

Management of Clyne Valley Pond



Mohammed Shorab (2105064)

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1.0 Introduction

Clyne Valley Country Park, located on Swansea city's western outskirts, is one of the biggest¹ continuous sections of land under Swansea Council's administration. Clyne Valley has several unique characteristics and advantages, and it is conveniently accessible to a large portion of the city's population.

Clyne Valley became a Country Park in the late 1970s, after Council purchase of the land and the recommendations of a 1978 strategic planning study. The Wildlife and Countryside Act of 1968 empowers local governments to establish Country Parks for the aim of "creating or increasing possibilities for the general enjoyment of the countryside."

Clyne Valley Country Park (CVCP) is also a Site of Interest for Nature Conservation (SINC) because it has considerable amounts of the following habitats:

- Broadleaf woodland (including areas of ancient woodland)
- Semi-natural grasses that have not been modified agriculturally
- Ponds, both permanent and ephemeral
- Much of the Clyne River and its tributaries

Since its inception, Clyne Valley has been designated as a Country Park under planning policy. Swansea's current Local Development Plan² (LDP, enacted February 2019) contains a policy (TR4) for Clyne Valley Country Park. The LDP establishes the Country Park's boundaries and formalises Swansea Council's policy on its usage. Clyne Valley is also expressly mentioned in the LDP as a strategically significant green area and an essential component of the County's Green Infrastructure network.

However, other from these LDP principles, the Swansea Council does not seem to have any specified management plans for CVCP. Since the 1978 planning study - more than 40 years ago – there has been no assessment of Clyne Valley, the Country Park, or the

¹ 300+ha

² Available: <https://archive.swansea.gov.uk/ldp>

Council's strategy or goals for the region. Management choices by the Swansea Council is made in accordance with individual departmental goals and within financial restrictions.

Management concerns in recent years, such as damage from third-party activities under COVID-19 conditions, have highlighted the need for the Swansea Council to strengthen its general approach to managing the Country Park. According to Swansea Council, their Planning Policy and Natural Environment Sections are beginning to coordinate this (internally as well as with stakeholders and local community organisations), with the goal of establishing a plan for Members and senior management.

A key habitat of CVCP is the Pond which is located on the southeast of CVCP. Biggs et al (2005) have defined pond as **“Water bodies between 1 m² and 2ha in area which may be permanent or seasonal, including both man-made and natural water bodies”**.

Ponds contain a considerable amount of aquatic biodiversity on a landscape scale, according to recent studies (Krivtsov et al. 2022; Hyseni et al. 2021). Ponds are an essential habitat for a vast diversity of freshwater biota because they typically feature uncommon, endemic, or otherwise endangered species (Céréghino et al., 2010).

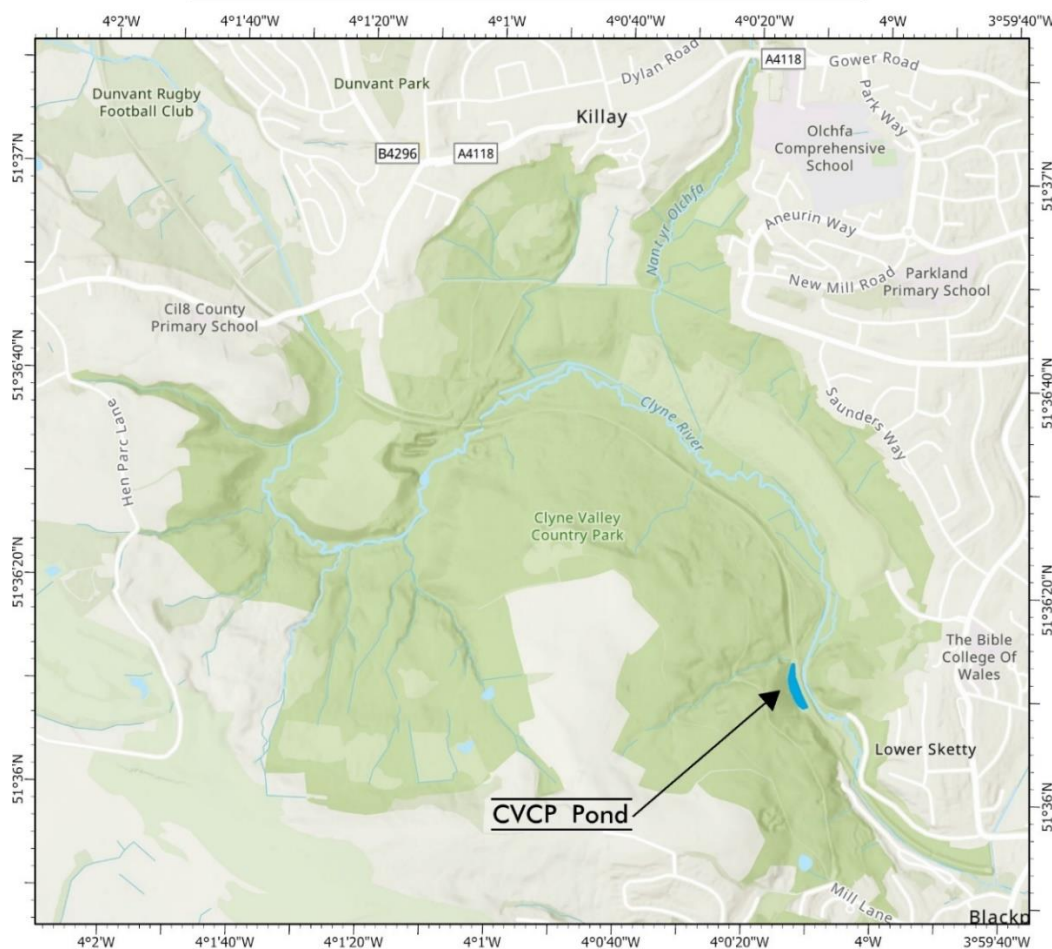
Given their relevance to aquatic biodiversity, ponds should be included in landscape-scale habitat biodiversity protection and improvement plans. These plans can only be successful if they are based on a deep understanding of the elements that govern the structure and diversity of pond communities. Ponds are also vital to the maintenance of regional biodiversity (Lemmens et al., 2013).

The protection of pond biodiversity needs an in-depth study of the risks it encounters. To understand how land use influences pond features, it is crucial to understand how watershed-scale processes occur (Wood et al. 2003). Habitat loss (infilling ponds; making ephemeral pools permanent) and other considerable human interventions

(e.g., excessive trampling by livestock, introduction of exotic species, urban runoff, diffuse agricultural pollution, acidification, erosion) on ponds pose immediate threats to the pond ecosystem.

The majority of current freshwater ponds in Britain were formed by natural factors such as glaciers and river action, or by human excavation, to produce water for animals, fish for the table, and so on. Many kinds of aquatic plants and animals, some of which are endangered, live in these tiny and frequently isolated ponds (Biggs et al., 1994). The conservation advantage is not limited to totally aquatic creatures; ponds increase both the number of species and the density of nesting birds (O'Connor and Shrubbs, 1986; Lack, 1992 as cited in Gee et al 1997).

Location of Pond at CVCP



Data Source:

Esri, Intermap, NASA, NGA, USGS, Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc, METI/NASA, USGS

Map 1 Location of Pond of study at the Clyne Valley Country Park

A specific Habitat Management Plan for CVCP could not be found online. This is of particular concern as there needs to be a set management plan for such a diverse habitat area.

Due to numerous limitations such as time, accessibility to information and such, this plan will only focus on the Pond in the Southeast of CVCP hereon referred to as the CVCP Pond. A survey of the Pond will inform on the status of water quality of the pond. A geospatial data analysis will inform the underlying and surrounding land use and land cover features in proximity of the pond. Remote sensing analysis of aerial imagery will be done to detect any land use or land cover changes in the surrounding areas of the pond. Thornhill (2013) made it evident through his research that the land use and land cover within the immediate 100metre surrounding area of ponds influence the pond as a habitat. This study will follow the same threshold and the GIS analysis will be done keeping the 100m buffer in mind. A thorough discussion of land use and land cover features and changes of the pond and its surrounding areas and its effect on the ponds habitat system will be done. The water quality and its limits as a habitat to biodiversity will also be discussed. Based on the above a few management plan options will be proposed. The management options from this study will inform the production of a detailed habitat conservation, protection, and management plan for the CVCP Pond.

A limitation of this study was that there are almost no standards or policies set by any governing agency for a natural ponds ideal conservation or management strategy. Standards such as ideal water quality measurements are important and should be set out for management of natural ponds for their conservation, protection and proper management. Keeping this in mind, wherever a pond guidance could not be found, guidance for freshwater lakes have been used as it is mostly similar to a pond ecosystem.

2.0 Methodology

2.1 Mapping Using GIS

Mapping of habitat in Wales can be traced as far back to 1979 (Lucas et al., 2011). Beginning with manual mapping, the habitat classification maps of Wales have evolved a lot having gone through GIS semi-automated and then later automated classification systems on pre trained models (Lucas et al., 2011). With new developments in GIS and Remote Sensing coupled with the vast open-source data available in the public domain, GIS seems to be a rapid developing field of interest and a vital tool to environmental scientists. GIS analysis and mapping in recent years have become key to habitat assessments (Khattak et al. 2022; Yu et al. 2022; Chandel et al. 2022).

The mapping of broad plant types in habitat or land cover maps is often the starting point for ecological assessments of sites and landscapes (Cheril and Mcclean, 1999). Habitat maps impact management decisions and may aid in the identification of areas that need further investigation (Cheril and Mcclean, 1999).

A GIS analysis was undertaken using the ArcGIS Pro Software. ArcGIS Pro is one of the many GIS and Remote Sensing software suites by the United States head quartered company 'Environmental Systems Research Institute (ESRI)' which is used by environment researchers worldwide (Purdon et al, 2022; Arcos-Aguilar et al., 2021; Groff, 2018; Best et al, 2007).

The data used in this exercise were obtained from Digimap which is a subscription-based online map and data delivery service provided to UK Higher Education institutions. Run by the University of Edinburgh, Digimap provides a variety of data sets, including Ordnance Survey, historical, geological, LiDAR, and marine maps and spatial data.

At first a 100m buffer was created of the pond using the buffer analysis tool in ArcGIS Pro. This buffer provided an area of focus for this study. Data such as Topography,

Habitat Type, Soil Type, Aerial Imagery were used to map out habitats and its corresponding features, which be discussed in the next section.

A semi-automated change detection was also performed using high resolution imagery from 2014 and 2020 available on Digimap. Semi-automated classifications using object-based image analysis (OBIA) methodology have proven to be highly accurate for land use and land cover change classifications (Bhatt et al. 2018).

Wherever guidance on symbology was available the standards were followed, where the guidance on symbology for mapping was not available, standard cartographic practices for symbology were followed. The maps were produced using ArcGIS Pro Layout functionality.

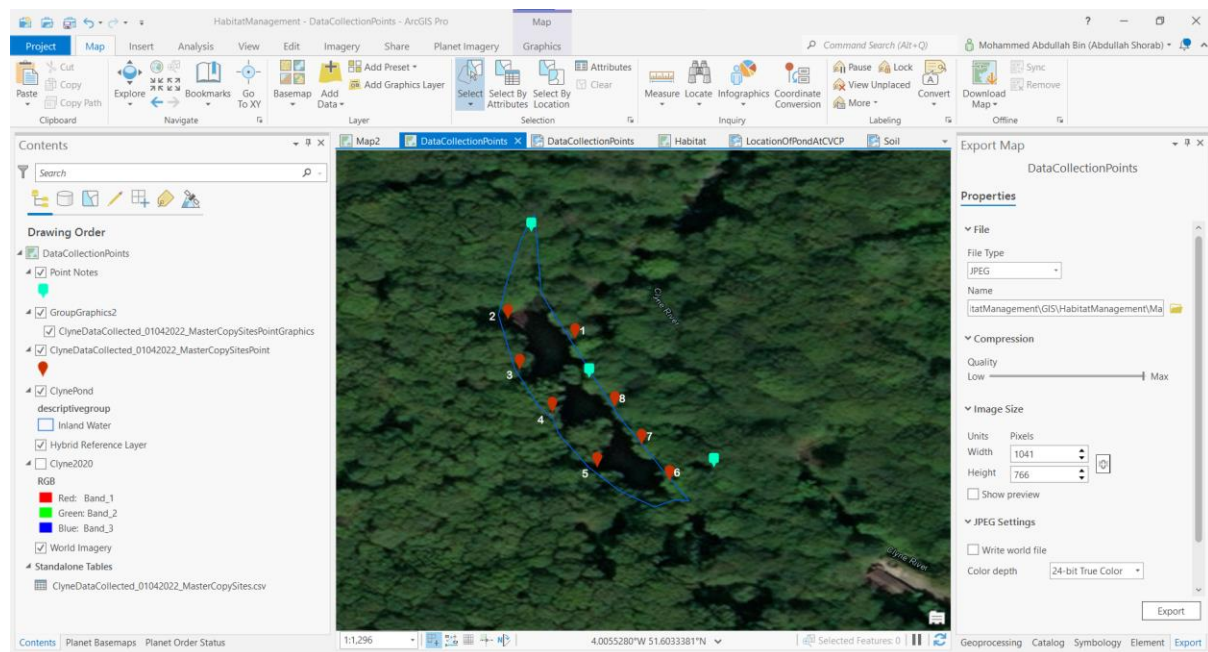


Figure 1 ArcGIS Pro Interface

2.2 Data Collection

Since there were no previous management plans found for the CVCP Pond, some baseline data was collected from the field to establish the current status of the pond.

Water quality data was collected around the edges of CVCP Pond using [Vernier LabQuest2](#) data collection equipment. The LabQuest2 uses sensors to collect different types of data. The accuracy of the Vernier LabQuest2 turbidity sensor $\pm 5\%$ NTU,

temperature sensor $\pm 0.25^{\circ}\text{C}$ (N. Wu and M. Khan, 2019) With the assistance of University Lab Assistant Sergio, water quality data was collected on the 1st of April 2022.



Figure 2 Collecting field data using the LabQuest2 data collection equipment

At eight points around the pond (Map 2), temperature ($^{\circ}\text{C}$), photosynthetic photon flux density (PPFD $\mu\text{mol m}^{-2} \text{s}^{-1}$), potential of hydrogen (pH), and dissolved oxygen (mg/L) samples were collected. This data was collected with its locational attributes (longitudes and latitudes) as the LabQuest2 is capable of doing so automatically using its inbuilt GPS sensor. The types of data collected followed partial methodology practice from Thornhill (2013) who used these and other parameters to assess the quality of ponds in Birmingham. A major limitation for this data was seasonality and other weather conditions. According to Mamta Nayak, a (former) water specialist of UNICEF India, some of the data collected have different best times to collect and would not be its real form at the time it was collected for study (pers com, 2022). Thornhill (2013) collected data over 3 years to get average and real picture of the ponds water quality. Due to time limitations at hand, only one collection could be done which should be enough to devise a future plan for management of the pond.

The collected data is shown in table below.

Site	Temperature (°C)	PPFD ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	pH	Dissolved Oxygen (mg/L)	Latitude (°)	Longitude (°)
1	7.85	7.06	6.02	8.83	51.6038	-4.004754
2	7.80	7.59	6.59	10.17	51.60363	-4.00479
3	8.34	4.65	6.67	11.10	51.60384	-4.004795
4	8.11	18.65	6.75	10.66	51.60334	-4.004626
5	7.97	6.75	6.86	10.48	51.60319	-4.004212
6	7.97	26.74	7.03	10.54	51.60288	-4.004031
7	7.77	10.30	7.00	10.86	51.6031	-4.004244
8	7.93	15.26	6.99	11.04	51.60328	-4.004302
Average	7.97	12.13	6.74	10.46		

Table 1 Data collected at eight points around the Clyne Valley Pond

Furthermore, water samples were collected from the entry, mid pond and exit points of the pond (Map 2). These samples were brought to the lab analysed for conductivity ($\mu\text{S/cm}$), turbidity (NTU), sulphate (mg/L), phosphate (mg/L), and nitrate (ppm) under guidance of Sergio. While the conductivity and turbidity were analysed using the same LabQuest2 equipment and its sensors, the nutrient quality (i.e sulphate, phosphate, and nitrate) were analysed using other lab analysis equipment available at the Environmental Science lab. Assistance from Sergio and consultation with consultations Sergio and Mamta Nayak³ (a water expert) was very beneficial in interpreting the water quality data. Their interpretations helped in interpreting the water quality data which was gathered. The data gathered is presented below:

Site	Conductivity ($\mu\text{S/cm}$)	Turbidity (NTU)	Sulphate (mg/L)	Phosphate (mg/L)	Nitrate (ppm)
Entry	133.60	81.50	10.00	0.07	0.60
Mid Pond	137.10	208.30	10.00	0.09	2.80
Exit	138.70	322.70	10.00	0.30	0.00
Average	136.47	204.17	10.00	0.15	1.13

Table 2 Data collected at 3 entry, mid and exit points of pond

³ Ex Water Safety & Security consultant for UNICEF India and current student of MSc – Water in a Changing World at Cardiff University

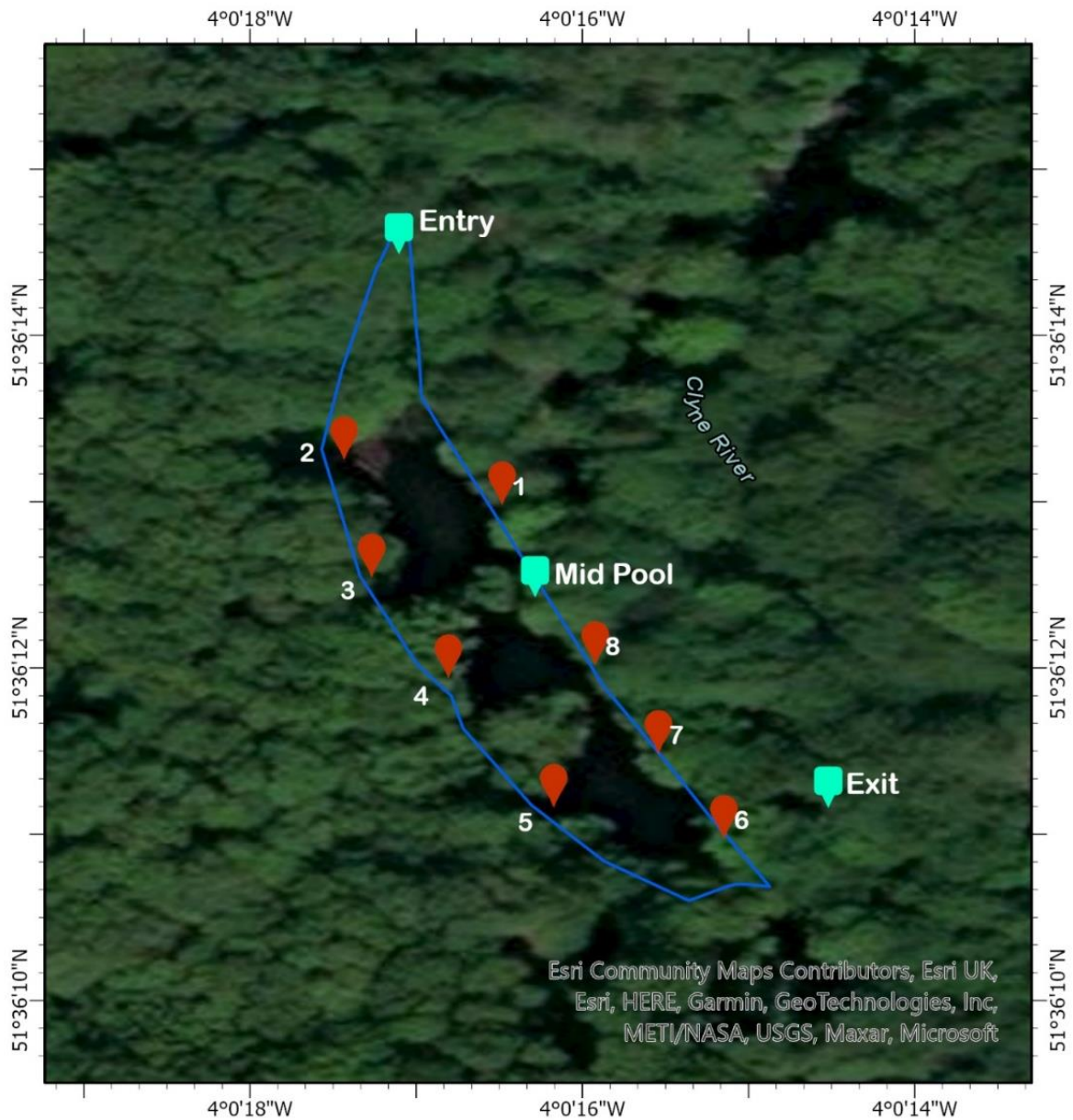
In addition to that, the distribution and abundance of freshwater invertebrates was measured by kick sampling in two different (10metres apart) micro-habitats at the entrance point of the pond. Kick sampling is a method suitable for shallow running water with a gravel or muddy bottom to study its habitat structure (Harper et al. 2021; Všetická and Adámek 2013; Olomukoro et al, 2013). A fine-mesh net was held in the direction of downstream. One-foot kicks for 30 seconds to the bottom of the stream dislodged the substrate in the direction of the net. Animals dislodged from the substrate were washed into the net. It was not practical to record every single invertebrate. Therefore, representative sample was collected in a bucket and analysed for presence of animals and organisms in the laboratory.



Figure 3 Sample collection at the entrance of pond using kick sampling method.

Map 2 below shows the data collection points described in table 1 and 2. Latitudes and Longitudes of these points were collected using the Labquest2 field equipment. They were then extracted from the equipment using Vernier software. After manually sorting the data in CSV format it was then imported to a GIS system and plotted according to their respective latitudes and longitudes.

Data Collection Points at Clyne Pond



Map 2 Points at which data were collected around the pond.

2.3 Field Observations

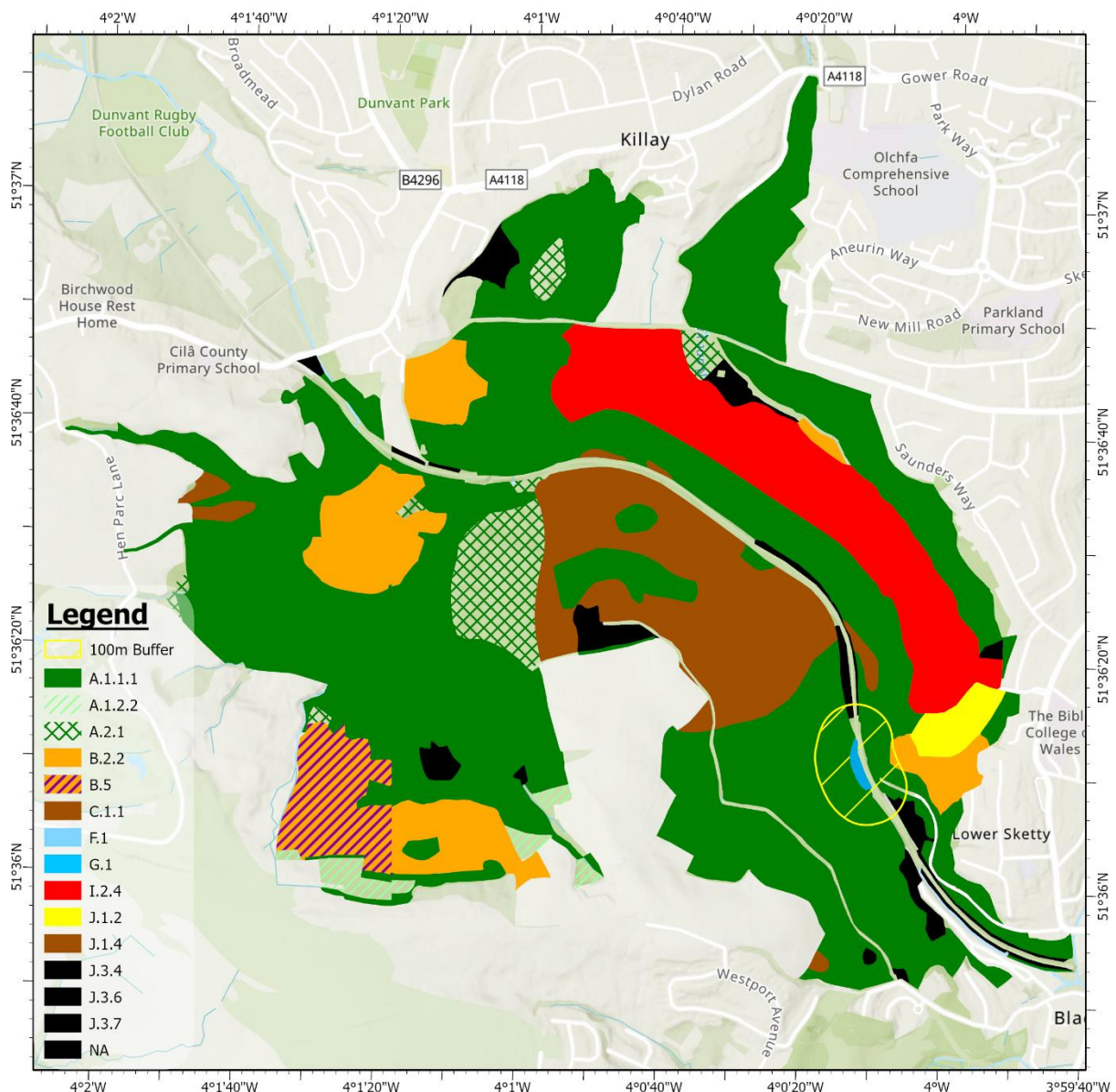
Field observations are an integral part of Phase 1 Habitat Surveys (Lucas et al., 2011; Cherrill and McClean, 1999). Two⁴ field visits were made for observations which are discussed in the results and discussion section.

⁴ 5th March and 1st April 2022.

3.0 Results and Discussions

3.1 Habitat

Clyne Valley Country Park Habitat Map



Data Source:

1. Esri, Intermap, NASA, NGA, USGS, Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, GeoTechnologies, Inc, METI/NASA, USGS
2. Natural Resource Wales - Terrestrial Phase 1 Habitat Survey

Map 3 Map of Habitats at CVCP

A habitat map of CVCP (above) depicts the habitats in surrounding areas to the pond. The pond as seen – located on the southeast side of CVCP is mostly surrounded by broad leaved semi-natural woodland. This is good for the pond's overall biodiversity.

The following table shows the relevant habitat descriptions from its code as shown in the map above.

Code	Description
A 1.1.1	Broad Leaved Semi-Natural Woodland
A 1.2.2	Corniferous Plantation Woodland
A 2.1	Dense Continous Scrub Woodland
B 2.2	Semi-improved Neutral Grassland
B 5	Marshy Grassland
C 1.1	Continous Bracken - Tall Herb and Fern
F 1	Swamp
I 2.4	Acid/Neutral Rock Exposure
J 1.2	Amenity Grassland
J 1.4	Introduced Shrub
J 3.6	Dry Ditch

Table 3 Phase 1 Habitat Classification code descriptions.

Using information in table 3, the following graphic (analysed using GIS and area information of the relevant phase 1 habitat survey code) shows distribution of the different types of habitats at CVCP.

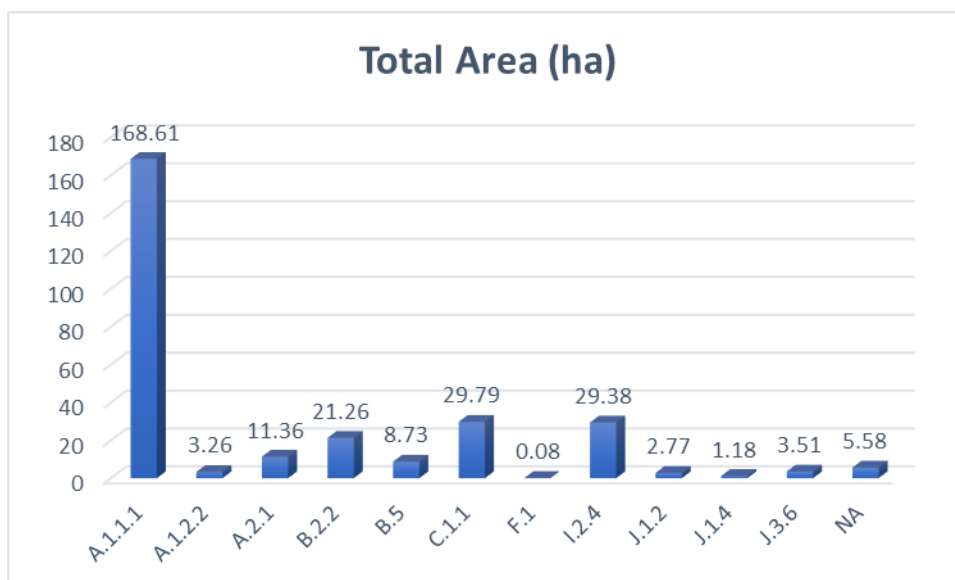


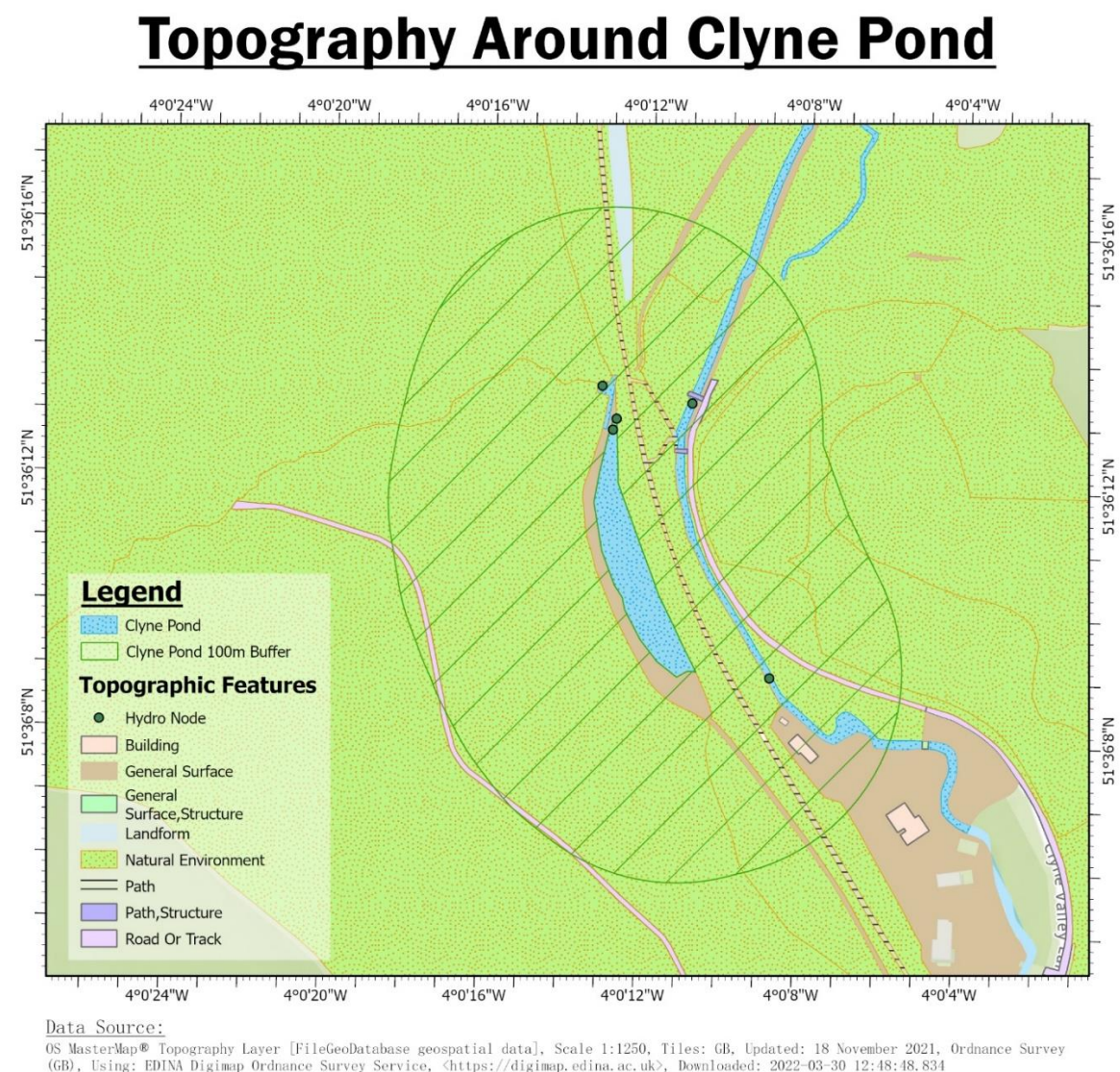
Figure 4 Distribution of Habitat type by area at CVCP

The analysis of habitat by area clearly shows that CVCP is dominated mainly by **Broad Leaved Semi-Natural Woodland**.

Broad Leaved Semi-Natural Woodland is well known for its biodiversity characteristics and habitat capabilities (Palo et al. 2013; Boughey et al. 2011; Gustafsson et al. 1992). Studies such as (Patenaude et al. 2003) even show that it holds a lot of carbon and is highly recommended to be properly protected and conserved.

3.2 Topography

The topographic map below which was generated using GIS software shows Topography around Clyne Pond.



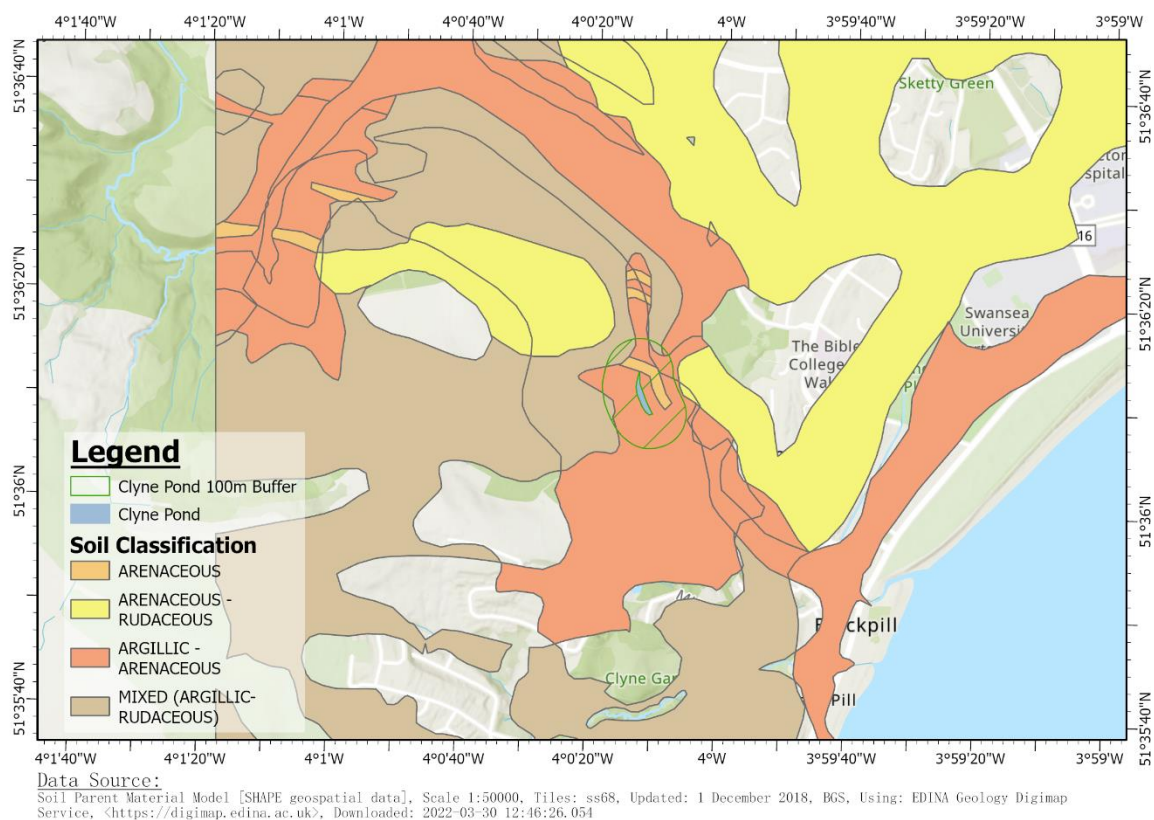
Map 4 Topography of Clyne Valley Pond

Maximum area around the pond is made of natural environment classification with one building (which seems to be a house) falling within the 100m buffer zone.

However, since this building is further downstream from the pond, it will not have an impact on the pond's water quality. Although it can be said that air pollution from the nearby buildings may have an impact on the pond's biodiversity. A walking and cycling path surround the pond from all sides. Although there can be some erosion of soil into the pond during very dry season, these activities do not seem to be of concern for the pond.

3.3 Soil

Soil by Grain Type Around Clyne Pond

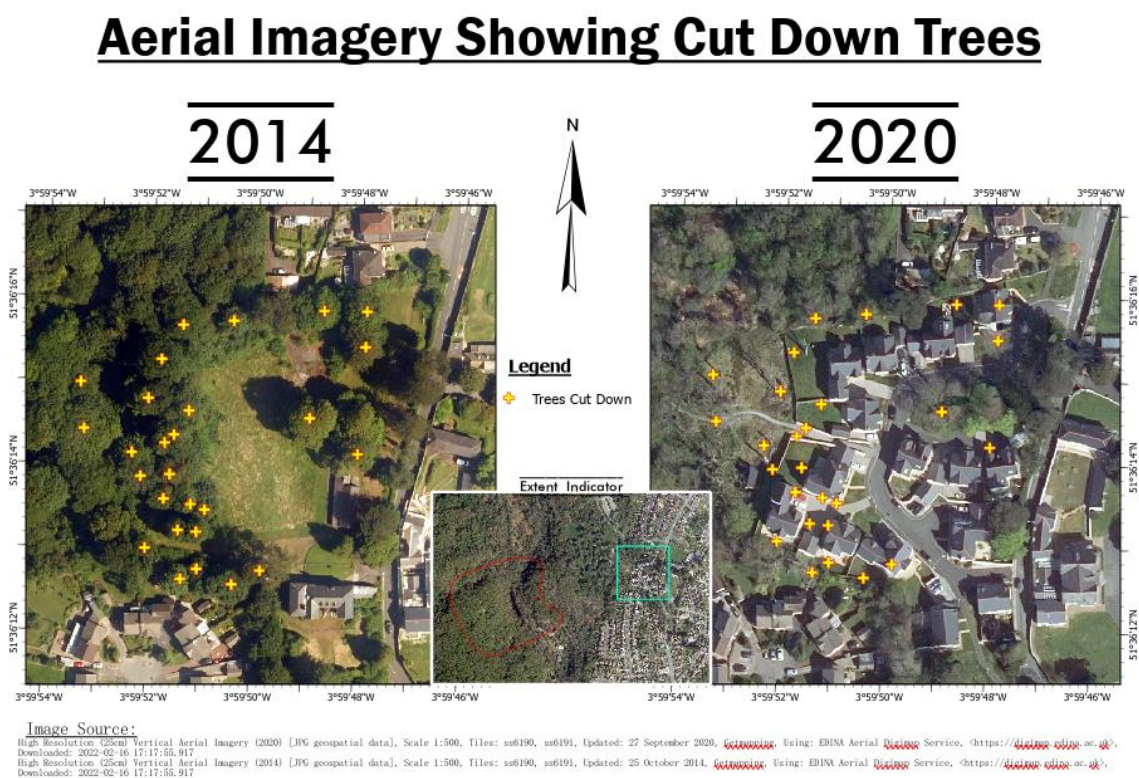


Map 5 Map of Soils classified by Grain type.

The above map shows soil in the area surrounding Clyne Pond by grain type. The pond and its 100m buffer area is dominated by Argillic – Arenaceous soil. Apart from Arenaceous – Rudaceous, all the soil types are not prone to wind erosion therefore it is less likely for the pond to get sediments from wind erosion. This would be good for the pond as a habitat.

3.4 Encroachment

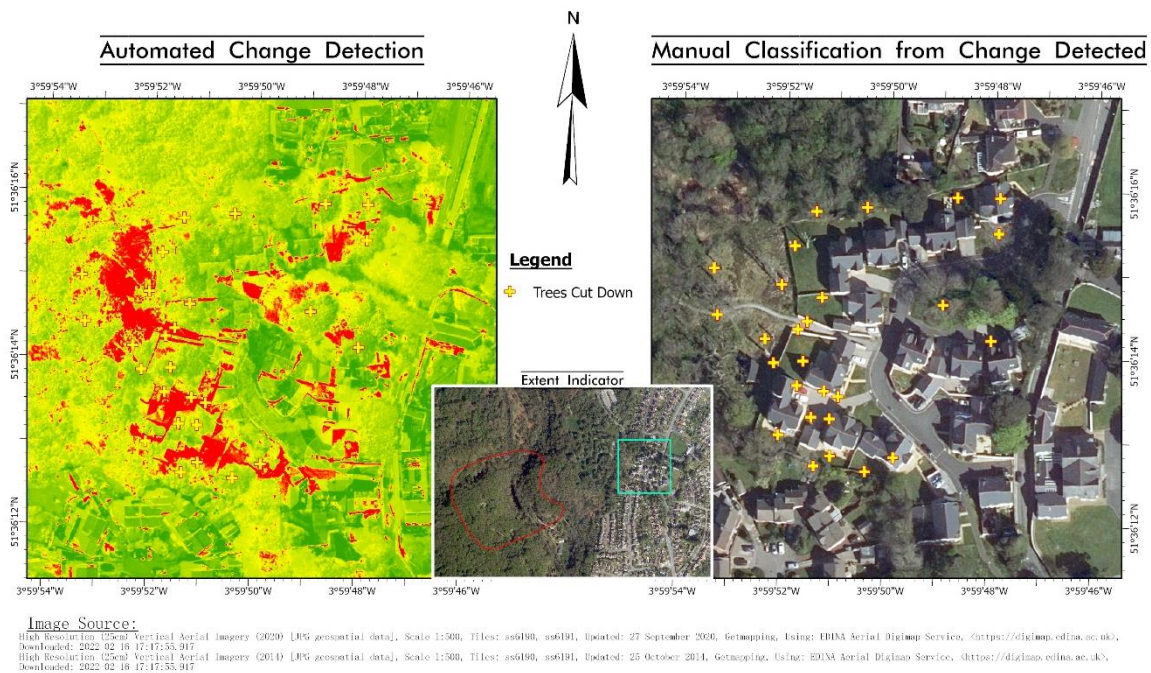
Encroachment can be a worrying issue for water bodies. Human civilization coming near to water bodies means the water bodies will get more interaction than as to previously and there can be a possibility of increased pollution. Following the automated classification change analysis using high resolution imagery from Digimap it was noticed that there had been some trees cut down for development towards the northeast of the pond. Using the before and after imagery the location of these trees were manually plotted, and it can be concluded that there were approximately 27 trees cut down for developments between the years 2014 to 2020. The following maps show the automated change detection and manually classified tree location with an inset map of the location to the pond.



Map 6 Manual Classification of cut down trees

This encroachment is a concern for both the pond and the CVCP itself. Any further developments and/or cutting down of trees of such nature should be avoided at all costs to keep the CVCP in its natural and biodiverse form.

Change Detection Showing Cut Down Trees



Map 7 Semi-Automated Change Detection of Land Cover

3.5 Water Quality

Based on the findings presented in Tables 1 and 2 above and discussion with subject matter experts, the general water quality of the pond seems to be good. According to Sergio the analysis from kick sampling also shows results which can be inferred to good quality. Due to limitations of phase 1 survey good water quality cannot be concluded and it is recommended that tests at different times and seasons should be done to analyse the real quality of water at different times of the year. Using this information, management of the pond can be planned according to seasonality or whatever quality variation that the water quality analysis shows for its best management.

3.6 Fishing

According to the Fishing in Wales [website](#) the pond holds a good head of Wild Brown Trout, Roach, Tench, Bream, Carp, Perch, Eels, Brown Goldfish and Rudd fish species. These freshwater fish contribute to the biodiversity of the pond. There are numerous websites on the internet which promote fishing in this pond. The lease of fishing in the pond is being held by the South Wales Fishing Society. An attempt was made to get in

touch with the society management and discuss the management plans of the pond but there was no response to the emails sent to them. While fishing helps keep the fish population of the pond at controlled, overfishing can lead to loss of biodiversity and a hole in the ecosystem functioning. A proper plan of fishing should be made and there should be contingency in place to seed the pond with fish, should they decrease in population. Since the South Wales Fishing Society holds license for the pond, a condition of their license should be to use the pond in an environmentally sustainable manner. A regular inspection of the pond should be done to see that all regulations and conditions of lease set are being abided to.

3.7 Human Intervention

Other human interventions noticed during the site visit was regular cyclists all around the pond as well as visitors of the park taking a walk. At one of the site visits there were 3 fisherman seen fishing. Tables and benches are also on the east side of the pond adjacent to the walking path for visitors to sit and enjoy a peaceful natural environment.

A matter of concern is that while presence of humans was seen there were no litter bins on site. It is an undeniable fact that rubbish and litter will be present at all places where humans are present. The fisherman, cyclists and walking visitors would eventually accumulate litter which would end up polluting the pond. This is an urgent matter of concern and should be attended to urgently. A dog poo bin should also be enacted as it was observed that a lot of visitors take their dogs for walk in the park.

4.0 Analysis & Management Recommendations

The following is an analysis of the findings and management recommendations (mostly adopted from [UK Department for Environment, Food & Rural Affairs](#)) for CVCP and specifically for the Clyne Valley Pond.

4.1 Detailed Management Plan

From the data gathered and information presented prior to this section, the biggest problem is that there is no existing management plan for the whole CVCP let alone the Clyne Valley Pond (or if there is then it isn't accessible on the internet). As stated earlier, this is the biggest concern and should be addressed urgently at the earliest possible by the Swansea Council. A management plan should be developed for the whole CVCP in consultation with the relevant stakeholders and the public. This management plan should be accessible to the public. The Clyne Valley Pond and other water bodies at CVCP should be given equal attention as to other terrestrial habitats in the management plan. Usually, habitats which make up a small area of a larger habitat are ignored.

The plan should be developed after a thorough assessment of the whole site. A phase 2 using experts is highly recommended to come up with this plan. The area is big, and it contains a variety of biodiversity which keep our environment intact. This area is the nearest green space from the Swansea City also. Therefore, it should not be taken lightly and better late than never to have a written document guiding its wellbeing.

This management plan should include proven methods of management (backed up by science) and detailed schedule of implementation and monitoring. It would also help to consider the economic (budget) as well as human resource needs for the implementation and monitoring of this plan.

4.2 Consultation

Consultation should be held with the park users and other stakeholders when developing a detailed management plan. As users of the park their inputs are important, and their consultation will make them feel a part of the park. This would mean that they would feel involved and responsible for the proper management of the park. A number of studies (Fors et al., 2019, 2015; Hung et al., 2011; Speller and Ravenscroft, 2005) have looked into this and encouraged public participation in urban parks planning and management.

Together with park users, fisherman and the South Wales Fishing Society should play an important role in development, implementation, and monitoring of the plan. Being users of the pond, they are equally responsible for its proper management and biodiversity enhancement.

Academics (subject matter experts) should also be consulted as they would help build the detailed management plan which is proven and well informed by science. It would not be difficult to partner with one of the Universities and have the students propose a detailed management plan as part of their Uni project. This would be mutually beneficial for both the Swansea Council and the University students. This is a highly recommended approach.

4.3 Improving Water Quality

The water in a pond provides home for a variety of plants and animals, including frogs and other animals that don't live on land. The water in a pond also provides a quiet habitat for young fish, which helps them grow into healthy adults. In a pond, water flows evenly, without being diverted or diverted in small amounts, which means that it is easy to test the water's quality. The soil in a pond is also more stable than soil on land, which makes it better for plants to grow.

The water quality of a pond can have a large impact on the health and well-being of the plants and animals that live in it. The water quality is determined by the amount of nutrients and other water-soluble substances in the water. The water-soluble substances include nutrients like nitrogen and phosphorus, which are needed by plants and animals to grow, and other substances like dirt, which are needed to bind soil particles together. If the amount of water-soluble substances in the pond water becomes too high, it can lead to excessive growth of plants and animals and can harm their health.

Although the current baseline assessment indicates good water quality. A detailed water quality assessment must be done by experts in order to determine the ponds original water quality.

Regularly monitoring the pond source may aid in detecting sources of pollution or nutrient runoff. If a pollution or nutrient runoff source is determined, it should be addressed and/or decreased as soon as feasible to avoid any harm on the pond ecosystem.

According to the mapping information, there is an agricultural activity going on near the pond source. The agricultural activity must correspond to the farming criteria for water. These compel you to take measures to avoid manure, fertilisers, or dirt from entering water bodies. This agricultural activity, as well as its impact on the pond's water source, must be examined on a regular basis.

The following are the best agricultural strategies for having the least effect on the quality of pond water sources is recommended by the UK Department for Environment, Food & Rural Affairs (2021):

- adapt fertilisers and organic manures to crop needs to reduce the hazard of nutrient runoff
- develop and implement a nutrient management strategy
- preserve adjoining grassland without applying fertilisers
- change the way you manage grassland near sources of water.
- Use grass margins to help intercept silt, fertilisers, and pesticides.
- change water levels as required

4.4 Maintenance and Enhancement

Small organisms (zooplankton) that attract birds and fish may be provided artificial refuges or "floating islands" built of logs or vegetation mats. Unless invasive non-native species are removed, submerged vegetation should be left alone.

Pond plants are best handled in the autumn and winter. This protects breeding birds, amphibians, and fish from being disturbed. Some emergent plants should be eradicated if they cover more than half of the pond surface. If a single species, such as bulrush, starts to dominate, it should be eradicated as soon as practical. When

removing plants, strive to leave roughly 20 percent of the emergent vegetation; do not remove all plants of a specific species; and do not remove more than 10 percent of a pond's marginal plants in any one year.

When maintaining marginal plants, trees, and bushes in a mature pond, keep to the pond's original area and profile. Avoid enlarging or modifying the pond's perimeter. Mature ponds packed with developing species already provide great habitat. Some careful plant removal may be advantageous, but no more than 25 percent should be eliminated during a three-year period.

As leaf litter and insects fall into the water, trees along the bank provide both food and habitat for invertebrates and fish. Excessive shade should be avoided as it could inhibit the growth of aquatic plants. Aim for a bank that has a blend of total shade, dappled shade, and open areas. Shade provides numerous benefits, including: cooling the water, which may help lessen the impacts of climate change; and lowering wind and wave activity, which decreases shoreline disturbance.

Bank management could include pruning certain shoreline trees or brush on a regular basis to retain healthy portions of marginal vegetation; removing trees, particularly if marginal vegetation is diminishing; and periodic grazing to prevent shoreline vegetation from growing too rank.

4.5 Fishing

Apart from what has already been mentioned in the discussion section, the following is recommended.

If the Pond is to remain a recreational fishery, fish other than Carp, Bream, and Tench should be allowed to grow. The pond already contains wild Brown Trout, Perch, Brown Goldfish, Roach, Rudd, and Eel, which should form the basis of this fishery. Wild Brown Trout as the ponds predatory fish, will help to maintain a balanced ecosystem by restricting recruitment of zooplanktivorous fish (Perch and juvenile Roach) (Scheffer 2004).

Season ticket holders should be the only ones who can fish. A permit limit of 25 permits per year would be enough to retain a core group of fishermen on the pond.

To minimise trampling of bank margins, angling should be limited to the east side of the pond, with specific care given to the susceptible western and southern banks.

Although the use of ground bait and boilies should be outlawed, the sharing of information on the removal of Carp and Bream should result in a shift in this fishing technique as it is not appropriate for Roach, Rudd, Perch, or Eel. Season ticket holders could benefit Swansea Council by maintaining a record of their catches in order to make better judgments in the future. Fishing activities should be evaluated every few years.

5.0 Conclusion

Clyne Valley Country Park is a biodiverse area with a number of habitats. It is high time that Swansea Council gives it serious attention and without delay start working on a Management Plan. This area also holds significance for the people of Swansea and acts as an area of natural beauty.

In regard to the pond – findings of this study show that the overall water quality is good and it is a habitat of significance at CVCP. As recommended earlier, the water bodies should not be neglected in the management plan which is to be developed, as is seen in most major management plans that small area habitats are not given priority in a big area management plan.

Many species of plants and animals in and around the pond may face threats such as habitat loss, over-exploitation, and invasive species. In order to address these threats, it is necessary to develop a detailed habitat management plan. This plan will describe the habitat required by each species, and then outline how that habitat will be managed to meet the needs of the species. This will usually include ensuring that the habitat is protected from threats, providing adequate resources for the management

of the habitat, and establishing a monitoring program to ensure that the habitat is being properly managed.

Keeping in mind the limitations of this study, the recommendations both within the discussion section and analysis and recommendations section can help develop a proper management plan if followed accordingly.

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