



Habitat Management & GIS

HABITAT MANAGEMENT PLAN

Llyn Llech Owain Country Park

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1.0 Introduction

Managing natural landscapes entails several critical factors. Each site is distinct due to its location, geography, flora, and fauna. Many strategies must be investigated to manage existing wildlife while encouraging new species' biodiversity. There are several approaches for developing and implementing a habitat management plan, each with limitations and strengths. Despite this, the deeper one's grasp of a given site's unique qualities, the more likely a successful and mutually beneficial habitat management strategy will be implemented (Wilhere, 2002).

Carmarthenshire County Council (CCC) constructed a management plan for Llyn Llech Owain in 1993, outlining five main aims, which are outlined below:

1. to enhance areas of nature conservation interest and reinstate the native vegetation.
2. to allow public access to the lake and surrounding area.
3. to bring the woodland into management as an amenity resource through the introduction of native species.
4. to encourage environmental education, e.g., nature study and bird watching; and
5. to emphasise the historical associations of the site.

To better grasp the habitats at Llyn Llech Owain, two site visits were conducted—the first on February 18th, 2023, and the second on April 29th, 2023. From data collected from the site visit, GIS mapping, and information gathered from the original management plan, this report will outline a ten-year plan for the site alongside suggestions for improvement relative to the habitat and site-specific features.

To critique each aim by land use and current management techniques, the following has been broken down into the below categories.

- Woodland
- Wetland
- Heathland
- Recreation and infrastructure

2.0 Existing Conditions

Site Name: Llyn Llech Owain

County: Carmarthenshire

OS Grid Reference: 256867,215102

Latitude/ Longitude: N51°48.97', W004°4.68'

Altitude (m): 238

Conservation Status: Site of Special Scientific Interest (SSSI)

Access: There are three access points to the park. The first is from the West via Church Road, which leads to the car park. The second is from the east, accessed by foot leading from Gorslas B4297 road, and the third is to the North via a secluded Public Right of Way (PROW) footpath.



Figure 1 Location map of the site



Figure 2 Satellite image of site

2.1. Historical Background

The origin of the name of the park relates to local folklore. According to the tale, a serviceman named Owain Lawgoch was guarding a well on Mynydd Mawr mountain, located southwest of Llyn Llech Owain. One day, after forgetting to replace the slab on the well, he fell asleep, and when he awoke, the lake was formed. Therefore, Llyn Lech Owain translates to ‘the lake of Owain’s slab’ (Discover Carmarthenshire, 2022).

In 1974, Welsh Water began using the lake as a reservoir to supply water to the village of Gorslas, which sometimes almost drained the lake (Natural Resources Wales, 2014). The site was designated an SSSI (Site of Special Scientific Interest) in 1993, so the lake is now protected. The water tower at the north end of the lake is still present, as shown by the target note in Figure 3.

2.2 Regional Setting

Llyn Llech Owain Country Park is situated in 240m above sea level in eastern Carmarthenshire near the village of Gorslas in the Gwendraeth Valley (OS Grid Reference- 256867,215102). Located one mile from the A48 trunk road, connecting to the M4, the park has good access points for visitors.

2.3 Topography and Geology

A central feature of the park is the lake, which was formed in the last ice age on a layer of glacial deposits, including carboniferous limestone, as well as the surrounding Twrch Sandstone Formation, which is more resistant to erosion, resulting in the upland ridge in which Llyn Llech Owain is situated (Lowe, 2021).

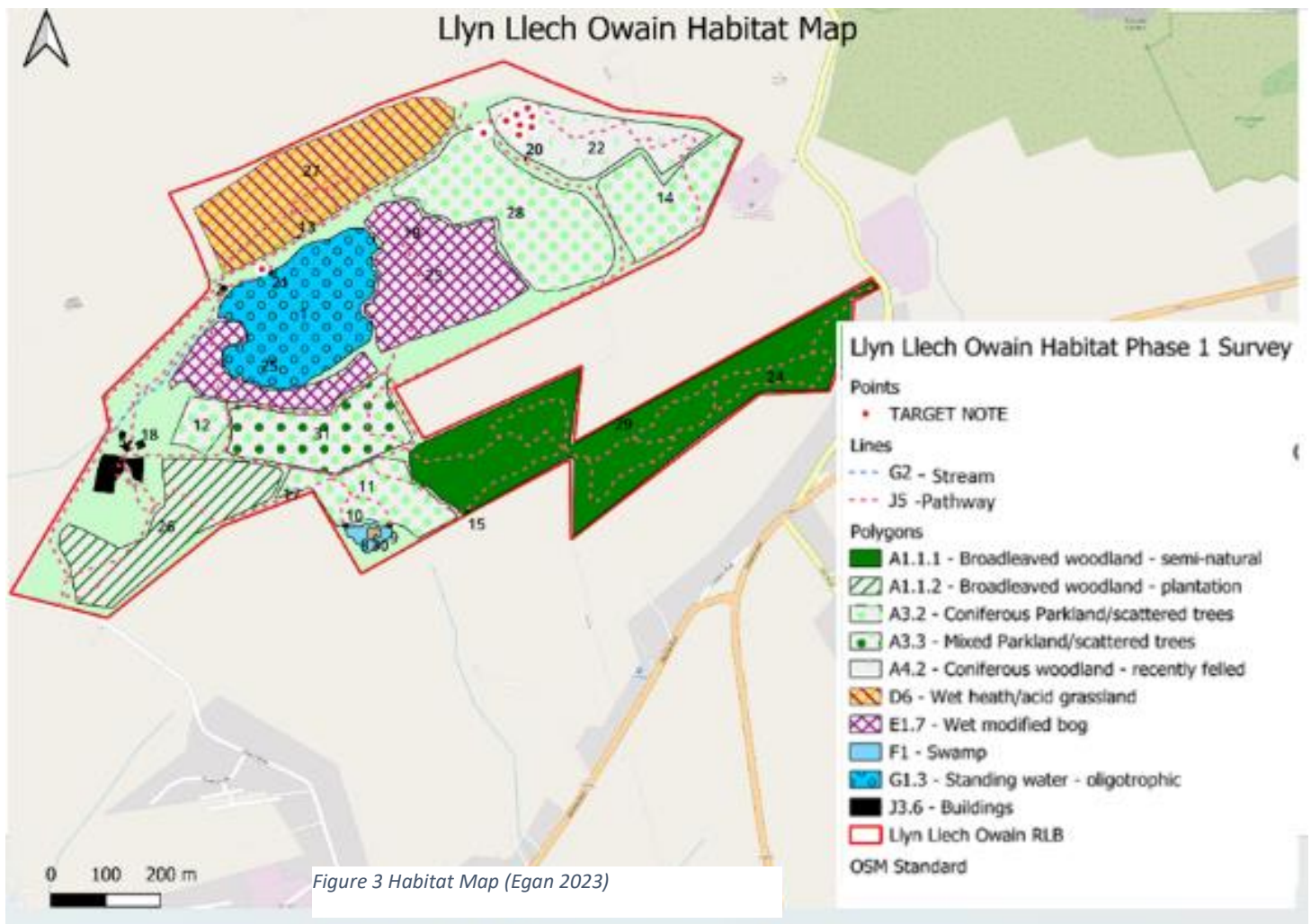
Surrounding the lake is an acidic peat bog formed in the damp conditions of the area, giving the park the status of SSSI protected by law under the Wildlife and Countryside Act 1981. The oligotrophic lake has a small storage capacity with a depth of 1.7 m, which is replenished by precipitation and drainage. Due to the peat causing acidity in the water, the colour of the water is permanently stained brown (Morris, 1996). The primary vegetation found in the lake is waterlily (*Nymphaea spp*). The bog's geology, landscape, and acidity determine what species and vegetation are present. The lake is bordered by marshy grassland and wet heath, which feature acid-tolerant species such as purple moor grass (*Molinia caerulea*) and rush (*Juncus*). Beyond the bog is coniferous woodland planted by the Forestry Commission in the 1960s; this woodland comprises Sitka spruce (*Picea sitchensis*) and Lodgepole pine (*Pinus latifolia*).

3. Woodland

The woodland of Llyn Llech Owain was roughly 50ha comprising Sitka Spruce in the south and Lodgepole Pine in the drier north. At the time of planting, drainage channels were installed. According to the original management plan, the trees were densely planted with a closed canopy, indicating inadequate care and that some trees had failed. Additionally, the wet ground conditions and planting density prevented the tree roots from establishing, thus leaving the trees unstable and lacking protection from the wind. The firebreaks were overgrown with willow and bramble, and access to certain areas was difficult. Before the Forestry Commission used the area for timber, the site would have been a mosaic of purple moor grass in the wetter areas and common ling in the drier areas.

To improve the park, it was proposed to lower the number of conifer trees and replace them with native broadleaf trees, increasing timber resources and improving fauna. This would be done gradually to preserve spaces for local landscape structures. By removing or thinning the area through regulated management, plants can regrow naturally while providing a sustainable timber resource. To do this, healthy vegetation regions should be avoided so existing ecosystems are not harmed.

In addition to this, the necessity to set up road infrastructure and firebreaks was emphasised. It was stated that this should be done in conjunction with the proposed footpaths for public use around the park in the interest of public safety and enjoyment of the site. These proposed management strategies aligned with the overall aim of the management plan and included clear actions to be taken. The primary aim of the management plan was to transform the even-aged conifer plantation into uneven-aged broadleaf woodland, not timber production. A diverse woodland structure needed to be developed to create an attractive woodland for both wildlife and visitors. Well-developed vertical layers provide the most significant number of niches for wildlife, including tall trees, smaller trees, bushes, and saplings, and tall herbs, small herbs, and mosses. A variety of tree species with only two or three main species would allow for easier management, along with old, rotten, and dead trees providing habitats for birds and insects.



During an April site visit, it was evident that the woodland is a crucial element of the site. As indicated by polygon 22 in Figure 3, the whole region that was formerly planted is now mostly empty, with only dead trees remaining, as shown in Figures 4 and 5. These dead trees now provide a habitat for more birds, bats, and insects. As exhibited in Figure 5, there is clear evidence of woodpeckers. Underneath all the fallen timber is European Dry Heath (*Calluna vulgaris*), an Annex I habitat type. This habitat type is high quality, unique to the area, and needs effective management. In a conversation with the Carmarthenshire County Council Conservation Co-ordinator, he claimed that a recent funding proposal to clear the site of fallen timber and adequately manage the habitat had been denied. Without this financial support, the necessary work cannot be completed (Audrey, P, Pers-Comms).



Figure 4 Polygon 22 (Egan 2023)



Figure 5 Example of dead tree habitat (Egan, 2023)



Figure 6 Aerial view of polygons 22 & 14

(Source: Carmarthenshire County Council, 2021)

Similarly, the current conifer woodland represented by polygon 14 would ideally be felled. However, it would dramatically impact the landscape and should be done in phases over 50 years. It is also likely to be on top of European dry heath care must be taken to restore the ecosystem to its former state. The recommendation would be to thin the space to renew the floor gradually. Figures 7 and 8 illustrate that the current state is rather bare and devoid of vegetation.



Figure 7 Polygon 14 woodland (Egan, 2023)

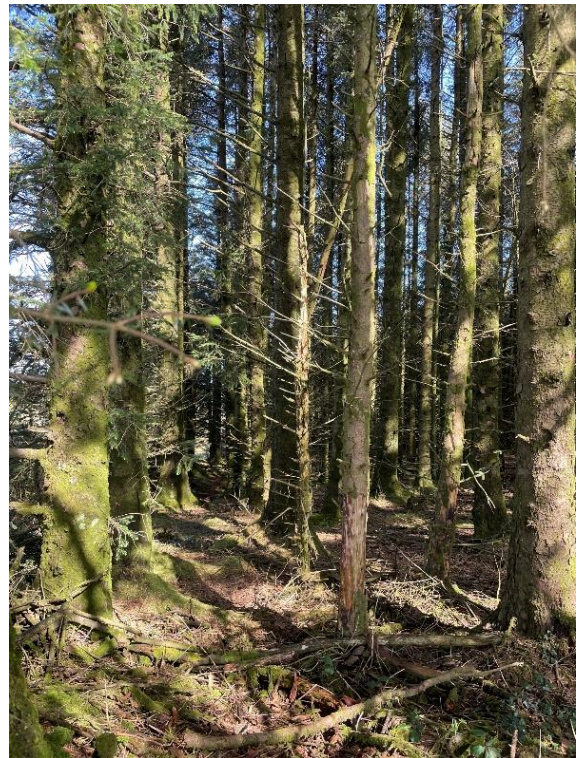


Figure 8 Polygon 14 woodland ground (Egan, 2023)

In a nineteen-year water quality study of Afon Hafren, the influence of conifer harvesting on stream and groundwater quality was critiqued. The study found that phased felling had little impact on the stream; however, clear-felling in the adjacent catchment area reported water quality deterioration, indicating a significant release of nitrate into the surface and groundwater (Neal et al., 2004). Therefore, once felling has begun, the water quality on the site will need to be monitored to ensure habitats or the peat are not affected.

While speaking with the conservation coordinator, who manages the site, he confirmed that the Sitka spruce woodlands represented by polygons 11 and 12 in Figure 3 had to fell permission from Natural Resources Wales (NRW). Polygon 11 has a 'fell and replant' licence, while Polygon 12 has a 'fell and replant' licence. However, only 100 trees must be replanted because it is on a protected peat bog. The recommendation for the future is to restore the land to its natural state. Given that Sitka spruce is not native to the area and should not be planted near peat bogs, the site's objective should be to clear the area of this species, replace area 11 with a native broadleaf species, and leave the area 12 tree-free. Clearing conifer trees to restore peat bogs is imposed across the country; Neath Port Talbot, and Rhondda Cynon Taf have used this method in their recent Pen Y Cymoedd restoration project with favourable results. This project aimed to infill existing drainage systems and plough furrows to raise the water table, thereby restoring the hydrology of the peat (Joint Nature Conservation Committee, 2021).

The woodland in area 11 should be managed as coppice with standards at varying stages at a fifteen-year rotation, achieved by clear-felling and replacing with broadleaf species planted in a mosaic. Using the brash from clear-felling to suppress weeds and improve ground conditions on the



Figure 9 Example of windblown trees (Egan, 2023)

damp and boggy site. Upon a site inspection, many of the Sitka spruces had been windblown due to the poor soil in the area; the roots had not developed well. A woodland edge mix should be planted as a short-term solution to provide some protection. Some examples would be holly (*Ilex aquifolium*) or common hazel (*Corylus avellana*), as both thrive in wet conditions and provide food for wildlife. This aligns with the Woodlands for Wales policy (2021) to enhance the landscape and have diverse species and habitats.

Polygon 26 depicts an area that was recently felled and replaced with broadleaf species in accordance with the goals of the original management plan. Polygon 29 symbolises natural broadleaf woods; a site inspection revealed that this region is flourishing. Evidence of planting of Rowan trees (*Sorbus aucuparia*) was observed as rabbit guards were affixed to the base. Moving forward in the next ten years, more fruiting trees should be planted strategically around the site, most notably in areas represented by polygons 11, 22 and 26. Recommendations for species include Hawthorn (*Craegus monogyna*), Buckthorn (*Rhamnus cathartica*) and Blackthorn (*Prunus spinosa*). This is because the flowering in the spring attracts pollinators like bees and subsequently provides fruit in the autumn for mice and birds.

In 2022, a dormouse survey was undertaken by Amber Environmental Consultancy at Llyn Llech Owain to gather information and inform woodland management. The surveyed areas are shown in Figure 10, as 1 and 2, including two woodland areas along the hedgerow by the visitor centre. The study deduced that dormice (*Muscardinus avellanarius*) are present, making it essential to gain a conservation licence from NRW before any management work is undertaken. The management recommended retaining coppiced wood to allow climbers to grow and provide structural and species diversity, the arboreal connection from the ground to the canopy, shelter, food, and hibernation sites. While conducting a site visit, area 3 was spotted as a potential site to introduce similar methods. As it is currently a broadleaf woodland with different ages of trees, dead wood, ground flora, and an abundance of hazel trees, this makes for a suitable dormice habitat. Therefore, a suitability assessment should be conducted by placing boxes and monitoring activity.



Figure 10 Amber Environmental Survey areas and recommendation for additional boxes to be placed Image Source: Google Satellite. Annotations: Egan (2023)

4. Wetland

Wetland habitats of Llyn Llech Owain consist of the oligotrophic lake, the *Molinia* bog and the stream running to the west of the lake.

4.1 Lake

As previously discussed, the lake is acidic, and it was noted in the original management that the pH level should be monitored as changes in the woodland occur. In a study by NRW in 2012, it noted that the pH is 6.06. Plant and animal life are deficient in the lake due to the acidity; the dominant plant species include bottle sedge (*Cartex Rostrata*), Yellow water lily (*Nymphaea Lutea*) and white water lily (*Nymphaea alba*).

As a result of low nutrient levels and, therefore, limited wildlife attraction, the lake itself has been considered for use in small use of water sports activities such as canoe but limited to small groups, which would mean an increase in safety precautions to be considered. In addition, the bow wave of watercraft can cause shoreline erosion and therefore needs to be limited. If the lake proves popular, a permit system could be introduced where a fee would be payable.

During the site visit, there was a small gathering of Canada geese (*Branta canaensis*), but no other activity was observed, which is rare for a lake of this size. Pond skaters (*Gerridae*) were seen near the water's edge, but no other signs of life were sighted. As little wildlife was present, the suggestion for small-scale water sport activity could be considered a source of income for the site but monitored closely.

4.2 Ponds

The management plan states that one way to attract more wading birds, wildfowl, and vegetation to the site is to create shallow open water within the *Molinia* bog to the east of the lake, as well as small islands in the ponds to protect wildfowl from predators and provide safety for breeding birds. Polygon 8 represents a small, dredged pond south of the site. According to the original management plan, this

was not there in 1993; however, there is no record of when it was constructed. Figure 11 was taken at a site visit from a bird-watching hut where three male Mallard ducks (*Anas platyrhynchos*) were spotted. This feature aligns with the aims of the original management plan, as the island provides a habitat for the ducks with protection from predators. This is an example of successful management within the park, as very few wildfowl can be found at the site due to the acidity of the water and lack of food. Creating areas in which they can thrive demonstrates habitat enhancement.



Figure 11 View of pond from birdwatching hut (Egan, 2023)



Figure 12 Aerial view of pond Source: Google Satellite

4.3 Molinia Bog

The Molinia bog is heavily influenced by the position of the water table, with drier areas consisting of purple moor grass and common ling. The lower-lying and wet areas consist of hare's tail cotton grass (*Eriophorum vaginatum*) and cross-leaved heath (*Erica tetralix*). Although the management plan indicated the intention was to establish small ponds in this area to attract wildfowl, a site visit revealed this was not the case.

During the inspection, it was clear that there is no access to this area via paths because it is protected and can only be accessible by machinery for safety reasons. From an ariel perspective,

bunds within the bog are visible. This was completed in 2019 to manage the peat bog to ensure it does not drain and water is retained. The integrity of the peat is closely related to water retention when compared with its natural state (Lowe, 2021). In a study done by Lowe, it was observed that forestry had harmed the peat due to the prolonged desiccation increasing permeability alongside the presence of tree root networks. In addition to this, the bunds that were installed are not parallel to the ground surface contour. As illustrated in Figure 14, the bunds should run in line with the yellow lines to hold the water back. The bunds are running against the contours, forcing the bog to drain in areas.

Interestingly, the bunds did not dry out during the 2022 drought, which is thought to be due to the curved edges (Audrey, P, 2023. Pers-Comms). Moving forward, remedying the bund system must be considered to fulfil its intended purpose. This must be done knowledgeably and carefully (Lowe, 2021).

Degraded peatlands account for 25% of global CO₂ emissions from the land use sector and 75% of GHG (greenhouse gas) emissions from agricultural land use in the European Union. Therefore, degraded peatlands represent a significant risk and, eventually, a considerable cost to society (Bonn et al., 2014). Under the United Nations Framework Convention for Climate Change Kyoto Protocol, reducing GHG emissions by land management is mandatory. As peat holds more carbon than trees, restoring these areas is paramount (Bonn et al., 2014).



Figure 13 Aerial view of bunds Source: Google Satellite



Figure 14 Example of correct bund positioning Image Source: Google Satellite. Annotations Egan, (2023)

The bog itself is a vital habitat for species, particularly dragonflies. Females disperse from water to avoid male harassment, according to research. A study in Wisconsin discovered that females avoided wetland areas, preferring the drier peripheral habitat (Foster & Soulk, 2006). Acidic bogs are an essential habitat for dragonflies, with the most diversified species (British Dragonfly Society, 1993). However, many of these habitats have been harmed by peat disturbances, emphasising the importance of restoring the peat bog at Llyn Llech Owain. A list of all Odonata species recorded at the site can be found in Appendix 2.

4.4 Stream

The stream running northeast of the lake is the source of the Gwendraeth River and was observed to have nature conservation potential. The banks were cloaked in naturally seeded willow trees in 1993 to manage them through coppicing while keeping the remainder intact with a 5m boundary to allow natural vegetation to flourish. It was proposed to build a path next to the stream as it leads from the car park, but it was made clear that the stream will need to be monitored for soil erosion.

The area was significantly boggy and waterlogged during the site visit. As illustrated in Figure 15, soil erosion was visible, with washed-away trees obstructing the stream. Furthermore, as seen in Figure 16, the additional silt in the river triggered drainage concerns. Drainage pipes were present along the path, as shown in Figure 17; however, they are likely blocked due to the additional silt.

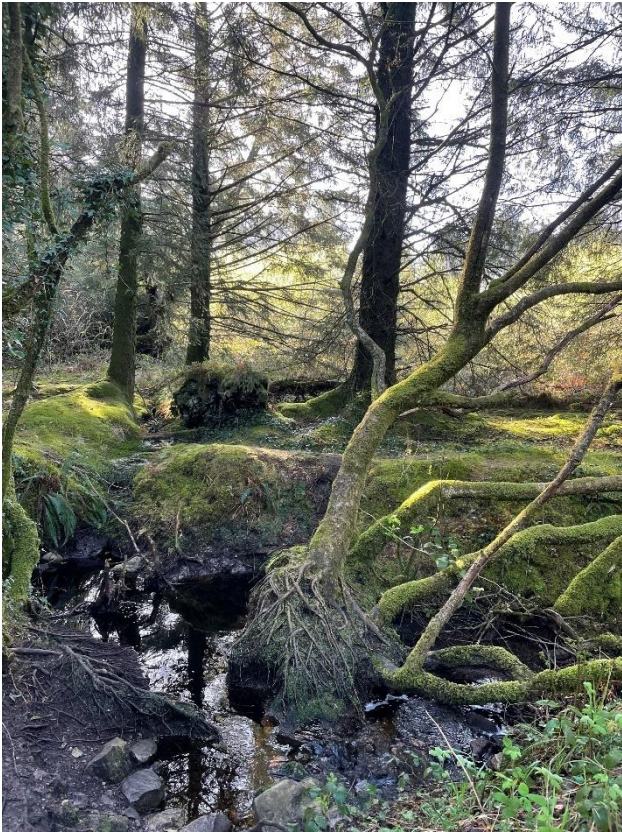


Figure 15 Example of tree blockage caused by erosion of bank (Egan, 2023)



Figure 16 Example of flooding due to poor drainage (Egan, 2023)



Figure 17 Example of drainage found on site (Egan, 2023)



Figure 18 Example of willow weave (Living Willow Farm, n.d)

During the site visit, a variety of birds, including Blue Tit (*Cyanistes caeruleus*), Grey Wagtail (*Motocilla cinerea*), and Coal Tit (*Peiparus ater*), were observed, exhibiting a healthy riparian habitat. Riparian zones are the transitional zones between terrestrial and aquatic ecosystems. They are mosaics of landforms, communities, and habitats in the broader landscape (Gregory et al., 1991). Riparian areas are critical for biodiversity. On the other hand, human pressures degrade stream-riparian networks, stressing the critical need for riparian management and thus enhancing riparian zones. The restoration of these areas is consistent with nature-based solutions (Burdon et al., 2020).

Moving forward, the willow trees causing problems need to be coppiced to manage this area effectively. Using the brash of the trees, a small, willow basket weave flood defence wall could be placed to protect the bank from erosion as a form of green engineering. This exercise could be run as an educational workshop, benefiting the stream by providing a solid, riparian habitat. This method has been used in Aberdeen on the River Don and proved successful (Scottish Environment Protection Agency, 2020). An example of this is shown in Figure 18.

5. Heathland

The heathland at Llyn Llech Owain is a critical habitat. The area represented by polygon 27 in Figure 3 has a narrow trail along the ridge that visitors do not commonly utilise. According to the management plan, the grass heath was depleted and contributed little to the site to encourage regeneration and colonisation of heather and associated plant species contributing to diversity, and the lodgepole pines needed felling. Patches of common ling, interspersed with purple moor grass and pines, were growing on the ridge. It was reported that the risk of invasive species such as bramble (*Rubus*), bracken (*Pteridium*), and rosebay willowherb (*Chamaenerion angustifolium*) was high, and weed control measures will need to be taken. It was encouraged to trial plots using different techniques such as layering existing heather (*Calluna*) plants, propagating material from the site to be planted as established or seeding from existing plants. To manage the heathland as a sustainable resource, methods must be employed to stop the succession process to woodland. This can be done by burning, grazing or cutting. It was determined that burning would not be suitable; therefore, grazing was suggested by fencing off an area and offering the area to a local farmer.



Figure 19 Aerial view of heathland 1

(Source: Carmarthenshire County Council, 2021)



Figure 20 Aerial view of heathland 1

(Source: Carmarthenshire County Council, 2021)

At the site visit, it was clear that the heathland was managed correctly by bracken beating, as shown in Figure 21. This method weakens the plant to ensure it does not grow back. The pines mentioned along the ridge were felled in 2020 (Audrey, P. 2023 Pers-Comms) to restore the habitat.



Figure 21 Example of bracken beating (Egan, 2023)

In January 2023, a terrestrial invertebrate survey was undertaken by Celtic Wildflowers to understand the importance the invertebrate fauna had on the site. The survey found 387 species, 70% of which were lepidopterans; a list can be found in Appendix 2. Emphasised was the need to continue to manage the encroachment of bracken, bramble, and scrub to create more bare ground for different species. In addition, the importance of providing structural variation to maintain a diverse range of habitats is made clear.

Trialling different management methods, such as bracken rolling, mowing, and grazing, on a rotational basis to test their effectiveness should be considered. Interestingly, Llyn Llech Owain now has a herd of Exmoor ponies used as ‘conservation grazers’ to reduce the purple moor grass and invasive scrub to encourage healthier growth. To effectively manage the heathland, bracken and bramble need to be made a priority, and the regrowth of the felled conifers must be monitored. However, a study on heathland found that different aged plants react differently to disturbances; in some cases, disturbances do not promote even-aged, uniform heath. It was suggested that the severity of management types determines the health and age of the plant (Schellenberg & Bergmeier; E., 2022). To correctly manage the area, regrowth monitoring is essential to ensure the heathland responds well to the management technique.

6. Recreation and Infrastructure

As this is a busy park, the visitor impacts, including soil trampling, wildlife disturbance, and littering, need serious consideration (Tisdell, 2011). Along with habitat conservation, emphasis must be paid to visitor management and facility provision. This covers the management of infrastructure such as buildings, pathways, and fences, among other things. When the plan was written, the visitors centre, car park, toilet block, café or path network had not yet been built. It was noticed that to preserve the swampy *Molinia* from footfall, boardwalks and raised footpaths made of geotextiles will need to be built. This allows for quick access while safeguarding the environment. It was also suggested that bird-watching shelters be placed strategically near walkways to ensure that wildlife is not disturbed.

During the site visit, there was no evidence of damage to the boundary fence, suggesting effective management. However, this must be inspected frequently because Exmoor ponies graze the heathland. Dotted around the site are benches placed in scenic spots. Some older ones were built of wood, but the majority are now made of recycled materials to prevent rot in acidic soil, again demonstrating effective management.

The visitors centre and valve tower are picnic spots with views of the lake; while no evidence of littering was spotted on the site visit, this area needs to be monitored for litter in peak seasons and on clear days. To encourage visitors to look after the site, litter pickers and bags are placed by the café for people to use, as shown in Figure 22.

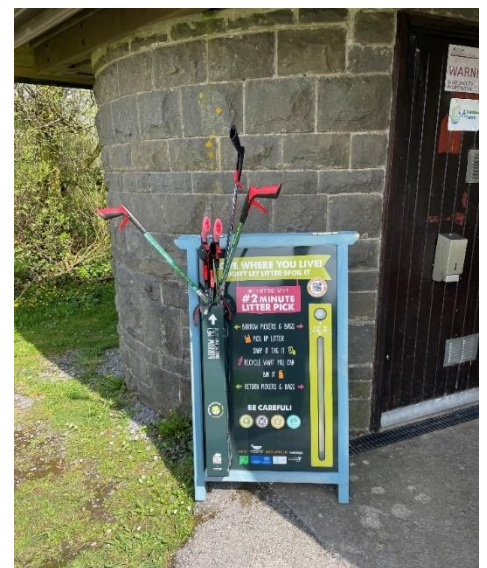


Figure 22 Example of litter picking (Egan, 2023)

As previously mentioned, the area surrounding the stream is boggy. While signs are placed to warn visitors, only two were spotted in Figures 23 and 24. Ideally, five should be placed throughout the park in boggy sites.



Figure 23 Example of warning sign 1 (Egan, 2023)



Figure 24 Example of warning sign 2 (Egan, 2023)

As shown in Figures 25 and 26, the wooden planks boarding the path have been removed, which is unclear why, leaving exposed wooden spikes that pose a trip hazard. Immediate action needs to be taken to ensure the site is safe, either by replacing, removing, or temporarily placing caution signs.



Figure 25 Path next to stream damage (Egan, 2023)



Figure 26 Example of wooden spikes from path needing removal (Egan, 2023)

Furthermore, while walking near the conifer plantation represented by Polygon 14, it was observed that the gravel dust on the path had been washed away due to the downhill slope. This area, while not unsafe, could pose a problem to mothers with prams or wheelchairs due to the uneven ground. Figure 27 shows the current state, and Figure 28 depicts the desired state.



Figure 27 Example of path damage from water run off (Egan, 2023)

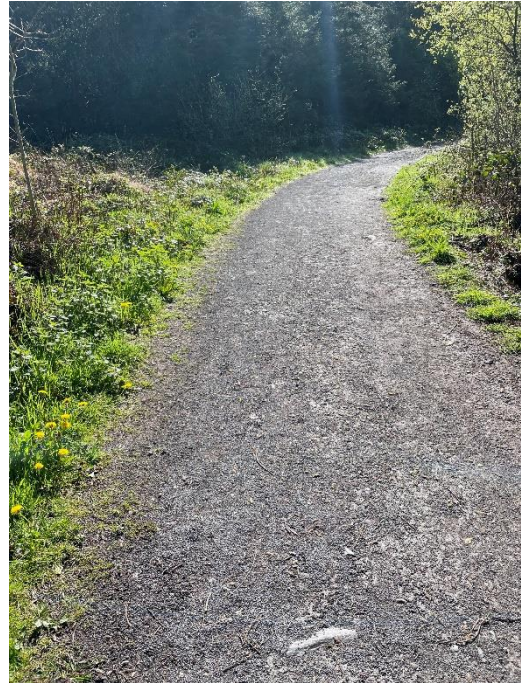


Figure 28 Example of path in desired state (Egan, 2023)

Additionally, to ensure the safety of visitors, a layer of chicken wire should be placed across all wooden boardwalks and bridges to cross safely in wet weather and avoid slipping. The footbridge in Figure 30 below missed this feature. As the original management plan stated, a layer of eco textiles lines all gravel tracks. During the site visit, areas of damage were observed. These should also be remedied to avoid visitors tripping.



Figure 29 Example of damaged path in need of repair (Egan, 2023)



Figure 30 Example of footbridge needing chicken wire (Egan, 2023)

Furthermore, drainage at the site needs improvement. The drainage infrastructure needs to be improved as the site consists of boggy, wet soils. The original management plan stated that drainage was installed when planting the conifers in the 1960s. Therefore, an upgrade is well overdue. As shown in the figures below, the footpaths are becoming damaged due to the water run-off, with some sections being completely washed away.



Figure 31 Example of surface water on path 1 (Egan, 2023)



Figure 32 Example of damage on path caused by surface water 1 (Egan, 2023)



Figure 33 Example of damage on path caused by surface water 2 (Egan, 2023)



Figure 34 Example of surface water on path 2 (Egan, 2023)

On the two site visits, it was clear that visitors used the park well. Many people were seen walking dogs or out with families. Horse riders were spotted in the broadleaf woodland making use of the bridle trail, and every Saturday, the park hosts a 5k fun run free to anyone.



Figure 35 Example of park being used for recreation (Egan, 2023)



Figure 36 Example of bird watching hut (Egan, 2023)

Six bird-watching shelters have been installed across the park to avoid animal disturbance, represented by polygons 9, 10, 13, 15, 17, and 19. All five are in excellent condition and show no signs of deterioration. However, over the next 5 years, these will need to be inspected for signs of wear and tear.

7. Enhancement of Habitats

To encourage more wildlife into the area, there is room for improvement. While at the site visit, several small bird boxes were placed on trees, and a large owl box had been placed in what was once a conifer plantation north of the park, as shown in Figure 37.



Figure 37 Example of owl box (Egan, 2023)

Moving forward, bird, owl and bat boxes should be placed in the newly replanted broadleaf woodland and existing conifer woodland to encourage apex predators. Surveys should be conducted on an annual basis to log progress.



Figure 38 Example of otter holt (BSG Ecology, n.d)

Furthermore, a natural otter holt is currently placed within the Molinia bog, as there is limited food supply for otters; they tend to only stay for the winter. More otter holds are planned to be installed in the bog during the next few years. (Audrey, P. 2023, Pers-Comms).



Figure 39 Example of bos (Amber Environmental, 2022)

As previously mentioned, boxes were placed for monitoring while surveying the dormice. To encourage dormice in other site areas, they should be placed in wooded areas and monitored.

8. GIS Modelling

To present a clear picture of the site, Quantum Geographical Information Software (QGIS) was used to illustrate different habitats and features throughout the park. Using Ordnance Survey and Google Maps to create the background geographical data and a shapefile.

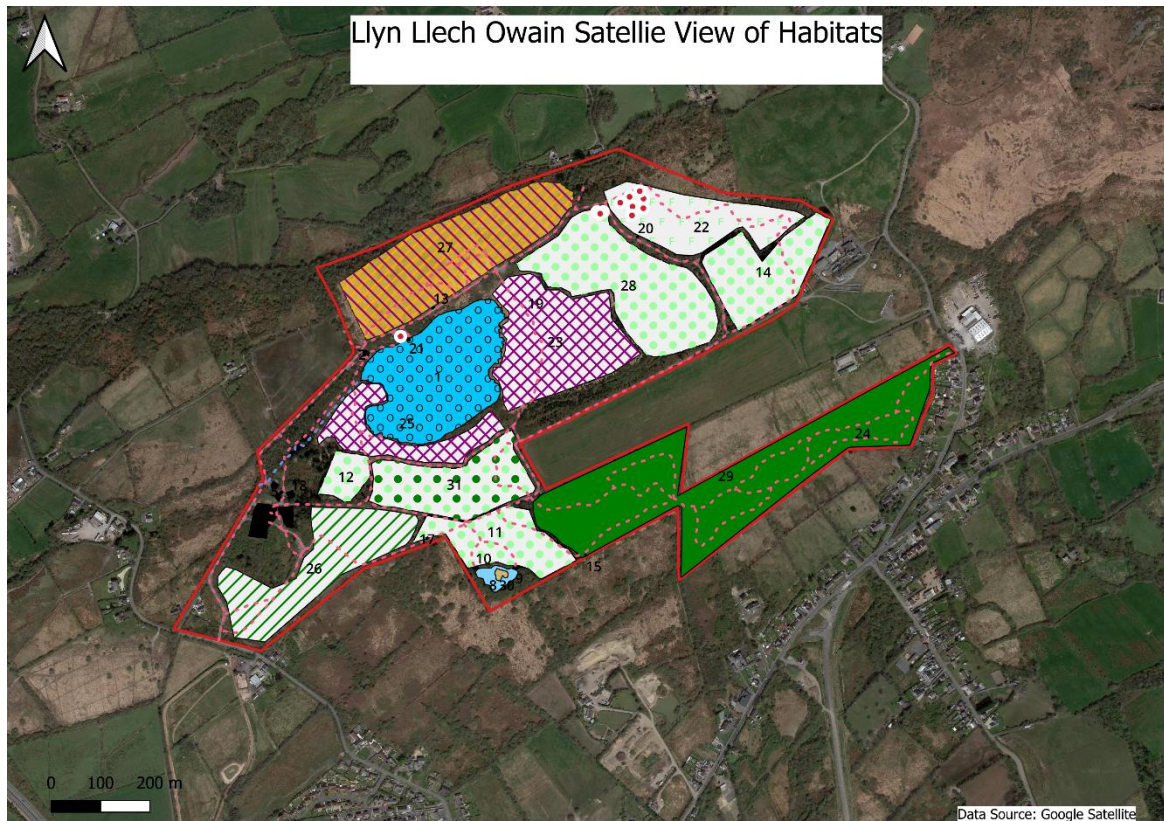


Figure 40 QGIS aerial map displaying polygons, lines and point data (Egan, 2023)

To map the site, a red line boundary was created to outline the study area. Within this boundary, polygons of different habitats were created, represented by different colour codes. This was done by completing an attribute table including a phase 1 habitat code alongside a description of the habitat and the area in m². This was completed after a site visit to determine the correct description for each feature. Lines were then created to symbolise paths, roads and the stream, finally, target points were added to show target notes using the same method.

Polygon Attribute Table

id	P1 Code	Desc	Area (m2)	Label	Source
1	G1.3	LAKE	55907.56	LAKE	SITE VISIT
2	J3.6	VISITOR CENTRE	105.08	VISITOR CENTRE	MANAGEMENT PLAN
3	J3.6	CAR PARK	2709.57	CAR PARK	SITE VISIT
4	J3.6	PLAYGROUND	923.91	PLAYGORUND	SITE VISIT
5	J3.6	CAFE	113.64	CAFE	SITE VISIT
7	J3.6	TOILETS	31.74	TOILETS	SITE VISIT
8	F1	STANDING WATER	2727.80	POND	SITE VISIT
9	J3.6	BIRD WATCHING HUT 1	45.00	BIRD WATCHING HUT 1	SITE VISIT
10	J3.6	BIRD WATCHING HUT 2	56.46	BIRD WATCHING HUT 2	SITE VISIT
11	A3.2	WOODLAND 1	24594.34	WOODLAND 1	SITE VISIT
12	A3.2	WOODLAND 2	7249.17	WOODLAND 2	SITE VISIT
13	J3.6	BIRD HUT 3	24.77	BIRD WATCHING HUT 3	SITE VISIT
14	A3.2	WOODLAND 3	30119.16	WOODLAND 3	SITE VISIT
15	J3.6	BIRD WATCHING HUT 4	11.18	BIR WATCHING HUT 4	SITE VISIT
16	J3.6	CLASS ROOM	111.54	CLASS ROOM	SITE VISIT
17	J3.6	BIRD WATCHING HUT 5	20.94	BIRD WATCHING HUT 6	SITE VISIT
18	J3.6	OFFICE	150.20	OFFICE	SITE VISIT
19	J3.6	BIRD WATCHING HUT 6	10.93	BIRD WATCHING HUT 6	SITE VISIT
20	J3.6	BUILDING	12.15	BIRD WATCHING HUT 7	SITE VISIT
21	J3.6	BUILDING	24.60	WATER TOWER	SITE VISIT
22	A4.2	CONIFEROUS WOODLAND- RECENTLY FELLED	33215.39	WOODLAND FELLED	SITE VISIT
23	E1.7	WET MODIFIED BOG	50642.26	MOLINIA BOG	SITE VISIT
24	J3.6	BUILDING	17.90	BIRD WATCHING HUT 8	SITE VISIT
25	E1.7	WET MODIFIED BOG	20774.56	BOG	SITE VISIT
26	A1.1.2	BROADLEAVED WOODLAND -PLANTATION	42966.79	RECENTLY FELLED AND REPLANTED	SITE VISIT
27	D6	WET HEATH/ACID GRASSLAND	25402.81	HEATHLAND	SITE VISIT
28	A3.2	Coniferous Parkland/scattered trees	56892.72	FELLED WOODLAND	SITE VISIT
29	A1.1.1	Mixed woodland - semi-natural	106082.64	MIXED WOODLAND	SITE VISIT
30	NA	NOT ACCESSED LAND	420.94	WILDFOWL ISLAND	SITE VIST
31	A3.3	Mixed Parkland/scattered trees	33389.31	FIELD WITH SCATTERED TREES	SITE VISIT

Figures 41, 42 and 43 showing
attribute tables (Egan, 2023)

Line Attribute Table

id	P1 CODE	DESC	LENGTH	LABEL	SOURCE
2	J5	PATH	173.88	PATH 1	GOOGLE MAPS
3	J5	PATH	45.18	PATH 2	GOOGLE MAPS
4	J5	PATH	32.29	PATH 3	GOOGLE MAPS
5	J5	PATH	403.76	PATH 4	GOOGLE MAPS
6	J5	PATH	261.83	PATH 5	GOOGLE MAPS
7	J5	PATH	380.33	PATH 6	GOOGLE MAPSGOOGLE MAPS
8	J5	PATH	172.50	PATH 7	GOOGLE MAPS
9	J5	PATH	320.84	PATH 8	GOOGLE MAPS
10	J5	PATH	154.52	PATH 9	GOOGLE MAPS
11	J5	PATH	908.44	PATH 10	GOOGLE MAPS
12	J5	PATH	243.03	PATH 11	GOOGLE MAPS
13	J5	PATH	103.70	PATH 12	GOOGLE MAPS
14	J5	PATH	267.20	PATH 13	GOOGLE MAPS
15	J5	PATH	53.01	PATH 14	GOOGLE MAPS
16	J5	PATH	589.83	PATH 15	GOOGLE MAPS
17	J5	PATH	151.45	PATH 16	GOOGLE MAPS
18	J5	PATH	52.14	PATH 17	GOOGLE MAPS
19	J5	PATH	454.67	PATH 18	GOOGLE MAPS
20	J5	PATH	46.99	PATH 19	GOOGLE MAPS
21	J5	PATH	767.99	PATH 20	GOOGLE MAPS
22	J5	PATH	265.34	PATH 21	GOOGLE MAPS
23	J5	PATH	733.36	PATH 22	GOOGLE MAPS
24	J5	PATH	313.75	PATH 23	GOOGLE MAPS
25	J5	PATH	194.84	PATH 24	GOOGLE MAPS
26	J5	PATH	283.64	PATH 25	GOOGLE MAPS
27	J5	PATH	930.71	PATH 26	GOOGLE MAPS
28	J5	PATH	796.50	PATH 27	GOOGLE MAPS
29	J5	ROAD	713.71	ROAD 1	GOOGLE MAPSGOOGLE MAPS

Point Attribute Table

id	P1 CODE	DESC	LABEL	SOURCE
1	TARGET NOTE	TARGET NOTE	PICNIC SPOT	SITE VISIT
1	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 1	SITE VISIT
2	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 2	SITE VIST
3	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 3	SITE VISIT
4	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 4	SITE VISIT
5	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 5	SITE VIST
6	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 6	SITE VISIT
7	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 7	SITE VISIT
8	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 8	SITE VISIT
9	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 9	SITE VISIT
10	TARGET NOTE	TARGET NOTE	DEAD TREE HABITAT 10	SITE VISIT

The list of habitat types and features relative to colour code can be found below.

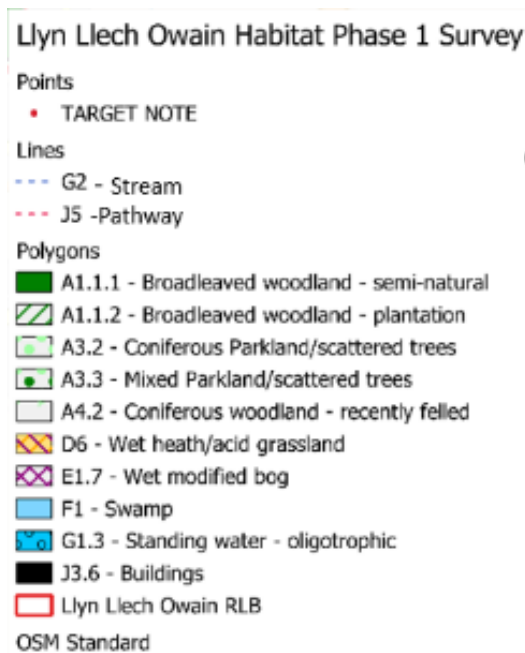


Figure 44 Habitat types (Egan, 2023)

A map of surface water flooding was developed using QGIS to determine which locations should be prioritised for future flood management planning. This was made using data from DataMapWales. Surface flooding near the steam is a concern, as illustrated in the figure below. During the site visit, it was discovered that this area has drainage issues, bank erosion, and blockage from trees.

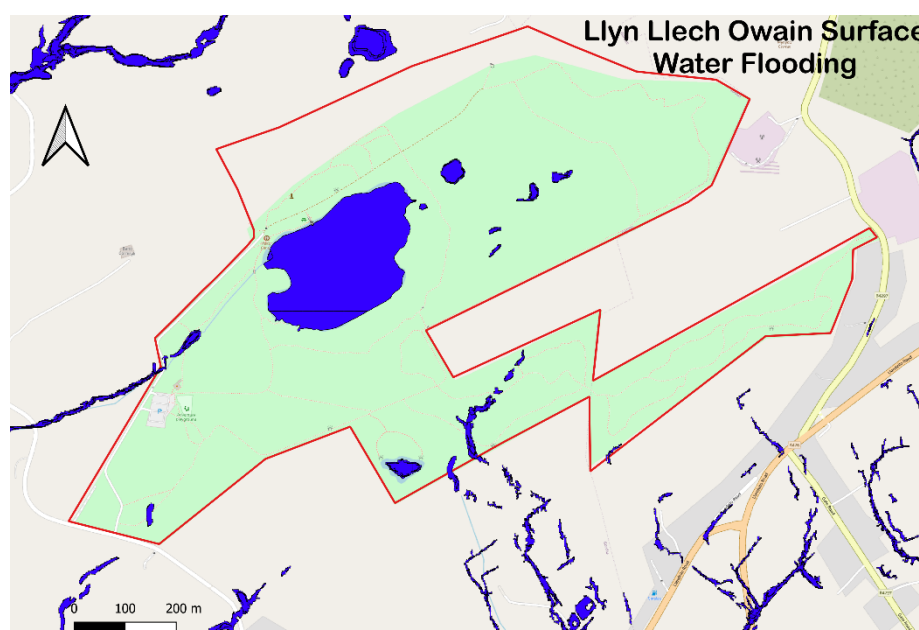


Figure 45 Surface water flooding map (Egan)

Furthermore, as the site is an SSSI due to the peat bog, a map was created to illustrate what areas of the park are home to deep peat. Again, this data was obtained by DataMapWales. This map was useful when conducting a site visit to see if these areas were restricted to visitors.

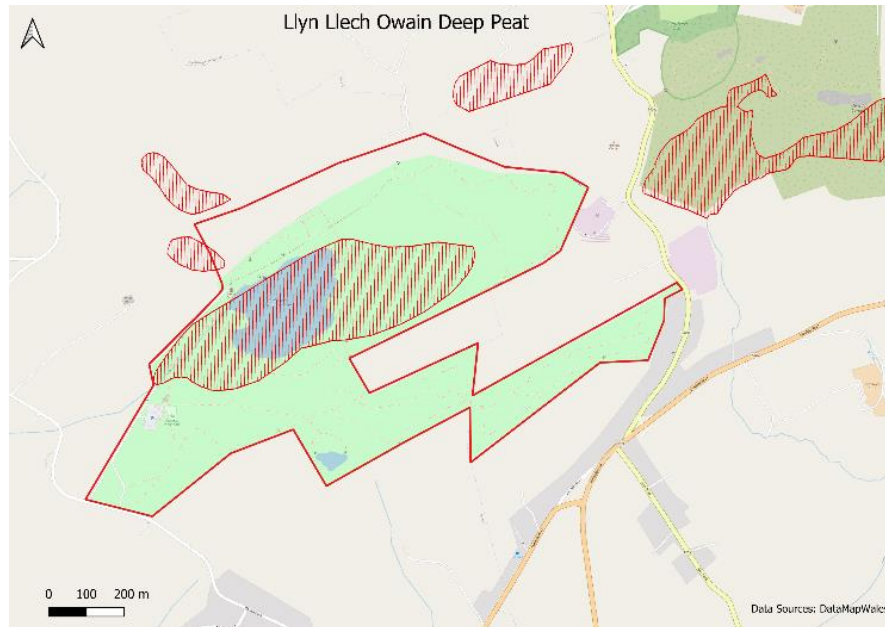


Figure 46 Peat map (Egan, 2023)

9. Conclusion

To summarise, Llyn Llech Owain is a place that is home to a variety of ecosystems, each of which plays an essential role. However, work must be done to restore it to its former splendour and efficiently manage it. The action plan below was coded in a traffic light style to reflect job importance. Red denotes urgency, amber denotes importance but not urgency, and green denotes non-urgency.

Action Plan for Next Ten Years			
1. Woodland			
Action No.	Action	Comments	Target Date
1.1	Remove conifer trees	Polygon 14 → Urgent but needs to be done in stages to retain structure/landscape. Gradually thin until clear Polygon 11 → fell and replant, use the woodland mix to encourage root structure. Polygon 12 → fell and replant with broadleaf, fell and leave it	Begin thinning in 2024, be clear by 2040 2030 Stage 1 → 2030 Stage 2 → 2060
1.2	Replant broadleaf trees	Polygon 22 → replant small areas of fruiting trees, do not disturb the standing, dead trees. Polygon 12 → once felled, replant fruiting trees	2025 2030

2. Wetland			
2.1	Correct the bunds	The bunds need to align with the geographical contours to be completely effective – expensive	2033
2.2	Install more Otter holds	Access issues	2025
2.3	Remove trees blocking the stream	Causing blockages and erosion of banks and could cause issues downstream	2025
2.4	Improve drainage around stream	Excess silt from erosion causing blockages	2024
2.5	Coppice willow trees	Regenerate groundcover vegetation → encourage biodiversity	2030
2.6	Construct willow bank flood defence	Using coppiced willow, → evaluate if needed after correcting drainage	2024

3. Heathland			
3.1	Control the bracken	Trail mowing, grazing, and rolling	2026
3.2	Control the bramble	Trail mowing, grazing, and rolling	2026
3.3	Control regrowth from the pine trees	Important for the peat	2025
3.4	Maintain grazing from Exmoor ponies		N/A

4. Recreation and Infrastructure			
4.1	Maintain boundary fence	Ensure no damage due to grazing ponies	N/A
4.2	Replace any rotten benches	Replace with recycled material benches	2030
4.3	Place more warning signs for boggy ground	5-10 more should be placed in the site to ensure safety	2025
4.4	Replace path by stream or remove wooden spikes	Trip hazard	2024
4.5	Place chicken wire on wooden boardwalks	Safety concern	2024
4.6	Repair/ replace drainage	Areas of water runoff causing damage because of drainage	2030

5. Monitoring and Review			
5.1	Annual review	Walkover assessment to evaluate problems/progress	N/A
5.2	Monitor the pH of the lake		Bi-annually
5.3	Monitor peat/ drainage	Ensure it is draining correctly	Annually
5.4	Monitor heath regrowth	Check health of heath	Annually
5.5	Monitor conifer regrowth		Annually
5.6	Monitor path network	Ensure it is safe	Annually
5.7	Conduct surveys of wildlife	Extremely limited amount of information of species at the site. Surveys should be done to manage species successfully	2030
5.8	Monitor bird-watching huts	Monitor wear and tear	5-year assessment

10. Appendices

Appendix 1: List of recorded species (Conservation Coordinator, 2023. Pers-Comms)

<u>Species</u>	<u>Latin Name</u>
<u>FLORA</u>	
Lake Habitat	
Bottle Sedge	<i>Carex nostrata</i>
Yellow Water Lily	<i>Nuraphae luta</i>
White Water Lily	<i>Nymphea alba</i>
Molinia Bog	
Angelica	<i>Angelica sylvestris</i>
Silver Birch	<i>Betula pendula</i>
Hard Fern	<i>Blechnum spicant</i>
Common Ling	<i>Calluna vulgaris</i>
Marsh Thistle	<i>Cirsium palustre</i>
Hawthorn	<i>Crataegus monogyna</i>
Tufted- Hair Grass	<i>Deschampsia cesptusia</i>
Common Buckler Fern	<i>Erica tetralix</i>
Common Cotton Grass	<i>Eriophorum angustifolium</i>
Hair's Tail Cotton Grass	<i>Eriophorum vaginatum</i>
Ivy	<i>Hendra tielix</i>
Sharp-Flowered Rush	<i>Juncus actiforus</i>
Bulbous Rush	<i>Juncus bulbous</i>
Soft Rush	<i>Juncus effusus</i>
Water Mint	<i>Mentha aquatic</i>

Purple Moor Grass	<i>Molinia caerulea</i>
Bog Pondweed	<i>Pontamogeton polygonifolius</i>
Bramble	<i>Rubus fruticosus</i>
Goat Willow	<i>Salix caprea</i>
Common Sallow	<i>Salix cinerea</i>
Eared Sallow	<i>Salix reticulata</i>
Protected Rare species within SSSI	
Sundew	<i>Drosera rotundifolia</i>
Bogbean	<i>Menyanthes trifoliata</i>
Royal Fern	<i>Osmunda regalis</i>
White Black Sedge	<i>Rhynchospora alba</i>
Open Scrub and Mire	
Common Ling	<i>Calluna vulgaris</i>
Common Cotton Grass	<i>Eriophorum angustifolium</i>
Hair's Tail Cotton Grass	<i>Eriophorum vaginatum</i>
Bramble	<i>Rubus fruticosus</i>
Goat Willow	<i>Salix caprea</i>
Common Sallow	<i>Salix cinerea</i>
Purple Moor Grass	<i>Molinia caerulea</i>
Common Yellow Sedge	<i>Carex demissa</i>
Carnation Sedge	<i>Carex panicea</i>
Common Buckler fern	<i>Dryopteris dilatata</i>
Cross Leaved Heath	<i>Erica tetralix</i>
Red Fescue	<i>Festuca rubra</i>
Sharp Flowered rush	<i>Juncus acutiflorus</i>

Soft Rush	<i>Juncus effusus</i>
Heath Rush	<i>Juncus aquarrousus</i>
Lousewort	<i>Pedicularis sylvatia</i>
Devil's Bit Scabious	<i>Succia prateusi</i>
Cranberry	<i>Vaccinium exycoccus</i>
Sycamore	<i>Acer pseudopplantanus</i>
Angelica	<i>Angelica sylvestris</i>
Hart's Tongue Fern	<i>Asplenium scolopendrium</i>
Lady's Smock	<i>Cardamine paresis</i>
Bottle Sedge	<i>Carex rostrata</i>
Rosebay Willow Herb	<i>Chamerion angustifolium</i>
Marsh Thistle	<i>Cisium palustre</i>
Hawthorn	<i>Crataegus monogyna</i>
Tufted- Hair Grass	<i>Deschampsia cesptusia</i>
Foxglove	<i>Digitalis purpurea</i>
Common Buckley Fern	<i>Dryopteris diloatata</i>
Male Fern	<i>Dryopteris filixmas</i>
Ivy	<i>Hendra tielix</i>
Bracken	<i>Pteridium aquilinium</i>
Meadow Buttercup	<i>Ranuculus acris</i>
Rhododendron	<i>Rhododendron ponticum</i>
Field Rose	<i>Rosa arvensis</i>
Dog Ros	<i>Rosa canuna</i>
Gorse	<i>Ulex europaeus</i>
Bilburry	<i>Vaccinium myrtilus</i>

Dry Heath Flora	
Hard Fern	<i>Blechnum spicant</i>
Common Ling	<i>Calluna vulgaris</i>
Wary Hair Grass	<i>Deschampsia flexuosa</i>
Common Buckley Fern	<i>Dryopteris dilatata</i>
Cross Leaved Heath	<i>Erica tetralix</i>
Heath Bedstraw	<i>Galium saxatile</i>
Soft Rush	<i>Juncus effusus</i>
Purple Moor Grass	<i>Molinia caerulea</i>
Blackthorn	<i>Prunus spinosa</i>
Bramble	<i>Rubus fruticosus</i>
Sheep's sornel	<i>Pumex acetosella</i>
Gorse	<i>Ulex europaeus</i>

Appendix 2: Celtic Wildflowers Terrestrial Invertebrate survey species list (2023)

Taxon	Vernacular
Orthoptera	
<i>Chorthippus parallelus</i>	Meadow Grasshopper
<i>Omocestus viridulus</i>	Common Green Grasshopper
Odonata	
<i>Aeshna juncea</i>	Common Hawker
<i>Anax imperator</i>	Emperor Dragonfly
<i>Coenagrion puella</i>	Azure Damselfly
<i>Cordulegaster boltonii</i>	Golden-ringed Dragonfly
<i>Enallagma cyathigerum</i>	Common Blue Damselfly
<i>Ischnura elegans</i>	Blue-tailed Damselfly
<i>Lestes sponsa</i>	Emerald Damselfly
<i>Sympetrum danae</i>	Black Darter
<i>Sympetrum striolatum</i>	Common Darter
Opiliones	
<i>Leiobunum blackwalli</i>	a harvestman
Trichoptera	
<i>Agrypnia varia</i>	a caddisfly
<i>Hydropsyche</i> sp.	a caddisfly
<i>Limnephilus affinis</i>	a caddisfly
<i>Limnephilus lunatus</i>	a caddisfly
<i>Limnephilus luridus</i>	a caddisfly
<i>Limnephilus marmoratus</i>	a caddisfly
<i>Limnephilus sparsus</i>	a caddisfly
<i>Phryganea bipunctata</i>	a caddisfly
<i>Potamophylax cingulatus</i>	a caddisfly
<i>Rhadicoleptus alpestris</i>	a caddisfly
Coleoptera	
<i>Acrossus rufipes</i>	a dung beetle
<i>Agonum fuliginosum</i>	a ground beetle
<i>Agonum marginatum</i>	a ground beetle
<i>Bembidion mannerheimii</i>	a ground beetle
<i>Bembidion tetracolum</i>	a ground beetle
<i>Bradycellus ruficollis</i>	a ground beetle
<i>Carabus granulatus</i>	a ground beetle
<i>Carabus problematicus</i>	a ground beetle
<i>Cicindela campestris</i>	Green Tiger Beetle
<i>Dyschirius globosus</i>	a ground beetle
<i>Elaphrus cupreus</i>	a ground beetle
<i>Harpalus latus</i>	a ground beetle
<i>Lagria hirta</i>	a darkling beetle
<i>Leistus fulvibarbis</i>	a ground beetle
<i>Lochmaea suturalis</i>	Heather Beetle
<i>Melolontha melolontha</i>	Common Cockchafer
<i>Nebria brevicollis</i>	a ground beetle
<i>Nebria salina</i>	a ground beetle

<i>Necrodes littoralis</i>	a carrion beetle
<i>Nicrophorus investigator</i>	a carrion beetle
<i>Pterostichus diligens</i>	a ground beetle
<i>Pterostichus madidus</i>	a ground beetle
<i>Pterostichus niger</i>	a ground beetle
<i>Pterostichus rhaeticus</i>	a ground beetle
<i>Pterostichus strenuus</i>	a ground beetle
<i>Rhagonycha fulva</i>	a soldier beetle
<i>Stictoleptura rubra</i>	a longhorn beetle

Diptera

<i>Baccha elongata</i>	a hoverfly
<i>Cheilosia albitarsis sens. str.</i>	a hoverfly
<i>Cheilosia illustrata</i>	a hoverfly
<i>Cheilosia pagana</i>	a hoverfly
<i>Chirosia betuleti</i>	a gall fly
<i>Chloromyia formosa</i>	a soldierfly
<i>Chrysopilus cristatus</i>	a snipe fly
<i>Chrysops relictus</i>	a horse-fly
<i>Episyrphus balteatus</i>	a hoverfly
<i>Eristalis arbustorum</i>	a hoverfly
<i>Eristalis intricaria</i>	a hoverfly
<i>Eristalis nemorum</i>	a hoverfly
<i>Eristalis pertinax</i>	a hoverfly
<i>Eristalis tenax</i>	a hoverfly
<i>Eupeodes corollae</i>	a hoverfly
<i>Eupeodes luniger</i>	a hoverfly
<i>Haematopota pluvialis</i>	a horse-fly
<i>Helophilus pendulus</i>	a hoverfly
<i>Iteomyia major</i>	a gall fly
<i>Leucozona glauca</i>	a hoverfly
<i>Melanostoma mellinum</i>	a hoverfly
<i>Melanostoma scalare</i>	a hoverfly
<i>Meliscaeva cinctella</i>	a hoverfly
<i>Pedicia rivosia</i>	a crane fly
<i>Platycheirus albimanus</i>	a hoverfly
<i>Platycheirus peltatus</i>	a hoverfly
<i>Platycheirus scutatus sens. str.</i>	a hoverfly
<i>Rhagio scolopaceus</i>	a snipe fly
<i>Rhingia campestris</i>	a hoverfly
<i>Rhingia rostrata</i>	a hoverfly
<i>Scaeva pyrastris</i>	a hoverfly
<i>Sericomyia silentis</i>	a hoverfly
<i>Sphaerophoria scripta</i>	a hoverfly
<i>Syrnitta pipiens</i>	a hoverfly
<i>Syrphus ribesii</i>	a hoverfly
<i>Syrphus vitripennis</i>	a hoverfly
<i>Tabanus sudeticus</i>	a horse-fly
<i>Volucella bombylans</i>	a hoverfly
<i>Volucella pellucens</i>	a hoverfly
<i>Xylophagus ater</i>	Common Awl-fly

Hemiptera

<i>Adelphocoris seticornis</i>	a plant bug
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<i>Iassus lanius</i>	a leafhopper
<i>Palomena prasina</i>	Common Green Shieldbug
<i>Picromerus bidens</i>	Spiked Shieldbug

Hymenoptera

<i>Andricus foecundatrix</i>	a gall wasp
<i>Andricus kollari</i>	a gall wasp
<i>Apis mellifera</i>	Western Honey Bee
<i>Biorhiza pallida</i>	a gall wasp
<i>Bombus campestris</i>	Field Cuckoo Bee
<i>Bombus jonellus</i>	Heath Bumblebee
<i>Bombus lapidarius</i>	Red-tailed Bumblebee
<i>Bombus lucorum sens. str.</i>	White-tailed Bumblebee
<i>Bombus pascuorum</i>	Common Carder Bee
<i>Bombus terrestris</i>	Buff-tailed Bumblebee
<i>Colletes succinctus</i>	Heather Colletes
<i>Dolichovespula sylvestris</i>	Tree Wasp
<i>Ectemnius continuus</i>	a digger wasp
<i>Euura proxima</i>	a gall wasp
<i>Lasius flavus</i>	an ant
<i>Lasius niger sens. str.</i>	an ant
<i>Neuroterus albipes</i>	a gall wasp
<i>Neuroterus anthracinus</i>	a gall wasp
<i>Neuroterus numismalis</i>	a gall wasp
<i>Neuroterus quercusbaccarum</i>	a gall wasp
<i>Vespa crabro</i>	The Hornet
<i>Vespula germanica</i>	German Wasp
<i>Vespula vulgaris</i>	Common Wasp

Lepidoptera

<i>Abrostola tripartita</i>	Spectacle
<i>Abrostola triplasia</i>	Dark Spectacle
<i>Acleris cristana</i>	a moth
<i>Acleris ferrugana/notana</i>	a moth
<i>Acleris laterana/comariana</i>	a moth
<i>Acronicta leporina</i>	Miller
<i>Acronicta psi</i>	Grey Dagger
<i>Acronicta rumicis</i>	Knot Grass
<i>Acronicta tridens</i>	Dark Dagger
<i>Aglais io</i>	Peacock
<i>Aglais urticae</i>	Small Tortoiseshell
<i>Agonopterix ciliella</i>	a moth
<i>Agonopterix subpropinqua</i>	a moth
<i>Agripha straminella</i>	a moth
<i>Agripha tristella</i>	a moth
<i>Agrotis exclamatoris</i>	Heart and Dart
<i>Agrotis ipsilon</i>	Dark Sword-grass
<i>Alcis repandata</i>	Mottled Beauty
<i>Anania lancealis</i>	a moth
<i>Anaplectoides prasina</i>	Green Arches
<i>Anarta myrtilli</i>	Beautiful Yellow Underwing
<i>Apamea crenata</i>	Clouded-bordered Brindle
<i>Apamea lithoxyloa</i>	Light Arches
<i>Apamea monoglypha</i>	Dark Arches

<i>Apamea remissa</i>	Dusky Brocade
<i>Apamea scolopacina</i>	Slender Brindle
<i>Apeira syringaria</i>	Lilac Beauty
<i>Aphelia viburnana</i>	Bilberry Tortrix
<i>Apotomis semifasciana</i>	a moth
<i>Arctia caja</i>	Garden Tiger
<i>Argyresthia brockeella</i>	a moth
<i>Argyresthia conjugella</i>	Apple Fruit Moth
<i>Argyresthia retinella</i>	a moth
<i>Autographa gamma</i>	Silver Y
<i>Autographa jota</i>	Plain Golden Y
<i>Autographa pulchrina</i>	Beautiful Golden Y
<i>Axylia putris</i>	Flame
<i>Bactra lancealana</i>	a moth
<i>Batrachedra praeangusta</i>	a moth
<i>Biston betularia</i>	Peppered Moth
<i>Blastobasis adustella</i>	a moth
<i>Blastobasis lacticolella</i>	a moth
<i>Brachylomia viminalis</i>	Minor Shoulder-knot
<i>Cabera exanthemata</i>	Common Wave
<i>Cabera pusaria</i>	Common White Wave
<i>Calliteara pudibunda</i>	Pale Tussock
<i>Caloptilia stigmatella</i>	a moth
<i>Campaea margaritaria</i>	Light Emerald
<i>Carcina quercana</i>	a moth
<i>Catoptria margaritella</i>	a moth
<i>Celypha lacunana</i>	a moth
<i>Ceramica pisi</i>	Broom Moth
<i>Cerapteryx graminis</i>	Antler Moth
<i>Cerastis rubricosa</i>	Red Chestnut
<i>Chloroclystis v-ata</i>	V-Pug
<i>Chrysoteuchia culmella</i>	Garden Grass-veneer
<i>Cilix glaucata</i>	Chinese Character
<i>Cochylis dubitana</i>	a moth
<i>Coleophora alticolella/glaucicolella</i>	a moth
<i>Colocasia coryli</i>	Nut-tree Tussock
<i>Colostygia pectinataria</i>	Green Carpet
<i>Coptotriche marginea</i>	a moth
<i>Cosmia trapezina</i>	Dun-bar
<i>Cosmorhoe ocellata</i>	Purple Bar
<i>Crambus lathoniellus</i>	a moth
<i>Crambus pascuella</i>	a moth
<i>Crambus perlella</i>	a moth
<i>Craniophora ligustri</i>	Coronet
<i>Crocallis elinguaris</i>	Scalloped Oak
<i>Cryptoblabes bistriga</i>	a moth
<i>Cybosia mesomella</i>	Four-dotted Footman
<i>Cydia splendana</i>	a moth
<i>Deilephila elpenor</i>	Elephant Hawk-moth
<i>Deilephila porcellus</i>	Small Elephant Hawk-moth
<i>Deileptenia ribeata</i>	Satin Beauty
<i>Deltote pygarga</i>	Marbled White Spot
<i>Diachrysia chrysis</i>	Burnished Brass
<i>Diachrysia chryson</i>	Scarce Burnished Brass

<i>Diarsia brunnea</i>	Purple Clay
<i>Diarsia mendica</i>	Ingrailed Clay
<i>Diarsia rubi</i>	Small Square-spot
<i>Ditula angustiorana</i>	Red-barred Tortrix
<i>Drepana falcatoria</i>	Pebble Hook-tip
<i>Drymonia dodonaea</i>	Marbled Brown
<i>Dysstroma citrata citrata</i>	Dark Marbled Carpet
<i>Dysstroma truncata</i>	Common Marbled Carpet
<i>Ectoedemia atricollis</i>	a moth
<i>Ectropis bistortata</i>	Engrailed
<i>Eilema depressa</i>	Buff Footman
<i>Eilema griseola</i>	Dingy Footman
<i>Eilema lurideola</i>	Common Footman
<i>Elachista subalbidella</i>	a moth
<i>Electrophaes corylata</i>	Broken-barred Carpet
<i>Elophila nymphaeata</i>	Brown China-mark
<i>Endothenia marginana</i>	a moth
<i>Epiblema scutulana</i>	a moth
<i>Epinotia cruciana</i>	Willow Tortrix
<i>Epinotia nisella</i>	a moth
<i>Epinotia tenerana</i>	Nut Bud Moth
<i>Epirrhoe alternata</i>	Common Carpet
<i>Epirrhoe rivata</i>	Wood Carpet
<i>Euchoeca nebulata</i>	Dingy Shell
<i>Eucosma cana</i>	a moth
<i>Eucosma hohenwartiana</i>	a moth
<i>Eudemis profundana</i>	a moth
<i>Eudonia delunella</i>	a moth
<i>Eudonia lacustrata</i>	a moth
<i>Eudonia mercurella</i>	a moth
<i>Eulithis populata</i>	Northern Spinach
<i>Eulithis prunata</i>	Phoenix
<i>Eulithis testata</i>	Chevron
<i>Eupithecia absinthiata</i>	Wormwood Pug
<i>Eupithecia nanata</i>	Narrow-winged Pug
<i>Eupithecia pulchellata</i>	Foxglove Pug
<i>Eupithecia subfuscata</i>	Grey Pug
<i>Eupithecia trisignaria</i>	Triple-spotted Pug
<i>Euplexia lucipara</i>	Small Angle Shades
<i>Eurrhpara lancealis</i>	a moth
<i>Euthrix potatoria</i>	Drinker
<i>Euxoa tritici</i>	White-line Dart
<i>Gelechia sororculella</i>	a moth
<i>Geometra papilionaria</i>	Large Emerald
<i>Gymnoscelis rufifasciata</i>	Double-striped Pug
<i>Habrosyne pyritoides</i>	Buff Arches
<i>Hadena bicruris</i>	Lychnis
<i>Hedya nubiferana</i>	Marbled Orchard Tortrix
<i>Hedya pruniana</i>	Plum Tortrix
<i>Helicoverpa armigera</i>	Scarce Bordered Straw
<i>Heliothis peltigera</i>	Bordered Straw
<i>Hemithea aestivaria</i>	Common Emerald
<i>Hepialus humuli</i>	Ghost Moth
<i>Herminia grisealis</i>	Small Fan-foot

<i>Hoplodrina blanda</i>	Rustic
<i>Hoplodrina octogenaria</i>	Uncertain
<i>Hydriomena furcata</i>	July Highflyer
<i>Hypena crassalis</i>	Beautiful Snout
<i>Hypenodes humidalis</i>	Marsh Oblique-barred
<i>Idaea aversata</i>	Riband Wave
<i>Idaea biselata</i>	Small Fan-footed Wave
<i>Idaea dimidiata</i>	Single-dotted Wave
<i>Idaea straminata</i>	Plain Wave
<i>Incurvaria praelatella</i>	a moth
<i>Korscheltellus fusconebulosa</i>	Map-winged Swift
<i>Lacanobia oleracea</i>	Bright-line Brown-eye
<i>Lacanobia thalassina</i>	Pale-shouldered Brocade
<i>Laothoe populi</i>	Poplar Hawk-moth
<i>Lasiocampa quercus</i>	Oak Eggar
<i>Laspeyria flexula</i>	Beautiful Hook-tip
<i>Lathronympha strigana</i>	a moth
<i>Lomaspilis marginata</i>	Clouded Border
<i>Lomographa bimaculata</i>	White-pinion Spotted
<i>Lomographa temerata</i>	Clouded Silver
<i>Lycaena phlaeas</i>	Small Copper
<i>Lycia hirtaria</i>	Brindled Beauty
<i>Lycophotia porphyrea</i>	True Lover's Knot
<i>Lymantria monacha</i>	Black Arches
<i>Lyonetia clerkella</i>	Apple Leaf Miner
<i>Macaria alternata</i>	Sharp-angled Peacock
<i>Macaria liturata</i>	Tawny-barred Angle
<i>Macrothylacia rubi</i>	Fox Moth
<i>Malacosoma neustria</i>	Lackey
<i>Maniola jurtina</i>	Meadow Brown
<i>Melanchra persicariae</i>	Dot Moth
<i>Mesapamea didyma</i>	Lesser Common Rustic
<i>Mesapamea secalis</i> agg.	Common Rustic agg.
<i>Mesoligia furuncula</i>	Cloaked Minor
<i>Mitochondria miniata</i>	Rosy Footman
<i>Mimas tiliae</i>	Lime Hawk-moth
<i>Mompha raschkiella</i>	a moth
<i>Mythimna ferrago</i>	Clay
<i>Mythimna impura</i>	Smoky Wainscot
<i>Mythimna pallens</i>	Common Wainscot
<i>Mythimna pudorina</i>	Striped Wainscot
<i>Mythimna turca</i>	Double Line
<i>Neofaculta ericetella</i>	a moth
<i>Noctua comes</i>	Lesser Yellow Underwing
<i>Noctua fimbriata</i>	Broad-bordered Yellow Underwing
<i>Noctua interjecta caliginosa</i>	Least Yellow Underwing
<i>Noctua pronuba</i>	Large Yellow Underwing
<i>Notocelia cynosbatella</i>	a moth
<i>Notocelia uddmanniana</i>	Bramble Shoot Moth
<i>Notodonta dromedarius</i>	Iron Prominent
<i>Notodonta ziczac</i>	Pebble Prominent
<i>Nycteola revayana</i>	Oak Nycteoline
<i>Ochropacha duplaris</i>	Common Lutestring
<i>Ochropleura plecta</i>	Flame Shoulder

<i>Odontopera bidentata</i>	Scalloped Hazel
<i>Oligia fasciuncula</i>	Middle-barred Minor
<i>Oligia strigilis</i>	Marbled Minor
<i>Oligia versicolor</i>	Rufous Minor
<i>Opisthagraptis luteolata</i>	Brimstone Moth
<i>Orthosia gothica</i>	Hebrew Character
<i>Ourapteryx sambucaria</i>	Swallow-tailed Moth
<i>Pandemis cerasana</i>	Barred Fruit-tree Tortrix
<i>Pandemis heparana</i>	Dark Fruit-tree Tortrix
<i>Pararge aegeria</i>	Speckled Wood
<i>Paromix anglicella</i>	a moth
<i>Pasiphila debiliata</i>	Bilberry Pug
<i>Peribatodes rhomboidaria</i>	Willow Beauty
<i>Perizoma alchemillata</i>	Small Rivulet
<i>Perizoma bifaciata</i>	Barred Rivulet
<i>Petrophora chlorosata</i>	Brown Silver-line
<i>Phalera bucephala</i>	Buff-tip
<i>Phalera bucephala</i>	Buff-tip
<i>Pheosia tremula</i>	Swallow Prominent
<i>Phlogophora meticulosa</i>	Angle Shades
<i>Photodes minima</i>	Small Dotted Buff
<i>Phragmatobia fuliginosa</i>	Ruby Tiger
<i>Phyllonorycter coryli</i>	Nut Leaf Blister Moth
<i>Phyllonorycter dubitella</i>	a moth
<i>Phyllonorycter oxyacanthae</i>	a moth
<i>Phyllonorycter spinicolella</i>	a moth
<i>Pieris napi</i>	Green-veined White
<i>Pieris rapae</i>	Small White
<i>Plagodis dolabraria</i>	Scorched Wing
<i>Plemyria rubiginata rubiginata</i>	Blue-bordered Carpet
<i>Plusia festucae</i>	Gold Spot
<i>Polia nebulosa</i>	Grey Arches
<i>Polygonia c-album</i>	Comma
<i>Pseudoips prasinana britannica</i>	Green Silver-lines
<i>Pseudoterpna pruinata atropunctaria</i>	Grass Emerald
<i>Pterapherapteryx sexalata</i>	Small Seraphim
<i>Pterostoma palpina</i>	Pale Prominent
<i>Ptilodon capucina</i>	Coxcomb Prominent
<i>Pyrrhia umbra</i>	Bordered Sallow
<i>Rheumaptera undulata</i>	Scallop Shell
<i>Rhodometra sacraria</i>	Vestal
<i>Rhopobota naevana</i>	Holly Tortrix
<i>Rivula sericealis</i>	Straw Dot
<i>Rusina ferruginea</i>	Brown Rustic
<i>Schrankia costaestrigalis</i>	Pinion-streaked Snout
<i>Scoliopteryx libatrix</i>	Herald
<i>Scoparia ambigualis</i>	a moth
<i>Scoparia subfusca</i>	a moth
<i>Scopula floslactata</i>	Cream Wave
<i>Scopula ternata</i>	Smoky Wave
<i>Selenia dentaria</i>	Early Thorn
<i>Sideridis rivularis</i>	Campion
<i>Smerinthus ocellata</i>	Eyed Hawk-moth
<i>Sphinx ligustri</i>	Privet Hawk-moth

<i>Spilonota ocellana</i>	Bud Moth
<i>Spilosoma lubricipeda</i>	White Ermine
<i>Spilosoma lutea</i>	Buff Ermine
<i>Spodoptera exigua</i>	Small Mottled Willow
<i>Stauropus fagi</i>	Lobster Moth
<i>Stigmella aurella</i>	a moth
<i>Stigmella continuella</i>	a moth
<i>Stigmella floslactella</i>	a moth
<i>Stigmella microtheriella</i>	a moth
<i>Stigmella nylandriella</i>	a moth
<i>Stigmella oxyacanthella</i>	a moth
<i>Stigmella perpygmaeella</i>	a moth
<i>Stigmella plagiolella</i>	a moth
<i>Stigmella salicis</i>	a moth
<i>Subacronicta megacephala</i>	Poplar Grey
<i>Swammerdamia caesiella</i>	a moth
<i>Tethea ocularis octogesimea</i>	Figure of Eighty
<i>Thyatira batis</i>	Peach Blossom
<i>Timandra comae</i>	Blood-Vein
<i>Tyria jacobaeae</i>	Cinnabar
<i>Udea ferrugalis</i>	Rusty-dot Pearl
<i>Udea prunalis</i>	a moth
<i>Vanessa atalanta</i>	Red Admiral
<i>Xanthorhoe ferrugata</i>	Dark-barred Twin-spot Carpet
<i>Xanthorhoe montanata</i>	Silver-ground Carpet
<i>Xestia baja</i>	Dotted Clay
<i>Xestia c-nigrum</i>	Setaceous Hebrew Character
<i>Xestia ditrapezium</i>	Triple-spotted Clay
<i>Xestia triangulum</i>	Double Square-spot
<i>Yponomeuta rorella</i>	Willow Ermine
<i>Zeiraphera ratzeburgiana</i>	Spruce Bud Moth
<i>Zelotherses paleana</i>	Timothy Tortrix

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