could be used to categorise contribtion, with the aim of expanding the 'Hooked' or 'Hooked +" categories.		
	2	People Nature	Build upon a suite of citizen science activities to help support and contribute to the building of this evidence-based case study at Sapperton Wilder.	Have a wider range of community science projects to involve community scientists in. Including different elements of the projects aligning with community scientists skills and interests, eg. Desk based, collation of information or monitoring of specific species etc.	**Metric** measure: More citizen science activites **Metric** measure: Maintain a community scientists databse of skills, interests and ambitions in relation to comunity science **Outcomes** measure: Create different community sceince roles.		
	3	People Nature Local	Observe continued connection to the landscape, wildlife, habitat and mission of the project through direct interaction.	Retaining community scientists and strengthening engagement of the community in Sapperton Wilder.	**Outcomes** measure: Survey or intereview participants		

	4	People Nature	Volunteers benefit mutually through learning and deepening of knowledge and curiosity and feeding back to help improve their experience.	Community Scientists developing specialisms and skills	**Outcomes** measure: A regular programme of learning for participants		
	5	People Local Nature	Social connections amongst the community strengthening though volunteering activities.	Being engaged in Sapperton Wilder supports existing feelings of belonging and a sense of place within the local community by giving people a role and purpose within the community. Strengthening connections beyond the project into everyday life.	**Outcome** measure: Survey or intereview participants		
	6	People	Adapting to ways of working that suit all involved and documenting all of this including negative feedback to help improve better decision making.	The term 'ways of working' could be defined as: Working towards a common, long-term vision; Solution focused; Integration of sustainable	**Outcome** measure: Discuss and evaluate through the co-design process.		

				development in all ways of working; Collaboration and involvement between community scientists and all stakeholders; Working toward inclusivity and diversity in all areas.			
	7	People Nature	An interest in other survey activities such as soil sampling, earthworm study, butterfly transects, moth trapping, reptile monitoring and beetle study for example.	Individuals expressing on interest in other activities Develop a record of skills and interest database of members This could be extended to a 'what would you like to learn about in the future'	**Metric** measure: Volunteers contributing to other Sapperton Wilder activities		
	8	People Nature	Increased understanding of the most efficient balance of volunteer management and integration of citizen scientists into the land management protocols.	Community Scientists feedback - they feel part of a positive change process at Sapperton Wilder and part of the	**Outcome measure:** Survey or intereview stakeholders		

				decision-making process in terms of land management protocols. Land managers value and listen to community science evidence and data.			

Score	Performance benchmark	Action
5	Excellent progress towards outcomes	Share learning with others
4	Good progress towards outcomes	Consider increasing objectives/target ambition
3	Fair progress towards outcomes	Review with aim to improve implementation, raising objective/target ambition
2	Poor progress towards outcomes	Review objectives/targets and better understand implementation
1	Not achieving progress towards outcomes	Immediate review and revisit of objectives/targets

Source: (RTPI, 2020)

Appendix 7: Project timetable

	Oct '22	Nov '22	Dec '22	Jan '23	Feb '23	March '23	April '23	May '23	June '23	July '23	Aug '23	Sept '23	Oct '23	Nov '23	Dec '23	Jan '24
Research methods modules																
Background reading																
Finalise focus and scope of project																
Literature review																
Develop dissertation plan																
Design data collection methods																
Gathering evidence or data																
Analysis of data																
Begin to draft the dissertation																
Refine dissertation plan and develop draft																
Complete draft dissertation																
Produce final dissertation																
Proof Read dissertation																
Fieldwork																