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Gloucestershire Heritage Hub biodiversity report

Internship

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Contents

Abstract

The Gloucestershire Heritage Hub is home to a small community garden in Gloucester City Centre, designed by Diana White in 2019. In the past year, the garden has become an important site for the local community, used for activities such as hosting social groups, education, and food production. This report will evaluate the current level of biodiversity on the site outside the food production side of the garden. Biodiversity is essential for the health and stability of a habitat. The site was evaluated twice within four months to improve accuracy in the survey results and to evaluate the level of change in the biodiversity on the site. This report considers grassland areas, hedgerow areas and birds. Data indicates a high level of diversity in all areas evaluated and highlights a few key areas for improvement to benefit biodiversity and productivity of the garden.

Introduction

Biodiversity plays a significant role in the natural world. The level of biodiversity is linked to the health and functionality of ecosystems (Duffy, J.E., date). Diverse habitats are more likely to survive an ecological or human-induced disturbance (Elmqvist, T. et al.2003). Low biodiversity often results in ecosystem collapse. (Rafferty, J.P. 2019)

Ecosystems provide many services to human populations, including but not limited to food production, climate regulation, and flood reduction. These services have become essential to people's livelihoods, particularly in food production. (Gianocostas, 2002; Novacek, 2008)

The diversity of the growing plots and the surrounding area helps to maintain the habitat's resilience, which is vitally important in this rapidly changing climate.

The level of natural biodiversity is intricately linked to essential ecosystem services, including soil fertilisation (Tltp123, 2025). Therefore, maintaining biodiversity will play a critical role in the future. However, effective management is impossible without a reliable baseline dataset (Bull et al., 2014).

This audit's purpose is to establish such baseline data. The information collected will support future management decisions and conservation planning.

Monitoring biodiversity has become essential for conservation and habitat management (Niemelä, 2000; Schlaepfer, 2018). Regular assessments provide crucial data on species populations, habitat conditions, and overall ecosystem health, enabling informed decision-making and timely interventions. Baseline information allows stakeholders to evaluate the effectiveness of conservation strategies, adapt them as necessary, and protect vulnerable species and habitats. Additionally, it helps track changes over time and identify trends in wildlife use of different site elements (Gerber & Iacona, 2024)

Site description

This biodiversity audit is produced for the Gloucestershire Heritage Hub located in the heart of Gloucestershire (see figure 1).

Figure 1: Site indication map.

Established as part of the wider Gloucestershire Heritage Hub redevelopment in 2019, the garden was designed by Diana White (a student at the Cotswold School of Gardening) and maintained by volunteers. The garden is currently used for growing food that is used by a local charity (Wiggly) and uses natural methods. See section 7 for further details. The garden is made up of three distinct sections: a wildlife garden, a formal garden, and a community gardening area.

As well as being a key place for biodiversity, the community garden is an important location for people, providing an urban green space on the doorstep of many. Urban green spaces hold several benefits. Evidence suggests spending time in natural areas has a positive effect on people's mental and physical health. (Nillon 2010). People have reported effects including increased social interactions, reduced stress, improved immune system functioning, and more. (Gianocostas, E. 2002)

Methods

Data collection draw on methods commonly used; in an adapted form, which made allowances for challenges posed by the site, such as size, where necessary. Invertebrates were observed using the site; however, direct surveys were not conducted due to a couple of limitations in the form of equipment required, site suitability for some of the methods and limited access to identification help sheets.

For birds, a combination of surveying methods was used to identify bird species using the site, including a transect from the entrance to the garden to the gate in front of the bee hives and due to the small size, the route was retraced to fulfil ten minutes of data collection. The data was supported using point count data, a record of any birds seen on the ground or flying on the site, were recorded and identified where possible. (Department of Environment and Climate Change NSW. 2009) A species list was then generated an abundance assessment was made based on the number of times each species was detected by the Merlin recording.

To survey vegetation, three 2 m^2 quadrates were conducted in three locations of the site, including two on the main grassland area and one on the area near the bee hives. Plant species were identified using Seek; the iNaturalist app a record was then kept of all species. The species identified were given a dominance score based on the number of times it was identified within the quadrates (Field Studies Council 2021).

Hedgerows: to survey hedgerows on the site. The length of two hedged areas was walked, and all plant species seen were identified using the Seek app. The species identified were then split into woody or non–woody species based on the thickness of the plant. (Defra 2007)

Data

Birds

Table 1: Bird species identified.

Species (scientific name)	Common name	Code
Cyanistes caeruleus	Eurasian blue tit	BT
Erithacus rubecula	European robin	R.
Passer domesticus	House sparrow	HS
Parus major	Great tit	GT
Phylloscopus inornatus	Yellow-browed warbler	**Unknown**
Aegithalos caudatus	Long tailed tit	LT
Pica pica	Magpie	MG
Phoenicurus ochruros	Black, red-star	RT

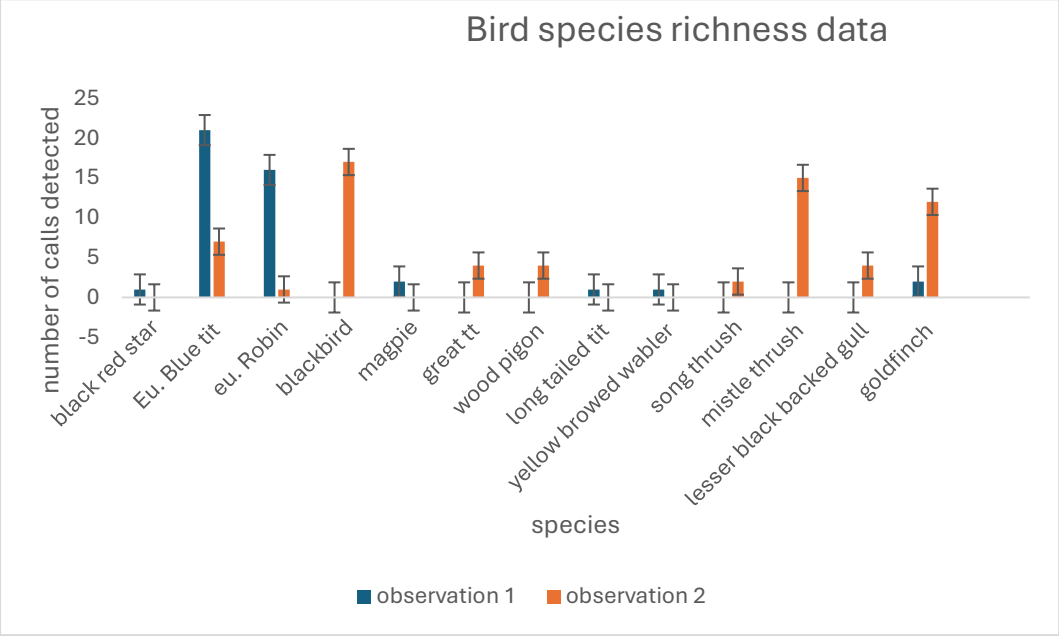

Figure 2: Species richness observations

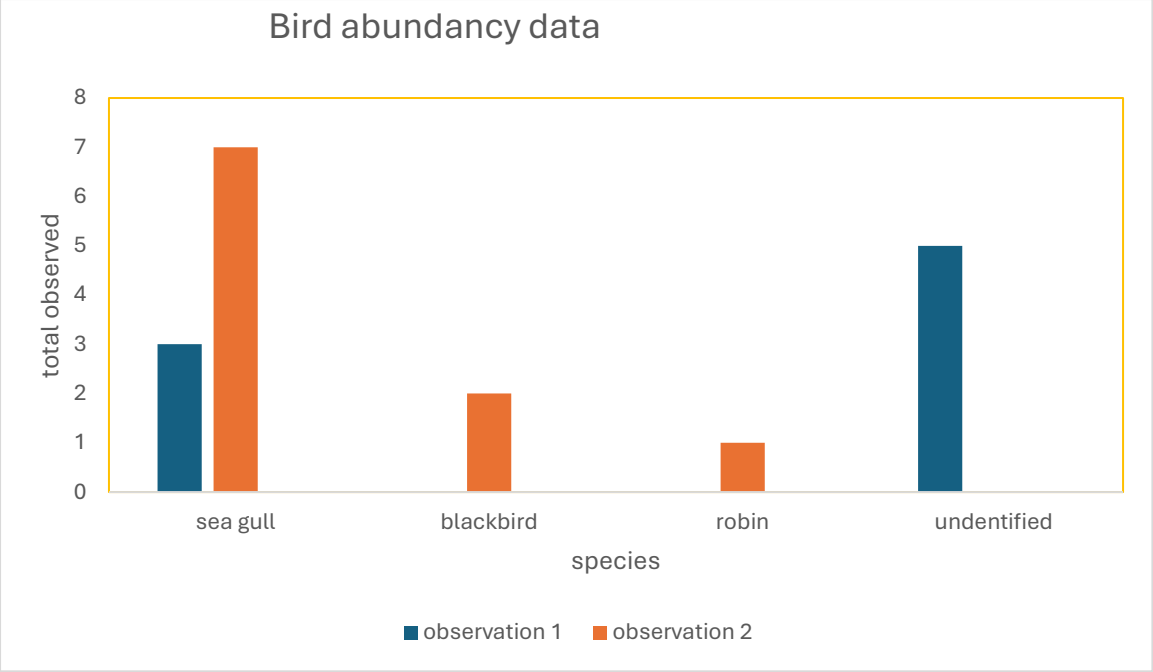

Figure 3: Species abundance data

Hedgerow assessment

Table 2: original hedgerow data

Woody	Non-woody
Woody hedge nettle (Stachys officinalis)	Dicots (Dicotyledon s. pp)
Cypress S. pp	Wild Teasel
	Mint family S. pp

Table 3: Repeated hedgerow data

Woody	Non-woody
Apple tree (Malus x domestica) Woody hedge nettle (Stachys officinalis)	Great stinging nettle (Urtica dioica) Wood avens (Geum urbanum) Cornflower (Centaurea cyanus) Creeping buttercup (Ranunculus repens) Nipplewort (Lapsana communis) Common dandelion (Taraxacum officinale) Green lady's mantle (Alchemilla vulgaris) Charlock (Raphanus S. pp) dicots (Dicotyledon s. pp)
	Wild teasel (Dipsacus fullonum)

Site: Gloucestershire Heritage Hub **Plot 1**	**Lat/Long** 51.8702° N, 2.2380° W	**Author: Charlotte**	
Site and vegetation description This is a small community garden in the Cotswolds. The ground has been hardened due to weather conditions, and the vegetation is all low-level. Plant communities are common in the local area.		**Date 7.1.25**	
		Altitude (M) **20**	**Slope (degrees)** **0**
		Aspect (degrees) **0**	**Soil depth (cm)** **1cm**
		Stand area (m)	**Sample area (m)** **2m2**
Layers: height (cm) for Canopy: 0	**Scrub: 0**	**Field: 0**	**Ground: 1cm**
Layers cover (%) for Canopy:0	**Scrub: 0**	**Field: 0**	**Ground: x**

Species list (common and scientific names)	**DOMIN**
Ragwort (*Senecio jacobaea)*	**1**
Monocots (*Monocotyledons S. pp)*	**2**
L*egumes S. pp*	**2**
Dicots (*Dicotyledon s. pp*)	**5**
Daisy (*Bellis perennis)*	**8**
	1

Site: Gloucestershire Heritage Hub Plot 3	**Lat/Long** 51.8702° N, 2.2380° W	**Author: Charlotte**	
Site and vegetation description This is a small community garden in Gloucester. The ground has been hardened due to weather conditions, and the vegetation is all low-level. Plant communities are common in the local area.		**Date 7.1.25**	
		Altitude (M) **20**	**Slope (degrees)** **0**
		Aspect (degrees) **0**	**Soil depth (cm)** **1cm**
		Stand area (m)	**Sample ar (m)** **2m**

Layers: height (cm) for	**Canopy: 0**	**Scrub: 0**	**Field: 0**	**Ground: 1c**
Layers cover (%) for	**Canopy:0**	**Scrub: 0**	**Field: 0**	**Ground: x**

Species list (common and scientific names)	**DOMIN**
Ragwort (*Senecio jacobaea*)	**1**
Monocots (*Monocotyledons S. pp*)	**1**
Bull thistle (*Cirsium vulgare*)	**1**
Common chickweed (*Stellaria media*)	**2**
Common selfheal (*Prunella vulgaris*)	**1**
Field horse tail (Equisetum arvense)	**1**
Meadow buttercup (*Ranunculus acris*)	**1**
White clover *(Trifolium repens)*	**1**
Creeping buttercup (*Ranunculus repens)*	**2**
Dicots (*Dicotyledon s. pp*)	**9**

Grassland data showed no difference in plots one and two due to their proximity. The results from the repeat survey did not differ from the original data collection sessions, which is because there were no management actions taken during the four months between the original data collection and the repeat survey.

Data interpretation

This biodiversity audit examined the level of diversity present within the Gloucestershire Heritage Hub's community garden, using a combination of methods appropriate to the three biodiversity markers examined. Methods used include transect, point count, hedgerow surveys and grassland surveys.

Data collected during January was used as a baseline dataset. This was not an optimal time of year to collect the data, particularly for grassland and hedgerow surveys, and winter conditions may have altered the identification results. Therefore, all data sets were then repeated during the week beginning on the 21st of March. This date was chosen for two reasons: the time that had passed since the original data collection sessions would allow for some seasonal variation among all data sets, and the observer's availability. The time between the data sets would be a factor to consider when accounting for the variation in the data sets. The same routes or plots were used when collecting data, except for the first vegetation survey. The original results showed plant species which were not realistic as grassland species. There were some abnormalities in the data, most likely indicating that the plot was on the line of a habitat boundary. The UK Hab classification is most likely to be g3c. Further classification is difficult as none of the indicator species were identified as being present (UKhab LTD 2023)

However, a few key observations were made throughout the four-day data collection period. The bird data collected shows a moderate level of biodiversity present within the area of the site. A total of ten bird species were identified over the two data collection sessions. Most of the species identified are common garden birds within the UK (Gloucestershire Wildlife Trust, no date) and therefore are expected to be present at some point in the year. Most of these species have a conservation status of least concern due to their global distribution. Although some of these birds use the site as a feeding or resting ground, based on the evidence of feeding and faecal matter on the ground.

During data collection, a robin nest was also identified as being at the site. These observations indicate that the Gloucestershire Heritage Hub is providing an adequate habitat for the UK bird species.

The site also shows potential to be a breeding or migration site for a rare species, the red blackstart bird. This species typically breeds in the UK, with records being prominent in built-up areas. If this is a true observation, there is a requirement for the site, due to the fact, the black redstart is a fully protected species. It is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). This protects the bird, its eggs, and nestlings from killing, injury, and damage or destruction to its nest (Black Redstarts UK n.d.).

The data collected on vegetation is consistent with what is expected with Gloucestershire based on plant communities in similar locations and the soil type present on the site. Data indicates a high level of biodiversity within the grassland areas of the site, with the most

dominant family being dicots; these were identified as being present in all the quadrates evaluated, alongside members of the Asteraceae family. The March data collection session suggested that daisies were most prevalent in the area located at the back of the community hub.

Within the data, one invasive plant species was identified as being present (ragwort). There were four observations of ragwort made across three of the quadrates without management, which is likely to increase in density, subsequently reducing the biodiversity of the grassland areas of the community hub.

The hedgerow survey data suggests that the community hub has hedgerow areas that code to h2a6 according to the UK habitat classification system. This may not be an accurate survey result as the site does not have a consistent hedgerow of 30m, which the code is based on. (UKhab 2023)

Data limitations

- Relied partly on birds being identified accurately by Merlin observers' knowledge of avian species.
- The data from the earlier data collection session may be unreliable due to the non-optimal time of year for collection (few flowering plants present)
- Site size: Some of the methods used had to be adapted to ensure that they would be appropriate for the site. The methods used are usually for larger sites.
- Seasonal variation may have altered the data sets generated during surveying.

What is the site already doing to benefit biodiversity?

The community hub has already implemented several provisions that benefit wildlife and biodiversity on the site. This section will show some of these using annotated photographs taken in person.

Bug houses

Figure 4: Bug house

Members of the site have built a bug house using a combination of natural resources and mounted it on a low-down wall. This is a great resource for many invertebrates, providing a small additional niche within the gardens.

Bird feeders

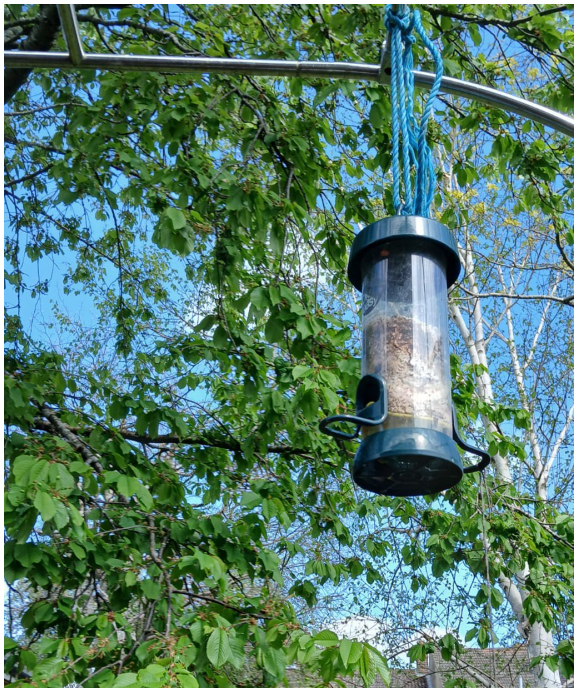

Figure 5: Bird Feeder 1

The site has two bird feeders hung high in areas with little likelihood of predatory disturbances. They are frequently used, with a particular preference for one containing fat balls.

Growing methods – The community hub uses a combination of growing methods within the garden, which do not use chemicals, to support their effort of gaining organic status. Methods include no-dig (raised) beds. The no-dig has several benefits to the environment and overall production rates.

Figure 6: growing method

The other method currently used by the Hub is the use of biodynamic growing practices; this is a method of growing designed and introduced by Rudolph Steiner in the 1920s. The word biodynamic is derived from the Ancient Greek words ‘bio’ (life) and ‘dunamis’ (power). This growing practice is a holistic approach. Biodynamic growing methods place focus on the connection between people, natural earth cycles, and the environment, combined with the more traditional organic practices. It is a practice now used by fifty different countries. It is guided by lunar, solar and cosmos cycles. These principles are because water availability, soil fertility are optimal at some times in the year. (Guide, A.202, Jutta, 2015),

These principles have been shown to have environmental benefits, the non-dig beds can provide benefits such as reduced soil compaction, carbon sequestration and increased natural soil nutrients. (Elizabeth 2023)

The practice uses no chemical fertilisers but, rather than relying on natural fertilisation in the hub uses wood chips and chicken manure as fertilisers. The use of natural products has proven beneficial for biodiversity in the garden. The ethos of the hub does not align with the use of chemicals.

Pond

Figure 7: the site’s pond

A small circular pond within the garden has been observed supporting newts and other aquatic invertebrates in the past few months. However, it is currently overgrown with moss. There are weeds which create a boundary for the pond, these will be beneficial for invertebrate communities by providing hiding and breeding spaces. Ponds are often known as biodiversity hotspots (Mulvany, H.2024); however, this pond needs some management to benefit biodiversity.

Education/ community outreach

The community hub facilitates social therapeutic horticulture with a range of people with learning difficulties, isolation issues, through to group Project Grow and caring for communities and people (CCP). As well as growing vegetables for a charity called Wiggly, who teach vulnerable people how to cook. They also host events such as talks on food and farming, as well as biodiversity week events where we have composting examples, food taste testing, with council members, staff and public, as well as climate youth groups. (Personal comp Hannah 2025)

Bee hives

Figure 8: Evidence of bee hives

The site also houses honeybees, which they harvest honey. This does not directly impact the biodiversity on the site due to them being housed in a controlled environment. However, it does play a role in the community outreach and food production element of the community garden and provides education opportunities and builds connections/awareness among people in the local area.

Wild section

Figure 9: wild-growing section.

The garden also has a small, newly established wildflower area within the community garden. This area helps to increase their species diversity but also provides opportunities for the presence of pollinator species and habitat/food sources for invertebrate species using the garden. This does need to be enhanced through further planting/growing can be done to benefit pollinators in the future.

Heritage Heirloom Fruits Trees

Figure 10: Heritage Heirloom Fruit Tree

Heritage fruits and nuts are traditional varieties which have been grown for centuries. This resilience is one of the reasons that they are an important biological feature, helping to maintain the site's genetic and species diversity. These trees are likely to be important habitats for birds and invertebrate species. This resource is also important for the local community, providing a food resource and reducing the reliance on commercially produced foods.

Site recommendations

The fact that the site is run and maintained by volunteers for all aspects offers a unique opportunity for engaging the public in understanding the importance of biodiversity, which is why this report recommends actions which can be implemented by people with little knowledge of all areas discussed in the report.

Bird feeders are to be cleared and refilled regularly, particularly the seed one, as during damp conditions seeds are likely to compact seeds which has the potential to sprout seeds or compact within the feeder, resulting in it being more difficult for birds to feed. The cleaning of bird feeders will also help in enhancing biosecurity measures and reduce the risk of diseases such as bird flu impacting the users (Feliciano, L.M. et al.2018). A regular refill will ensure that

birds can consistently use the resources available to them within the community garden. This action can be conducted by any of the volunteers on the site regularly, it may require a small step ladder to be able to access the ties holding the bird feeders up. The food can be purchased by the hub at a local pet store or gardening shop. This should be done weekly or fortnightly.

The site might benefit from installing some bird boxes targeted toward the small bird species using the site, such as the red Blackstart and robin, as a breeding site. The installation of bird feeders will help provide the birds with an alternative nesting site if the birds become disturbed by people using the site Welton, R., 2024b). Any installation of nest boxes should take place in late December or early January in time for breeding between February and March, which will give birds visiting the site time to acclimate to its presence. (VAUGHAN, N. 2020)

Implement a no-mowing practice for an area within the grassland section of the community garden. Reducing mowing in an area would provide a corridor kind of system for any invertebrates using the site, and a higher diversity of species would be able to be identified. (Wildlife Trust no date)

Continue to enhance wildflowers on the site with more growing and the addition of native wildflowers. The wildflower has the potential to be a significant area for pollinators and invertebrates. This could be used as a corridor in some areas of the hedge row, which are a little patchy on the site. A pollinator survey should be conducted in the coming weeks to identify the current use and evaluate potential new plants for the area if target species are identified as being important for the site to have for the environment or visitor perspective. These can be painted and monitored by any of the volunteers. Seasonal monitoring would be sufficient.

A survey of invertebrates on the site would be beneficial in adding to the current data on its biodiversity. This was not completed for this report due to the observer's personal challenges and resource availability at the time of the audit. This can be conducted by anyone using pond dipping and bush beating as methods, but they would need some equipment to conduct the survey. This will include:

- Identification keys like ones produced by the Field Study Council
- A long-handled net
- Two white trays
- A weighing boat
- Sample tubes with plastic lids and is clear.

The pond that is on site is currently overrun by moss, although there is a low level of open water left in the pond, and this has seen a rapid growth rate over the last couple of months. This high level of moss is likely harming the pond; for example, it reduces oxygen in the water.in its current condition, it is difficult to establish a baseline data set. The pond would benefit from these provisions before an aquatic invertebrate survey could be undertaken. Actions could include:

- A partial removal of the moss which has taken over the pond – this would allow for oxygenation, which will help support some of the aquatic life using the pond habitat.
- Prevention methods could then be implemented to reduce the rate of regrowth; this can be achieved by planting shading plants around part of the pond. The use of floating plants such as water lilies. Plant these in areas which are easily accessible for maintenance.
- Check the area for the presence of invasive species. This will help to maintain plant diversity around the pond and strengthen its resilience to change. (Barley straw in spring

- Wildflower planting around the pond will prevent excess nutrients from getting into the water.
- Ensure not to feed any animals in the pond, as excess will encourage algae and moss to regrow.
- Add submerged plants if appropriate.

(Recommendations for pond management came from: Cheshire Wildlife Trust, no date, Thyme 2021,

Future monitoring recommendations

- Seasonal monitoring should be undertaken in the future for bird diversity. Using a combination of point count data and transects in a continuous line on the site, where possible and point count surveys. Due to the small site, monitors would have to retrace their steps during the ten-minute data collection period. Surveys of birds should be conducted early in the morning when the site is quiet. The best survey results data can be collated and added to environmental records for the area. Surveys can be undertaken by any of the volunteers using the methods detailed in my methods. People with more bird knowledge should be encouraged to engage, as this may enhance the survey results, particularly the point count data. It is recommended that binoculars be used, particularly if the survey is being conducted by people with visual impairments.

- Ensure all bird feeders are kept topped up and clean to help maintain biosecurity.

- Track the rate of spread of ragwort species within the site; the current evaluation suggests at least five areas where at least one species of ragwort is present in grassland areas. Current opinions are that they should be left due to their aesthetics and the desired organic status of the Gloucestershire Heritage Hub. If opinions differ in the future, the current non-chemical method of control is physical removal and burning, including the roots of the plant.

- A pollinator and invertebrate survey should be conducted.
- Monitor the biodiversity in the pond, the presence of invasive plant species and moss regrowth following removal.

Conclusions

The purpose of this report was to identify the level of biodiversity present at Gloucestershire Heritage Hub's community garden, drawing on a combination of data collection methods to do so. Data indicates that the hub has a high level of biodiversity for all the major markers evaluated. The hub's community garden plays a vital role for the local community and biodiversity; however, to enhance these impacts, there are a few actions identified that the hub could undertake in future. – Specify a couple of these actions in your conclusion

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AI use acknowledgement

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