

Habitat Management and Monitoring Plan

Site Name: Frampton Court Estate

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Figure 1 Aerial image of Frampton On Severn (Seeley, 2020)

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Introduction

Frampton Court Estate encompasses a diverse landscape comprising woodlands, grasslands, wetlands, and water bodies. This habitat management plan aims to preserve and enhance the biodiversity of the estate while promoting sustainable land management practices. Through a combination of habitat restoration, invasive species management, and species-specific conservation measures, the plan seeks to maintain and improve habitat quality, support wildlife populations, and protect key ecological features across the estate.

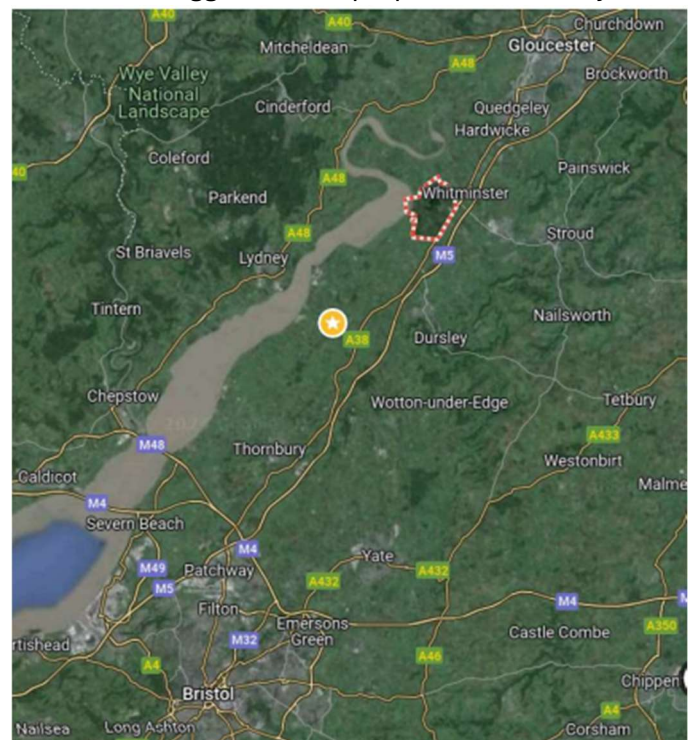
Site boundary plan:



Figure 2 Google. (2024). Frampton Court Estate [Google Maps]. Google Maps.

Site context map: map showing the location of the site on a bigger scale in proportion to nearby cities; Gloucester and Bristol.

Figure 3 Google. (2024). Frampton Court Estate [Google Maps]. Google Maps.



Overview of Frampton Court Estate

Located in the village of Frampton on Severn in Gloucestershire, Frampton Court Estate spans 556.2 hectares, encompassing a diverse array of habitats. These include cropland, grassland, heathland, shrubs, marine inlets, transitional waters, rivers, lakes, urban areas, wetlands, and woodland (Palmer, Wells and Young, 2023). The site also features a village green, a former landfill site, a grade 2 park, and multiple water habitats and is home to two Sites of Special Scientific Interest (SSSI): Frampton Pools and within the newgrounds. Renowned for its biodiversity, the estate boasts 728 tree species alongside numerous notable plant and animal species, albeit with some invasive species present (Palmer, Wells and Young, 2023). There is a network of public footpaths across the site. Steeped in history, Frampton Court Estate highlights various historic features. The main geology of the area is clay-heavy soil, with intermittent pockets of gravel. In the past, agriculture employed most of the population. Although arable crops were also farmed, the low-lying area near Frampton on the Severn was ideal for orchard cultivation and animal grazing (Stroud District Council, n.d.). Furthermore, The Frampton area historically supported various industries that utilised its natural resources. Clay extraction for brick and tile manufacturing dates to the 18th century. Gravel extraction also played a significant role, with operations expanding in the 19th century. While extraction activities have diminished over time, flooded pits are designated as Sites of Special Scientific Interest (Stroud District Council, n.d.). Moreover, situated within a conservation area supporting two SSSI and falling within three areas of international wetland importance (Ramsar, SAC and SPA), it demonstrates Frampton Court estate's biodiversity and conservation value (Frampton Parish Council, 2018).

Within the estate, there are many pockets of woodland present as shown in Figure 4.

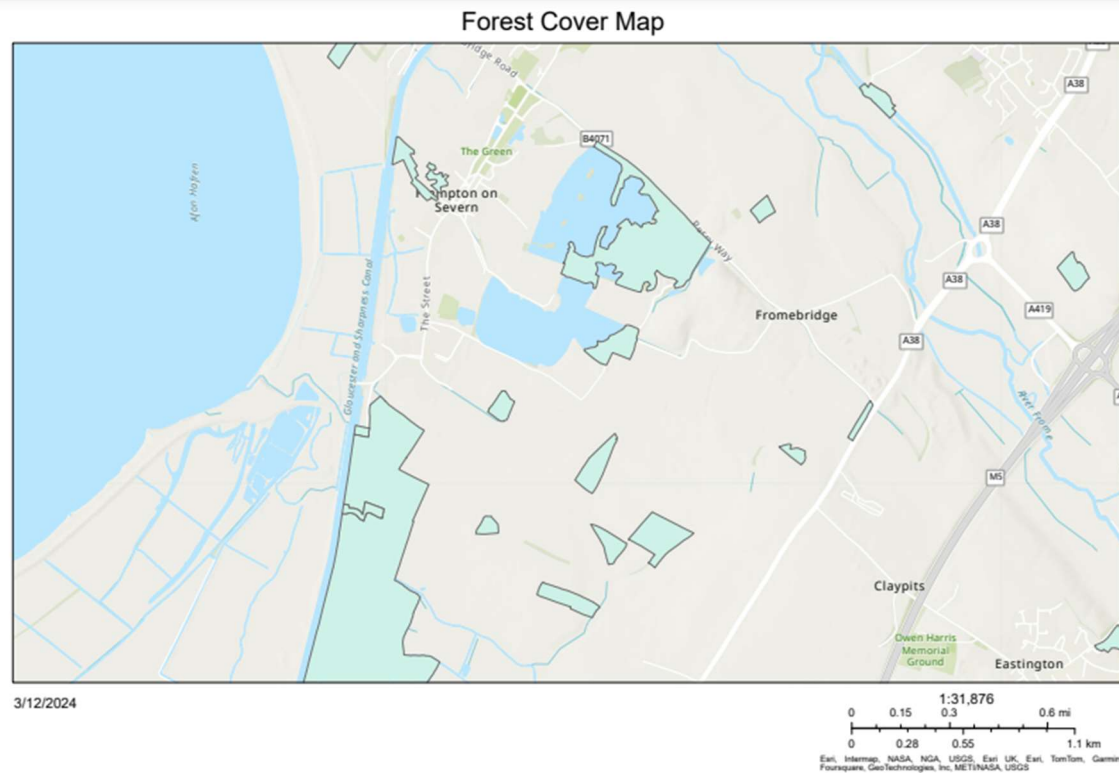


Figure 4, ArcGIS (2024) Forest Cover

It also features both managed grasslands and wildflower-rich meadows. There are multiple wetland habitats including ponds, lakes, rivers, canal, reedbeds and marshlands most of which are human made (Stroud District Council, n.d.).

Purpose and objectives of the habitat management plan

The management plan for the site at Frampton Court Estate addresses various ecological challenges. It aims to maximise conservation efforts, maintain ecosystem health, and preserve historical sites while ensuring long-term sustainability. Key priorities include managing invasive species such as Himalayan balsam and controlling algae growth in the ponds to maintain water quality. Protection of the two Sites of Special Scientific Interest (SSSI) is paramount, along with conservation measures for species such as the greater crested newt and diverse bird populations. A robust monitoring and evaluation framework will enable adaptive management, allowing for adjustments to strategies based on monitoring data and changing environmental conditions (Ausden, 2007). Through collaborative efforts and targeted actions, the management plan seeks to preserve the ecological integrity and biodiversity of Frampton Court Estate for future generations.

Habitat Assessment

Description of existing habitats on the estate

The site consists of 556.2 hectares which is made of multiple habitat classifications, including 43.4% cropland, 40.6% grassland, 0.9% heathland and shrub, 3.1% Marine inlets and transitional waters, 3.5% rivers and lakes, 1.8% urban, 0.7 % wetland and 6% woodland and forest (Palmer, Wells and Young, 2023).

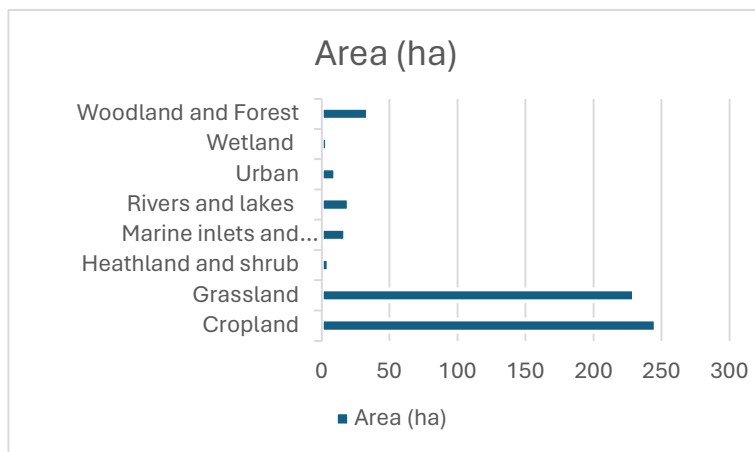


Figure 5 Area of habitat types in Frampton On Severn



The village green at Frampton on Severn, is 700m long and 80m wide and is reputed to be the longest village green in England (Frampton Parish Council, 2018). It serves as a vital refuge for biodiversity, characterised by its expansive grassland habitat. To enhance the ecological

richness, the grass is intentionally allowed to grow wild, with an annual hay cut implemented to promote the growth of wildflowers. However, challenges such as unauthorised parking on the grass verges and encroachment on footpaths pose threats to this habitat. The green hosts a diverse array of plant species, including pasture grasses and perennial herbs such as common buttercups, germander speedwell, and meadow cranesbill, indicative of its marshy history and occasional flooding (Frampton Parish Council, 2018).

Another feature of the estate is the old landfill site located east of the court lake. Efforts are focused on habitat rehabilitation and restoration. Vibrant blooms of bird's foot trefoil and common spotted bed orchids are found on the site in late June and July, highlighting its potential for habitat recovery (Frampton Parish Council, 2018).

As a Grade 2 park, The Court Park undergoes meticulous management to uphold its aesthetic and ecological value. Regular grazing by sheep contributes to habitat diversity, while annual events like the Frampton Country Fair are carefully coordinated to minimise disturbance to wildlife.

The estate features numerous water habitats, including lakes, and ponds, and the Gloucester Sharpness Canal runs along the west side of the village, with the River Severn running alongside. Notably, the Severn estuary, designated as a RAMSAR site of international wetland importance, hosts semi-improved fields supporting managed grazing and harbouring nationally scarce species like sea clover and bulbous rush (Frampton Parish Council, 2018).

Ecological condition assessment

The Frampton Pool lakes are categorised as eutrophic, facing recurrent blue-green algae blooms that pose a significant threat to the integrity of the SSSI and its rich biodiversity. This longstanding issue warrants immediate attention due to its adverse impact on the delicate balance of flora and fauna within the area (Palmer, Wells and Young, 2023).

Identification of key species and features

During the site survey at Frampton Court Estate, a thorough identification of key species and features was conducted. A total of 728 individual trees were identified, mainly found within field boundaries, with species including Ash, Cherry, English Elm, Field Maple, Hawthorn, Horse Chestnut, Large-leaved Lime, Norway spruce, Oak, Poplar, Sycamore, Walnut, and Willow (Palmer, Wells and Young, 2023).

Additionally, several invasive plant species were noted, including Lesser Periwinkle, Snowberry, Himalayan Balsam, Bamboo, Japanese Knotweed, Swamp Stonecrop, and Water Fern, each requiring targeted management efforts (Palmer, Wells and Young, 2023).

Species of note observed during the survey included large flocks of winter thrushes such as Fieldfare and Redwing, alongside Mistle Thrush and Song Thrush. Wintering granivorous birds were also observed, including Chaffinch, Linnet, Goldfinch, Yellowhammer, and Reed Bunting, often associated with areas planted with winter bird mixes. Notably, nine Harvest Mouse nests were found at four separate locations, along with three main badger setts and two annex setts, highlighting the diverse wildlife present on the estate (Palmer, Wells and Young, 2023).

Bats play a significant role in the ecology of the site, with records indicating the presence of various species, including greater and lesser horseshoe bats, a grounded serotine bat, barbastelle, and Nathusius's pipistrelle (Frampton Parish Council, 2018). Frampton is situated within a key area for Bats withing Gloucestershire. They contribute to biodiversity and ecosystem balance, highlighting the site's importance as a habitat for diverse wildlife.

Moreover, the many hedgerows across the estate serve as crucial wildlife corridors, providing shelter and foraging opportunities for birds, bees, and other wildlife species. With approximately 17,963.4 meters of H2 hedgerows and 16,758.1 meters of H2A hedgerows, designated as priority habitats, these vegetative boundaries enhance habitat connectivity and promote species movement across the landscape (Palmer, Wells and Young, 2023). The fields are bordered by hawthorn hedges, further augmenting the ecological value of the site (Frampton Parish Council, 2018).

Additionally, the presence of three ponds supports a thriving population of common toads, while the site is also home to the elusive greater crested newts, underscoring its significance as a haven for amphibian diversity (Frampton Parish Council, 2018). Overall, the site's diverse array of habitats and wildlife populations highlight its importance for conservation and biodiversity preservation.

Birds

Bird surveys have been conducted monthly by a dedicated volunteer group in Frampton. In the latest survey 2022-2023, A total of 104 distinct species were seen. The table in figure 6 shows a summary of the observations made across 9 years (Frampton Bird Group, 2023).

	Number of observations	Total number of birds	Number of birds in flight only	Number of birds at rest	Number of species	Species per month, mean	Species per month, max	Species per month, min
2014/2015	1109	6628	1680	4948	107	43	61 (Apr)	33 (Jan)
2015/2016	1095	6610	1509	5101	103	44	54 (Oct)	33 (Aug)
2016/2017	979	6091	1242	4847	97	40	49 (Oct)	34 (Aug & Sep)
2017/2018	966	7122	1162	5960	102	41	51 (Jan & Oct)	25 (Jul)
2018/2019	960	6994	1094	5900	108	42	50 (Nov)	33 (Feb & Aug)
2019/2020*	1015	7551	964	6587	112	45	60 (Aug)	28 (Feb)
2020/2021*	1132	8754	3412	5342	111	48	61 (May)	37 (Nov & Feb)
2021/2022	919	7094	4538	2556	106	43	57 (Apr)	37 (Jan)
2022/2023	919	11895	4088	7807	104	43	51 (Oct)	35 (Dec)
	*Eleven months only - because of Covid-19 restrictions							

Figure 6 Frampton Bird group (2023) Bird Survey Observations

Mapping of habitat distribution

Figure 7 shows the living England habitat map, showing the distribution of habitat types across the site.

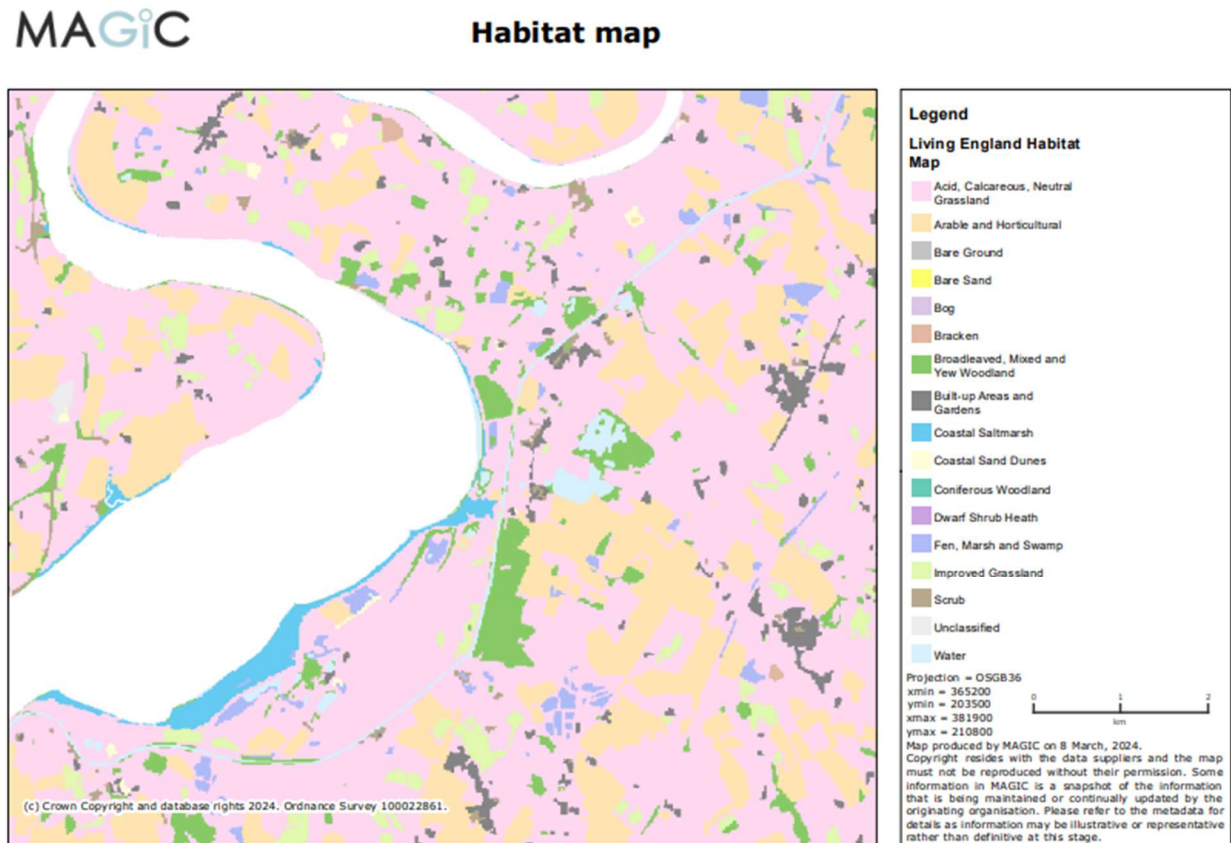


Figure 7 Magic (2024) Living England Habitat Map

Clear objectives for habitat management

- Preserve and enhance habitat diversity and ecological integrity.
- Reduce the presence of algae in lakes.
- Protect greater crested newts.
- Perform tree assessments.
- Perform wildlife corridor assessments.
- Prevent the spread of invasive plant species especially Himalayan balsam to minimise their impact on native vegetation.
- Protect and conserve key habitats and species including the designed SSSI sites.
- Engage with stakeholders and the local community to raise awareness of habitat conservation and promote stewardship.

Specific targets for each habitat type

Habitat enhancement

Habitat restoration and enhancement initiatives will focus on improving the quality and diversity of habitats across the estate. Key actions may include:

- Maintaining and enhancing hedgerows to provide wildlife corridors and habitat connectivity. Hedgerows will be left uncultivated and wild, with regular monitoring to assess habitat structure and biodiversity (Barr et al., 2021).
- Transitioning arable fields to grasslands and implementing no-mow periods to promote wildflower growth and support grassland species diversity (Ethos, 2020).
- Protecting and enhancing wetland habitats, including ponds, reedbeds, and marshy areas, to support aquatic and semi-aquatic species. Measures may include controlling nutrient runoff, managing water levels, and restoring natural hydrology.

Woodlands

To enhance woodland habitat diversity and promote regeneration, the woodland areas within Frampton Court Estate should be strategically managed through a rotational coppicing approach. This entails dividing the woodland into 10 coups, with one coup designated for coppicing each year. Coppicing involves selectively cutting certain trees or shrubs down to ground level, allowing them to regrow from the stump (Woodland Trust, 2023). By annually rotating the areas subject to coppicing, the estate can ensure that there is always a mosaic of age classes and habitat structures available, benefiting a range of plant and animal species. Using the byproducts from the coppicing e.g. stakes/binders for hedge laying elsewhere on site (Ausden, 2007). This management practice not only promotes woodland regeneration but also fosters biodiversity by creating different successional stages within the woodland ecosystem (Woodland Trust, 2023).

Algae

Efforts will be made to mitigate blue-green algae and Canadian pondweed in the lakes by encouraging reduced nitrogen usage on nearby farms. Algae thrive on nutrients like phosphorus and nitrogen. Implementing measures to reduce nutrient runoff from surrounding agricultural lands, such as implementing buffer strips, cover crops, and vegetative buffers, can help minimise nutrient inputs into the lakes (Stroom and Kardinaal, 2016). Establishing vegetative buffer zones along the lake shores can help filter out nutrients and sediment before they enter the water, thereby reducing the nutrient load available for algae growth. Installing aeration systems in the lakes can help improve water circulation and oxygen levels, which can inhibit algae growth. Aerators disrupt stratification and promote the mixing of oxygen-rich surface water with deeper layers, creating an inhospitable environment for algae (Stroom and Kardinaal, 2016). Additionally, spending more time and research into understanding the root causes of the excessive nutrient inputs into the lakes would help to identify and eliminate the source and therefore reduce algae growth and protect the habitat.

Invasive species control

Invasive species represent a significant threat to native biodiversity and ecosystem health, prompting the implementation of proactive management programs on the Frampton Court Estate. Among the targeted invasive plants are Himalayan Balsam, Japanese Knotweed, and swamp stonecrop, which have the potential to outcompete native vegetation and disrupt

ecosystem dynamics (Palmer, Wells and Young, 2023). The estate's management strategy should aim to control and eradicate these invasives through a combination of manual removal and targeted herbicide applications. Hand-pulling or cutting invasive plants is an effective method to prevent seed dispersal and inhibit regrowth, although it requires ongoing stakeholder engagement to ensure thorough removal. Specifically, for Himalayan Balsam, mechanical control through repeated cutting or mowing can be effective for large stands, but careful attention must be paid to cutting below the lowest node to prevent regeneration. Moreover, implementing two-year control programs can be successful in eradicating Himalayan Balsam, provided there is no further infestation from upstream or adjacent sites (Cosgrove, Kelly and Maguire, 2008). Herbicide application, such as spraying the foliage with glyphosate, is another method for controlling invasive species, but it may not be applicable near waterbodies due to potential environmental risks (Cosgrove, Kelly and Maguire, 2008). Despite the challenges posed by invasive species management, the estate is committed to employing these strategies to safeguard native ecosystems and promote biodiversity conservation.

Regular monitoring and adaptive management will be employed to assess the effectiveness of invasive species management efforts and adjust strategies as needed.

Deadwood

It is recommended that dead trees across Frampton Court Estate are not removed but instead left in place to provide essential habitats for a variety of wildlife species, including bats. Dead or decaying trees, also known as "snags," play a crucial role in ecosystem dynamics by providing nesting sites, roosting locations, and foraging opportunities for numerous wildlife species (Swales et al., 2002). Specifically, leaving dead trees intact can benefit bat populations, as they offer sheltered roosting sites and attract insects, a primary food source for many bat species (Berthinussen, Richardson and Altringham, 2021). Furthermore, dead trees contribute to habitat complexity and biodiversity, supporting a range of organisms from fungi and insects to birds and mammals (Swales et al., 2002).

By retaining dead trees within the estate, it not only enhances habitat quality but also promotes ecological resilience and supports the overall health of the ecosystem (Berthinussen, Richardson and Altringham, 2021). Therefore, proactive measures should be taken to conserve dead trees as valuable habitat features, contributing to the conservation of biodiversity and the maintenance of healthy ecosystems across Frampton Court Estate.

Bat boxes.

To enhance bat habitats across Frampton Court Estate, a proactive approach involves installing bat boxes throughout the estate. By strategically placing bat boxes in various locations, such as woodland edges, open fields, and near water bodies, additional roosting sites can be provided for bats. This initiative aims to increase the availability of suitable habitat spaces, particularly for rare bat species recorded within the estate, ensuring their populations have ample resources to thrive (Berthinussen, Richardson and Altringham, 2021). Bat boxes offer safe and sheltered roosting locations, mimicking natural roosting sites like tree hollows and crevices, and can attract bats seeking suitable habitats for breeding, resting, and hibernating. According to Reason and Wray (2023), offering various boxes of diverse sizes, designs, and materials, including multi-chambered alternatives, placed in different positions and orientations, particularly considering the degree of sun exposure and shade, is expected to become more crucial with changing climate conditions. When boxes are erected, they should be numbered

and a detailed plan should be made of each box's location, together with details of its height, aspect, and type (Reason and Wray, 2023). By enhancing bat habitats through the installation of bat boxes, Frampton Court Estate can contribute to the conservation and protection of bat populations while promoting biodiversity within the estate.

The case study conducted in Australia highlights the potential effectiveness of creating artificial hollows in trees as a habitat management strategy. Researchers found that despite being artificial, half of the hollows created were utilised by long-eared bats. This suggests that providing such artificial structures can offer viable habitat options for wildlife. With eight out of 16 artificial hollows being utilised by the bats, it underscores the importance and potential success of this approach in supporting bat populations (Rueegger, 2017). By strategically placing artificial hollows in trees, habitat management efforts can enhance biodiversity and provide essential roosting sites for wildlife species, contributing to overall ecosystem health and conservation efforts.

Amphibians

One of the primary threats to amphibians at Frampton Court Estate is posed by traffic, particularly during their migration periods. The movement of vehicles along roads adjacent to water bodies can result in amphibian mortality, especially during the breeding season when they migrate to breeding sites (Mazerolle, Huot and Gravel, 2005). To mitigate this threat, stakeholders have already taken proactive measures by organising toad patrols conducted by local volunteers. These patrols aim to monitor amphibian movements, assist in safely relocating them across roads, and raise awareness among drivers. Additionally, signage has been strategically placed to alert motorists to the presence of amphibians crossing roads, enhancing their chances of survival during critical migration periods (Mazerolle, Huot and Gravel, 2005). These initiatives demonstrate a proactive approach to addressing threats to amphibians and promoting their conservation at Frampton Court Estate.

Management summary and timings

Habitat compartment	Proposed work plan	Timing	Review
Gravel pit Woodland	1. Conduct Invasive Non-Native Species (INNS) clearance to remove invasive plants (Trumper, 2001).	Review progress after 6 months.	Evaluate effectiveness of clearance efforts in reducing invasive species presence
	2. Collect deadwood into habitat piles for wildlife habitat enhancement.	Annual Review	Assess habitat utilisation and degradation of deadwood piles by wildlife
	3. Perform tree assessment to identify potential hazards such as unstable or diseased trees for safety and health (Adesoye and Dondofema, 2021).	Annual Review	Ensure ongoing safety of visitors and wildlife by identifying and addressing hazardous trees
	4. Implement rotational coppicing to promote woodland regeneration and	Review completion after each coppicing cycle	Evaluate regeneration success and biodiversity response to coppicing activities

	biodiversity (Adesoye and Dondofema, 2021).		
Grassland	1.Implement grazing regime with controlled grazing to maintain patchy land for butterfly habitat (Broom, 2018).	Review effectiveness after 6 months, then annually	Monitor changes in grassland structure and butterfly populations in response to grazing regime
	2.Replace old fences to prevent livestock from accessing unauthorised areas	Review completion after installation	Ensure effective containment of livestock and protection of sensitive habitats
	3.Conduct ongoing maintenance of grazing regime, including monitoring grazing intensity and habitat impact (Broom, 2018.	Annual review	Assess habitat changes and grazing impact on vegetation composition and structure.
Hedgerows	1.Undertake hedge laying to create wildlife corridors and improve habitat connectivity.	Review completion after 1 year;	Evaluate success in creating wildlife corridors and enhancing connectivity (Ausden, 2007).
	2.Perform wildlife corridor assessment to identify key species and monitor movement patterns (Barr et al., 2021).	Annual review	Monitor wildlife utilisation of hedgerows and assess corridor effectiveness in promoting species movement (Ausden, 2007).
	3.Assessment and maintenance of hedgerow connectivity by managing gaps and barriers to wildlife movement (Barr et al., 2021).	Annual review	Ensure continuous habitat connectivity and address any barriers to wildlife movement
	4.Implement coppicing of hedgerows to rejuvenate and diversify hedgerow structure and habitat.	Review completion after each cycle	Assess hedgerow health and biodiversity response to coppicing activities
Court Lake and Sailing lake	1. Implement measures to reduce algae growth such as nutrient management and sediment control (Anderson, 2009).	Review effectiveness after 1 year;	Monitor changes in algae presence and water quality to evaluate the success of mitigation measures
	2. Monitor and manage invasive aquatic plants through targeted removal and prevention strategies	Annual review	Assess effectiveness of invasive species management in preventing spread and minimising impact on native flora and fauna
	3. Install aeration systems to improve water circulation and oxygen levels for enhanced lake ecosystem health and water quality (Heathland Group, 2023)	Review completion after installation	Monitor changes in water quality and aquatic biodiversity in response to aeration systems

In addition to outlining the proposed work plan for each habitat compartment, this table specifies the timing for each task and how it should be reviewed to ensure effectiveness and

adaptability over time. Regular reviews allow for adjustments to be made based on progress and changing conditions, thereby maximising the success of habitat management efforts.

Monitoring and engagement

To ensure effective habitat management at Frampton Court Estate, a variety of monitoring techniques will be employed. Regular surveys will be conducted to assess habitat quality and species abundance, providing valuable data for conservation efforts. Additionally, remote sensing techniques, such as satellite imagery and aerial surveys, will be used to monitor habitat changes over time and detect the presence of invasive species (Huang and Asner, 2009). Citizen science initiatives will also be implemented, involving volunteers and community members in data collection efforts. This will include activities such as bird counts, amphibian surveys, and bat monitoring, harnessing the collective efforts of local stakeholders to enhance our understanding of the estate's biodiversity and inform conservation strategies (JNCC, 2024).

Conclusion

In conclusion, the habitat management plan for Frampton Court Estate presents a comprehensive strategy aimed at preserving and enhancing the ecological integrity of the diverse habitats present within the site. With clear objectives and specific targets for each habitat type, the plan addresses key conservation challenges while promoting biodiversity conservation and habitat restoration.

The assessment of the site's ecological condition underscores the importance of immediate action, particularly in mitigating the recurrent blue-green algae blooms in the Frampton Pool lakes, which threaten the sensitive balance of flora and fauna within the area. By implementing measures to reduce nutrient inputs from surrounding agricultural lands and enhancing water circulation through aeration systems, the plan aims to restore the health of these vital aquatic ecosystems.

Furthermore, the management strategy recognises the importance of controlling invasive species such as Himalayan Balsam and Japanese Knotweed, which pose significant threats to native biodiversity and the SSSI site. Through targeted removal efforts and ongoing monitoring, the estate aims to prevent the spread of invasives and safeguard the ecological balance of the landscape.

Additionally, habitat enhancement initiatives, including the maintenance of hedgerows, transition of arable fields to grasslands, and protection of wetland habitats, seek to promote habitat diversity and support a thriving population of wildlife species. By retaining deadwood and installing bat boxes, the plan also acknowledges the importance of providing essential habitat features for various wildlife species, including bats and amphibians.

Overall, the habitat management plan for Frampton Court Estate represents a collaborative effort between stakeholders, local communities, and conservation experts to ensure the long-term sustainability of this unique ecological landscape. Through proactive management practices and adaptive strategies, the estate aims to serve as a model for habitat conservation and biodiversity preservation, demonstrating a commitment to stewardship and environmental responsibility.

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