

Assessment of Flora Found on Kilvey Hill

Biodiversity and Ecosystem Services

ACNA2002

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1. Introduction

1.1 Scope

This report aims to identify and examine the plant life found on two different sampling sites on Kilvey Hill, and compare these two datasets against each other and against other similar sites, with the goal of identifying beneficial actions and management strategies that could be undertaken to enhance the biodiversity of this site.

1.2 History of Kilvey Hill

Kilvey Hill, like much of Swansea, is a site with a long industrial history. In the 18th century, there were large copper and coal mining industries in the Tawe valley, and by the end of the 19th century, when copper mining in Swansea had begun to decline, lead and zinc mining took the lead as the dominant mining and processing material. The mining industry eventually collapsed, leaving a huge number of derelict work sites behind it, as well as heavy metal pollution and resulting environmental devastation (Hilton, 1963). Used as a waste and pollution dump by nearby work sites, by the 1870s, Kilvey Hill was described as totally devoid of plant life (figure 1), causing dangerous mudslides to occur, which threatened houses built at its base (HistoryPoint.org, 2023).

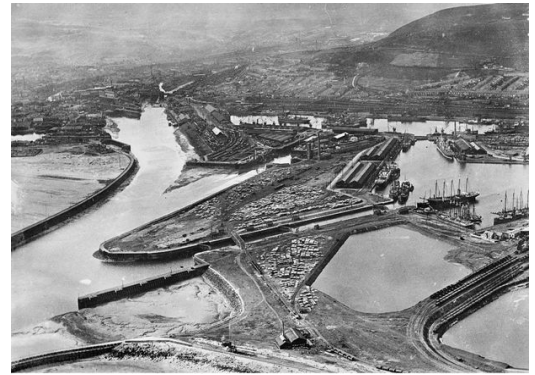


Figure 1: Kilvey Hill in the early 1900s (WalesOnline, 2019).

In 1961 the Lower Swansea Valley Project was developed, directed by Kenneth Hilton and Swansea University, to help focus and fund the reclamation efforts that had been taking place for the last decades, including restoring Kilvey Hill by planting trees, removing tips and tidying the area (WelshCopper.org, 2023). Many different local communities were invited to become involved in the restoration, from schoolchildren to volunteers, as earlier attempts at tree planting had suffered from vandalism, and it was hoped community involvement would lessen this risk. Work continued on the site for the next twenty years (Swansea Museum, 2023), and in some aspects it is still ongoing.

1.3 Kilvey Hill, Now



As an urban fringe green space, Kilvey Hill is used by a lot of different groups. There is a community nature reserve woodland, in which lizards and slowworms have been spotted (BBC, 2014), where Smallwoods run a monthly wellbeing activity group (Smallwoods, n.d). Since the 1990s, a volunteer group has been working to maintain the hill and the community

Figure 2: Kilvey Hill after restoration efforts (Saunders, 2010).

woodland present on the site (Kilvey Hill Community Woodland Volunteers, n.d), alongside with management by Swansea Council and Natural Resources Wales (Swansea Council, 2021). Kilvey Hill is also extensively used by dog walkers, cyclists, walkers and campers.

2. Methodology

A trip was arranged to Kilvey Hill to allow testing and data collection to take place. For this report, the method used to gather data was taking quadrat counts of flora present along a transect line. This was then recorded into a notebook on site. The weather on the day was sunny and clear, with low wind only.

As the aim was to compare how flora differs between sites on the hill, two sites were selected for analysis. Site 1 (figure 3) was on the more polluted side of the hill as it is overlooking the copper quarter. Site 2 (figure 4) was on the less polluted side of the hill. The transect lines used, as marked on the maps with orange lines, were 6m long, with a quadrat taken every 2m, to a total of three quadrats per transect line. These were taken using transect tapes and quadrat frames.

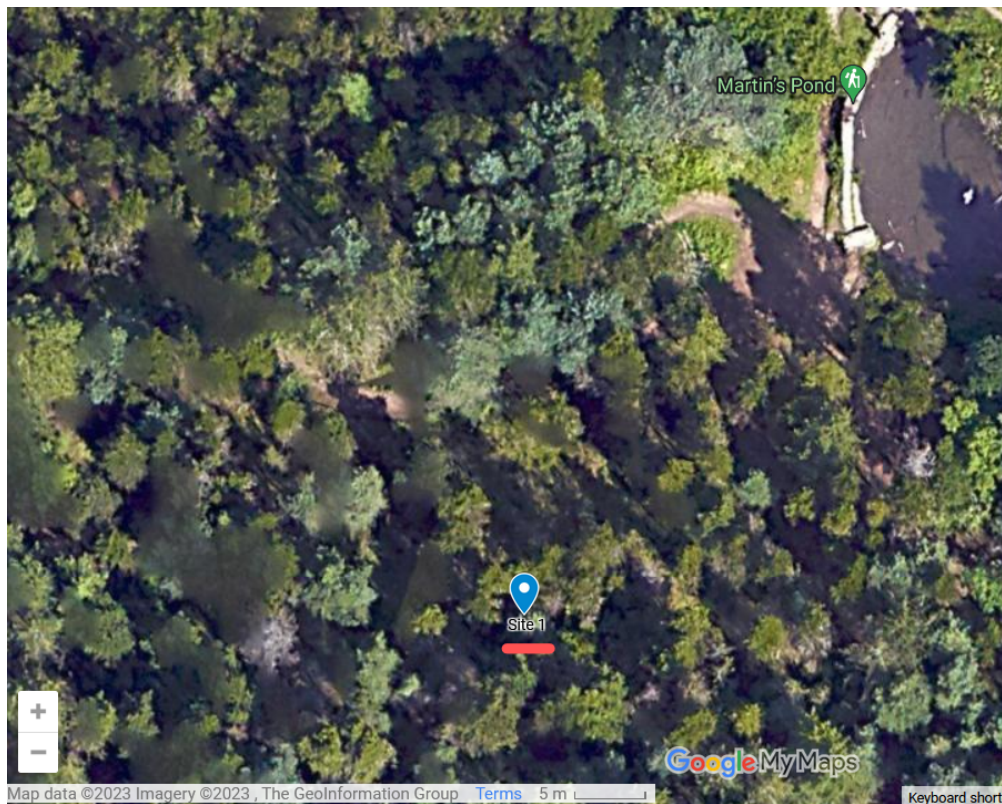


Figure 3: Test site 1, with transect line 1.
(Google My Maps, 2023)

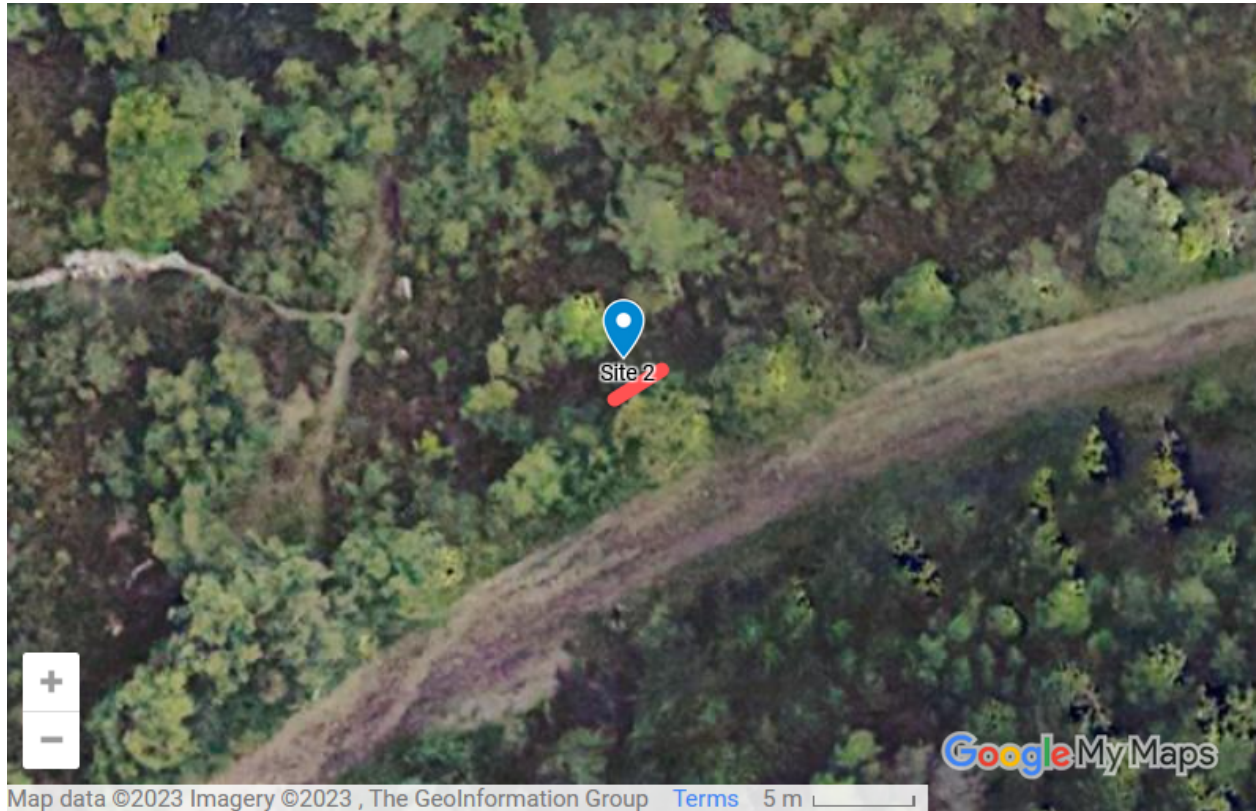


Figure 4: Test site 2 and transect line 2 (Google My Maps, 2023).

Using transect lines and quadrats is a common way of surveying organisms that are of the appropriate size to fit inside a frame placed on the ground. They can be excessively labour intensive if the organisms being surveyed are too thinly spread, or are distributed patchily (Murray, 2002), but this was not the case with the plant life on Kilvey Hill therefore they were selected as the best survey method.

There were no ethical concerns with this study taking place. The health and safety of the fieldwork taking place was assessed on site, taking care to not impact other users of the space, and ensuring that students were always in pairs at minimum at all times.

Surveying the flora of a site is often an important first step to being able to understand and conserve the area (Keighery *et al*, 2007), and flora surveys have been used as a first step in developing management plans for areas that have had great industrial impact (Bak *et al*, 2023).

3. Results

At Site 1, one transect line was measured with three quadrat counts along it. Pictured below are the findings of these three quadrats.

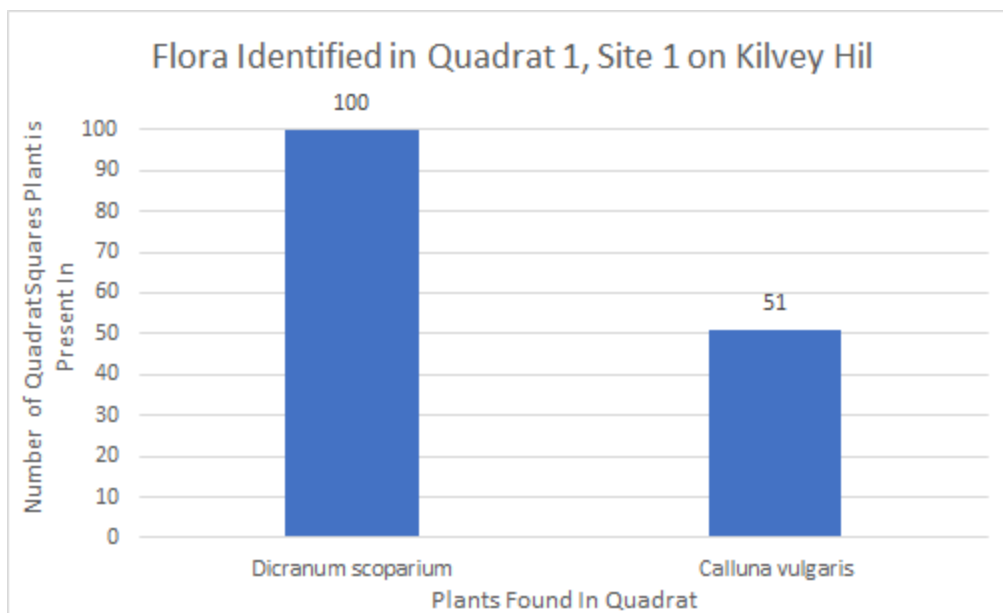


Figure 5: Quadrat 1, Site 1 data.

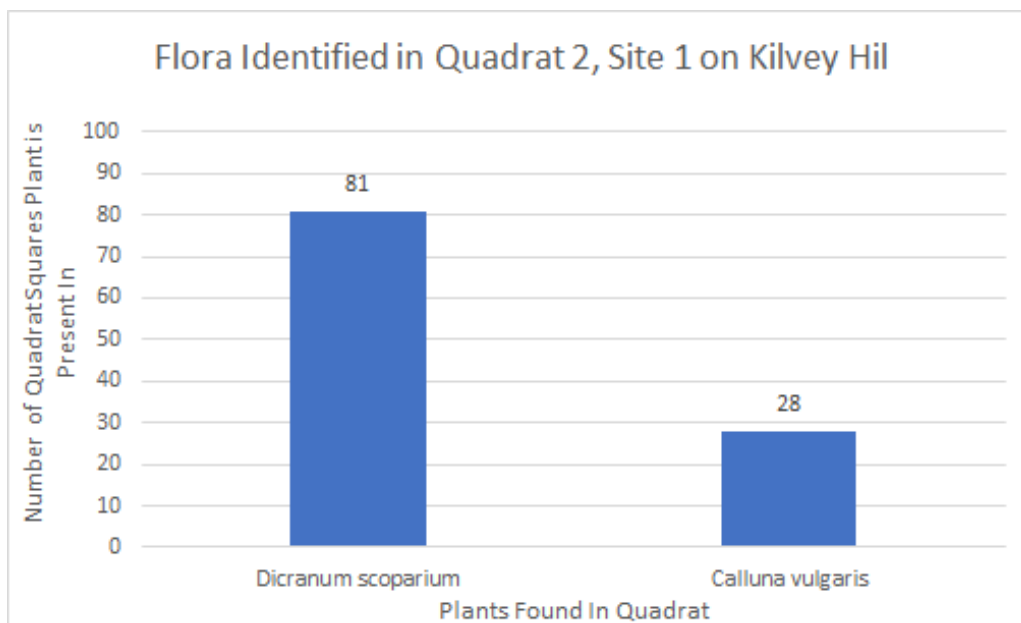


Figure 6: Quadrat 2, Site 1 data.

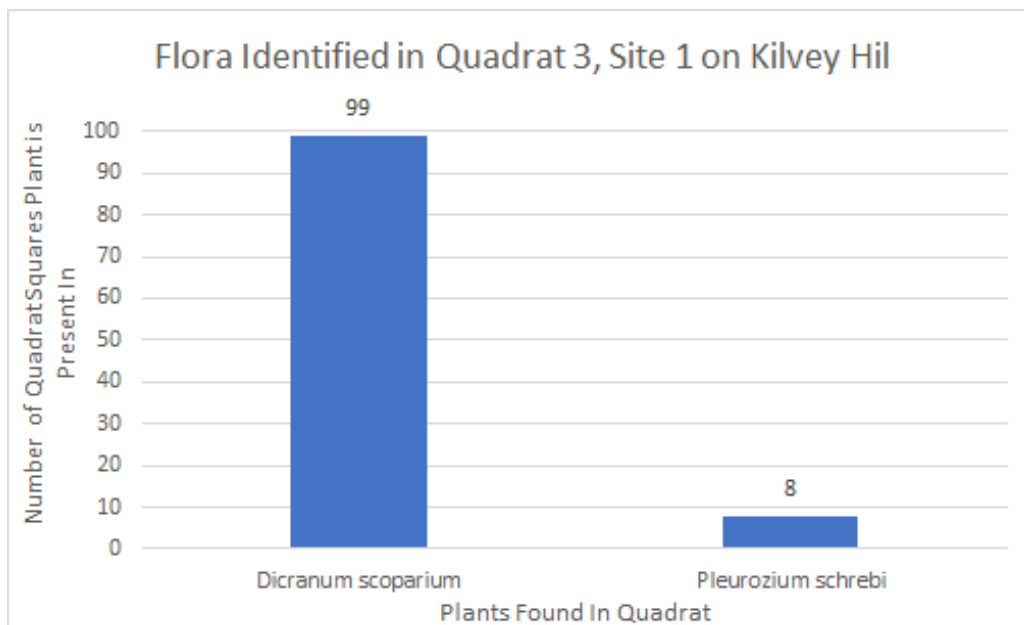


Figure 7: Quadrat 3, Site 1 data.

These show that *Dicranum scoparium* is very common on site 1, with a very slight *Pleurozium schrebi* presence and a middling amount of *Calluna vulgaris*.

Next, site 2 was sampled, with the same transect and three quadrats sampling regime. Shown below are these results.

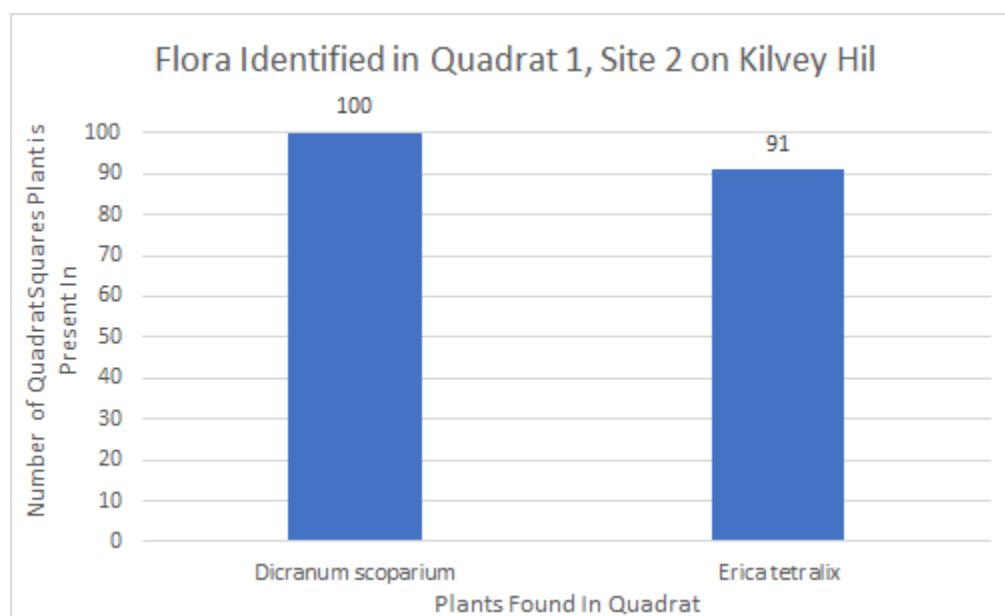


Figure 8: Quadrat 1, Site 2 data.

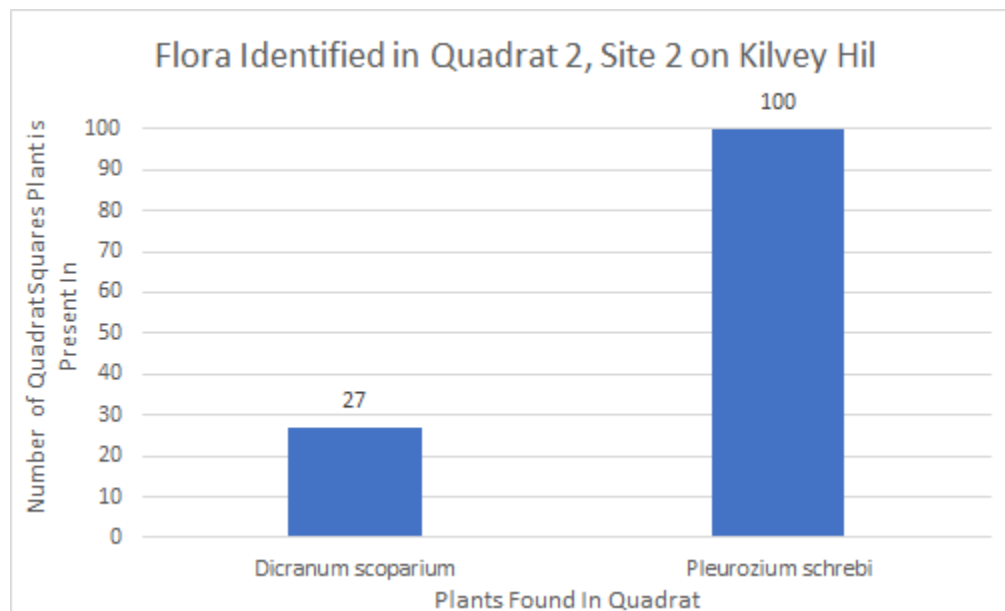


Figure 9: Quadrat 2, Site 2 data.

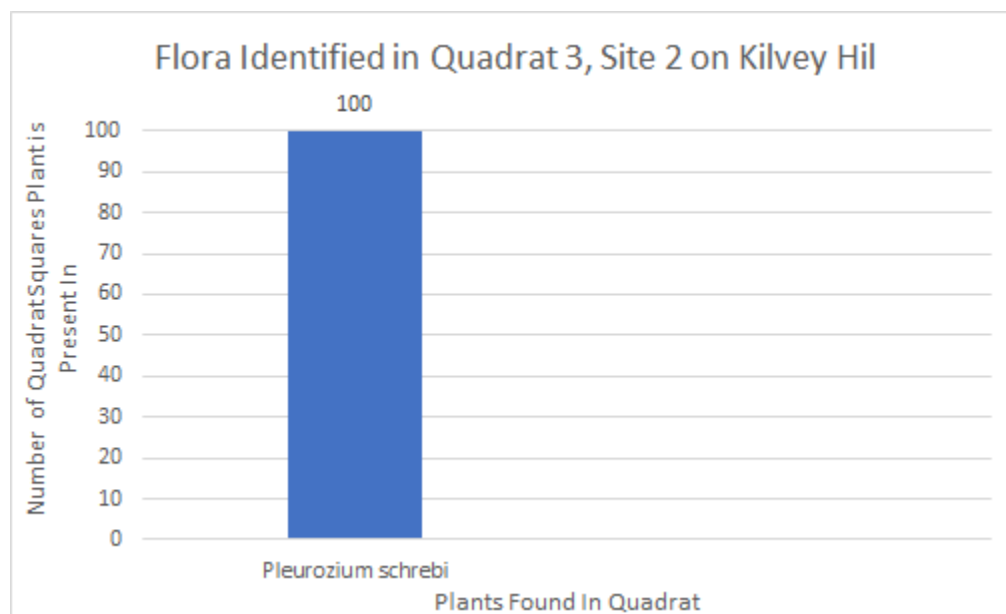


Figure 10: Quadrat 3, site 2 data.

These display the presence of *Erica tetralix*, and a large amount of *Pleurozium schrebi* was also recorded. Overall, only four different species were recorded in the six transects taken on Kilvey Hill across the two sites. Both *E. tetralix* and *C. vulgaris* had white flowers, compared to the usual pink displayed in identification guides. Figure 11 shows the two sampling sites.



Figure 11: Site 1 (left) and Site 2 (right).

Also identified on the site were several bird species: the European Robin (*Erithacus rubecula*), the Eurasian Magpie (*Pica pica*) and several House Sparrows (*Passer domesticus*). Each of these specimens appeared both outwardly healthy and to have the appropriate habitat necessary to complete their life cycles. Three Common Newts (*Lissotriton vulgaris*) were also spotted in the pond that is present on the site.

4. Discussion and Analysis

4.1 Flora

The data collected shows some differences between site 1 and site 2. The sites selected were quite similar in terms of environmental conditions, with the exception of the history of pollution in the area. They were both adjacent to conifer woodland, with plenty of water available. On site 1, *Calluna vulgaris*, the common heather, is present. This plant prefers more acidic soils (Bradbury, 2022), and as pollution can cause the acidification of soils (Goulding, 2016), it is unsurprising to see this plant growing on this site. On Site 2, however, no *C. vulgaris* was present. Present

instead was *Erica tetralix*, also called bog heather or the cross-leaved heath. This small shrub also prefers a more acidic soil like *C. vulgaris*, but also prefers a wetter soil (Plants For a Future, 2023).

Both these plants are typically described as having pale pink flowers, but on this site they each had completely white flowers (see figure 12). This could be due to nutrient deficiencies, as these are more common in plants growing in highly acidic or alkaline soils (Royal Horticultural Society, 2023a). There are also white forms of both of these plants, such as *Erica tetralix* f. *alba* 'Alba Mollis' and *Calluna vulgaris* 'White Lawn', and as these are popular garden cultivars, it is a possibility that they may have escaped from a local garden and colonised Kilvey Hill (Royal Horticultural Society, 2023b; Shoot Gardening, 2022). Whether the difference in colouration is beneficial or detrimental to the plants' ability to attract pollinators and so on is unclear, and this could benefit from further study.



Figure 12: *Erica tetralix*, with white flowers.

4.2 Management on Kilvey Hill

Urban fringe green spaces such as Kilvey Hill can have unique management issues. Supporting a large number of people, with a multitude of different desired activities and attitude to the environment, can be challenging to balance with conservation goals, as reported by Rotherham (1996). The different groups using the space may also conflict with each other, as described by Bell *et al* (2003) in their study regarding the fear people hold towards teenagers using a green space, even if their actions are not actually negative.

Kilvey Hill is managed mainly by Natural Resource Wales, who create a new 'Forest Resource Plan' to manage each of their sites every decade. Current goals include the removal of non-native *Larix* and *Pinus* trees to be replaced by native broadleaf specimens instead, with a focus on having a diverse enough range of these to resist diseases. Increasing access by improving roads and maintaining paths are also focuses highlighted in this plan (Natural Resources Wales, 2021).

The flora survey undertaken in this report found a limited range of species. Conifer plantations tend to support less biodiversity than native broadleaf woodland, partially because plantation style arrangements are dense and block out light that would allow the forest layers below the canopy to thrive (Norborg, 2023). However, a biodiverse forest has been shown to provide a wide number of ecosystem services, including improved habitat provision, wind resistance, carbon sequestration and cultural services (Brockerhoff *et al*, 2017). Cultural services in this instance refers to the interactions between people and woodland, which can include education, spiritual values, and aesthetic enjoyment.

Raising awareness of the benefits of biodiversity, and increasing knowledge in the local population about native species and healthy woodland ecosystems could benefit Kilvey Hill. As

it is such a popular site, the local population need to be involved in management to lessen the risk of vandalism, as the Lower Swansea Valley project discovered in the 1960s, but research into pollution tolerant native species, both understory plants as well as tree species, which could be planted on the hill could be a useful step to enhancing the biodiversity found on the hill. This would benefit the local community in the long run.

5. Limitations of Study

There are several potential limitations that have been identified in this study. A small amount of samples were gathered to base this study on, and further sampling may reveal new information and eliminate potential biases. Furthermore, the sampling only took place on one day. To examine the full range of flora present on Kilvey Hill, surveys should be undertaken in all seasons. Studies of the soil quality and structure and water quality on the site would also present information that could be relevant to the growing ability of the site's flora.

An additional limitation to this study was the fact that no local people were involved. People who have lived in a particular area may have a different perspective on management gained through experience of the place in question, and may know details of the place's history that are harder to find in written records unless it is known what to look for.

6. Conclusion

This report set out to examine and compare the flora of different sites on Kilvey Hill, with the intention to use this information to assess the management of Kilvey and identify potential ways to move forward. The results showed a low level of biodiversity, with forest understories primarily dominated by mosses, which highlights the need for biodiversity improving strategies to be kept in mind in future management. Management plans also have to factor in the high use of the site, and the industrial contamination issues when planning for the future. Ways to do this may include ensuring that paths are clearly demarcated and maintained so they are accessible and people are more inclined to stay on them and avoid damaging habitat nearby, and natural screening of areas that should be avoided such as delicate habitat sites by use of hawthorn (*Crataegus monogyna*) or blackthorn (*Prunus spinosa*).

There is an extensive legacy to this site, with social, environmental and industrial history all alongside, and it still provides important ecosystem services to the local population to this day. What really stood out in this study is how much of a unique site this is, and how many opportunities there are for conservation, and getting communities involved in improving the conditions of their local area. Kilvey Hill definitely requires further studies.

7. Reference List

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