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Is Nature on Par?

Do golf courses encourage biodiversity?

A field study of the ecology of golf courses and their respective surrounding areas.

By Luke Wallis



QR Code for Darlington and Pike Hills Golf Club



Introduction

The United Kingdom is currently experiencing a wildlife crisis, with species becoming increasingly threatened and biodiversity being lost.

To try and prevent further loss to our remaining wildlife, it is important to identify, investigate and protect areas that naturally harbour and encourage species biodiversity.

Golf courses are well managed areas of grasslands, hedgerows and forests that are often comprised of ponds, lakes and other open spaces which can often seem an ideal habitat for animals. There are approximately 2600 golf courses across the UK alone accounting for 0.7% of the total land area (Tanner and Gange, 2005).

With the UK being densely populated by golf courses, it is likely to assume that the wildlife and habitats will be affected by this new and increasing landscape but whether negative or positive was to be determined.



Figure 1: Golf Course and Flag [Source; Adobe Stock, 2024]

Aims and Objectives

To discover the biodiversity of golf courses and their surrounding landscapes
To discover their relative species richness, abundance
To devise and complete three transects for each golf course, gathering data through the use of multiple surveying methods such as pond dipping, sweep nettings and spot counts.
To explore what types of species are found on and around golf course and be able to justify why and discover the potential that golf courses can provide for wildlife conservation.

Hypothesis

H_0 : There will be no statistically significant difference between the biodiversity of the golf courses compared to their surrounding areas.

H_1 : There will be a statistically significant difference between the biodiversity of the golf courses compared to their surrounding areas.

Literature Review

The R&A's Golf Around the World 2019 study revealed that there 38,864 golf courses and 78% was located in just 10 countries (Elliot, 2019). Golf courses are subject to much debate in environmental terms because their construction involves modification of natural habitats (Warnken *et al.*, 2001). In addition to this land fragmentation and the impacts of the usage of pesticides on golf courses have become more important issues as the number of golf courses has increased (Fushiwaki *et al.*, 1993; Saravanan 2015).

Many studies that Tanner (2004) analysed between 1987-2000 showed that golf courses compare well in terms of wildlife abundance and diversity to that of adjacent areas of land. Residential development within golf course boundaries appears to have a negative effect on local abundances (Price, 2013) which implies that the surrounding area of golf courses might play just as much as a role in biodiversity preservation as the golf course does. Studies from Colding (2009), reinforced the idea that golf courses had a higher ecological value, as 64% of golf courses had higher biodiversity when compared to other green-area habitats .

Methods

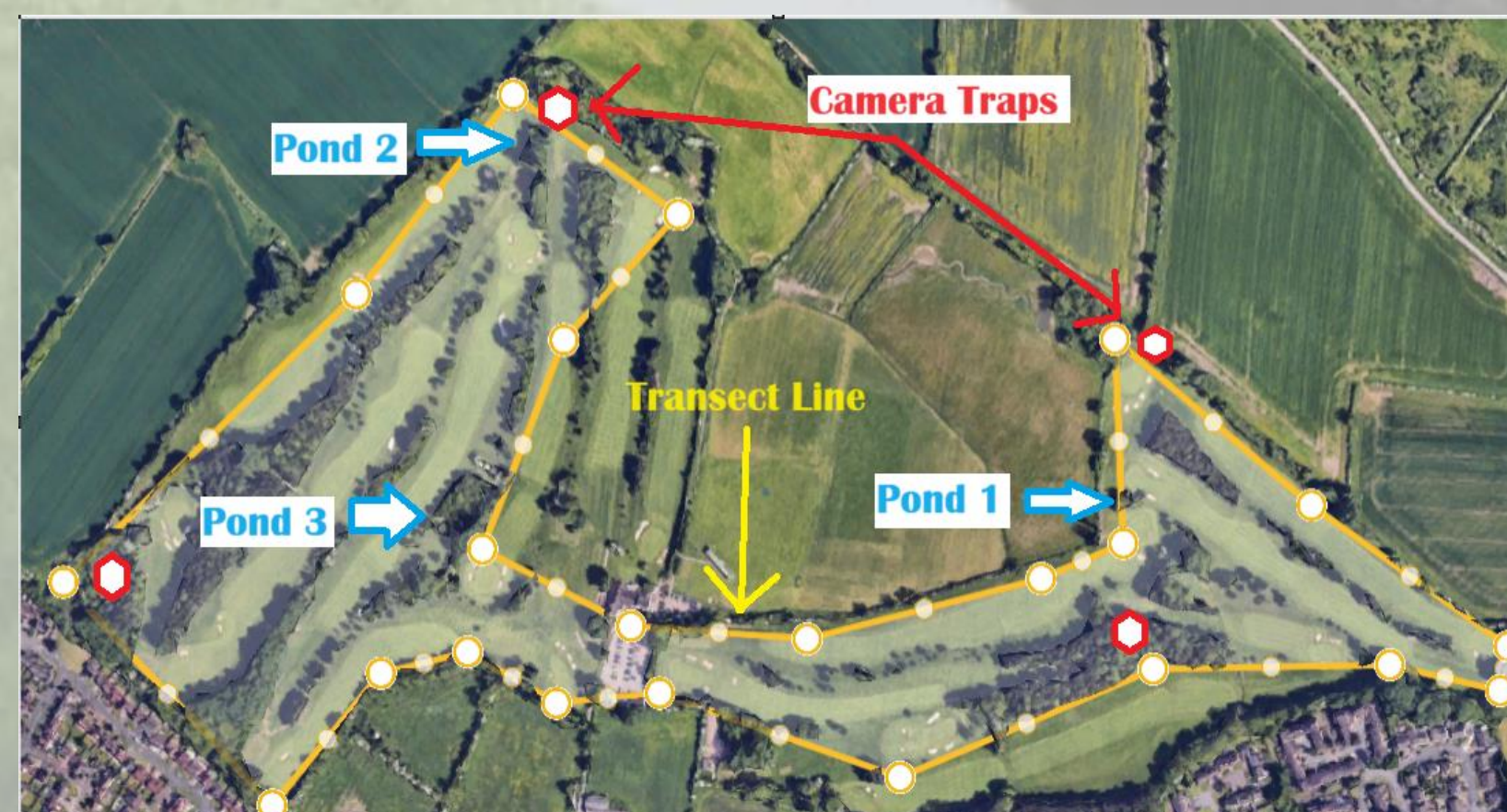
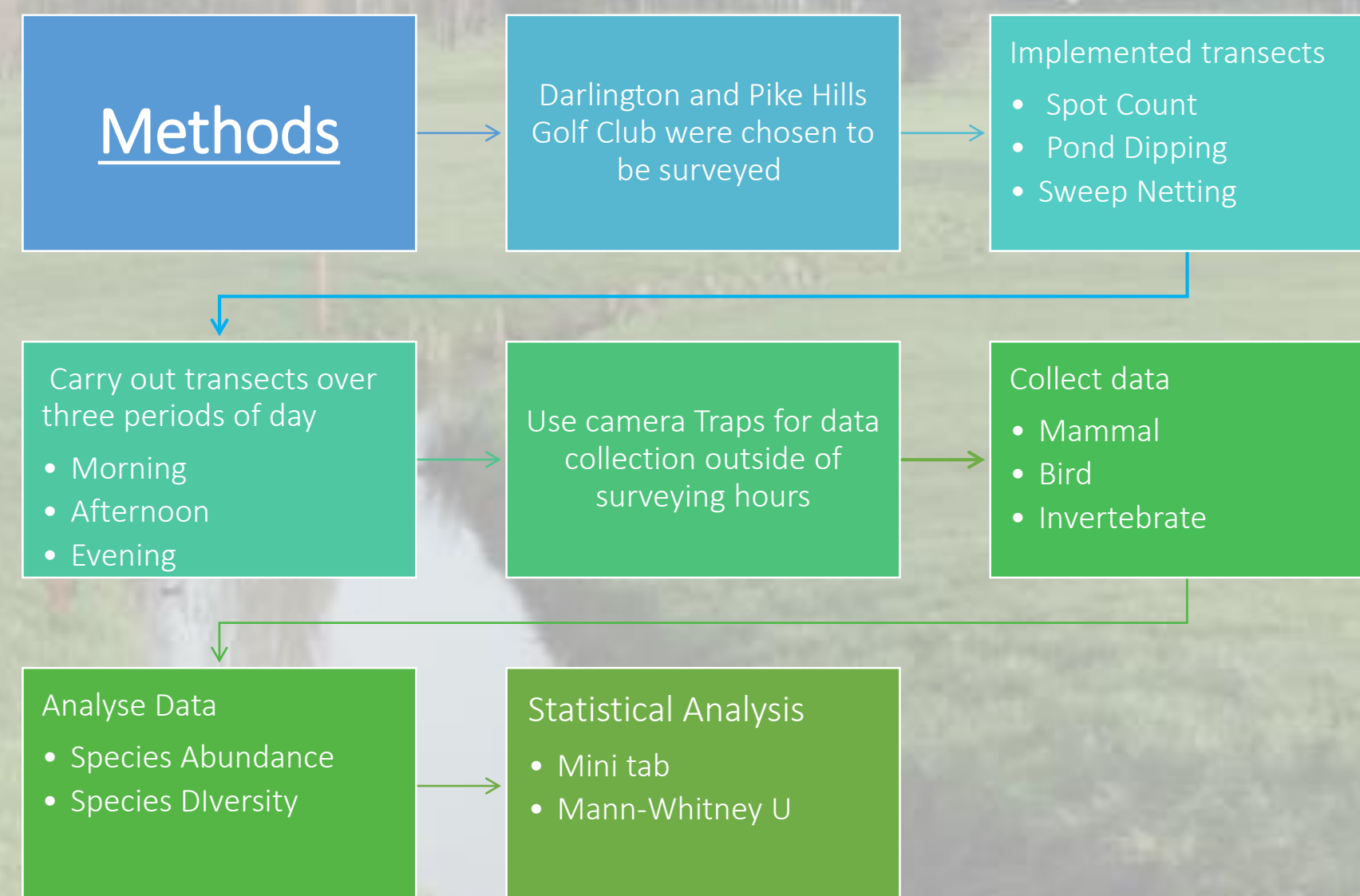


Figure 2: Darlington Golf Course Survey Area [Source; Google Earth, Author's Annotations, 2024]

Results

Species Abundance: There was a statistically significant difference between the abundance of species on golf courses versus that of the surrounding areas of the golf courses (Mann-Whitney U test: $W = 928$, $N = 28$, 28 , $p = 0.033$)

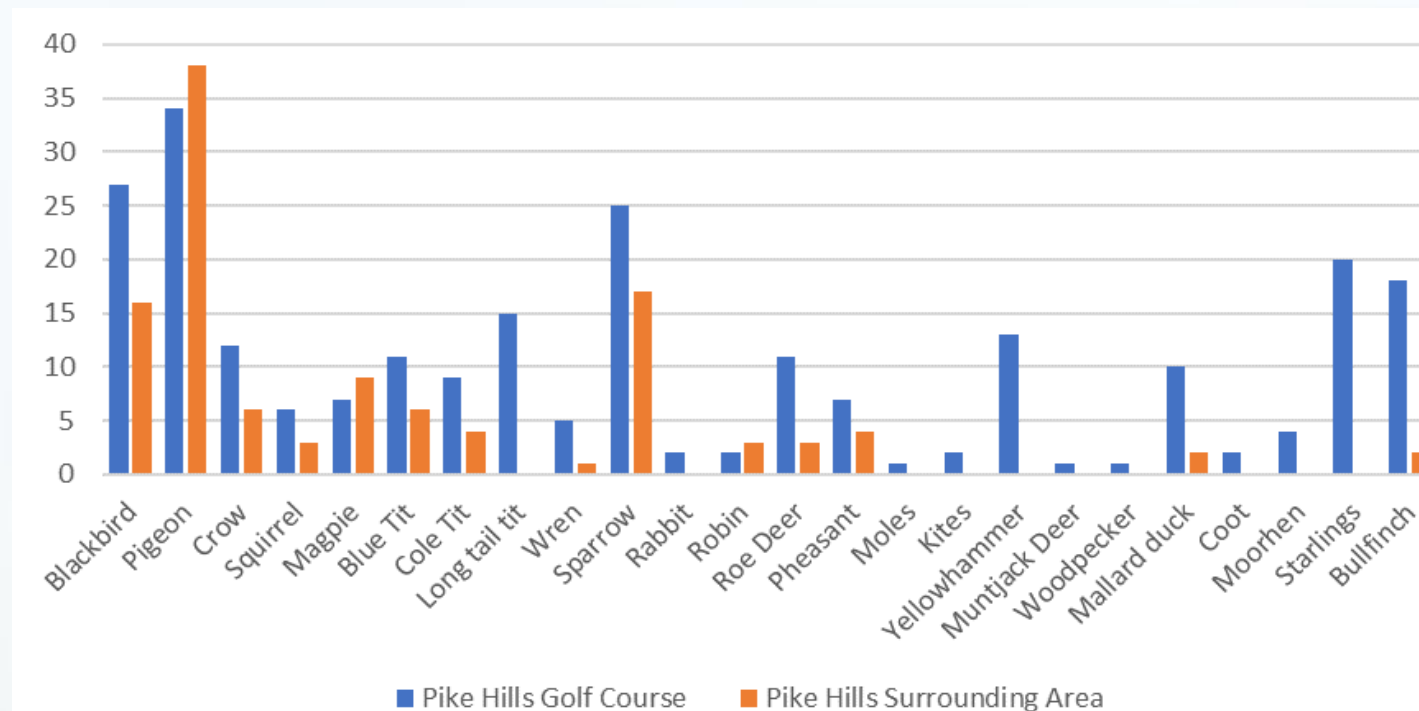


Figure 3: Terrestrial Abundance for Pike Hills Golf Course

Biodiversity Score: There is no statistically significant difference between the biodiversity of aquatic animals on golf courses compared to that of the surrounding landscapes (2-sample t-test $t_4 = -2.94$, $p = 0.099$).

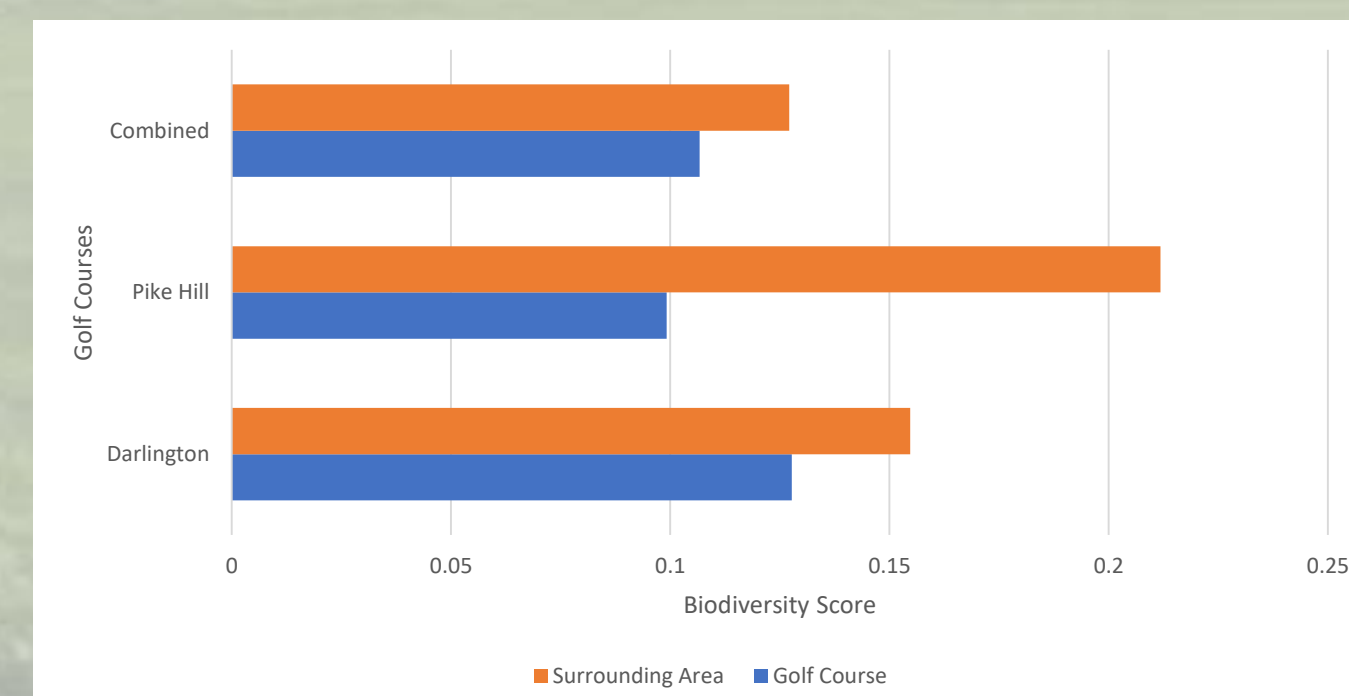


Figure 4: Simpson's Biodiversity Index for Terrestrial Diversity

Aquatic Biodiversity: There is no statistically significant difference between the biodiversity of aquatic animals on golf courses compared to that of the surrounding landscapes (2-sample t-test $t_4 = -2.94$, $p = 0.099$).

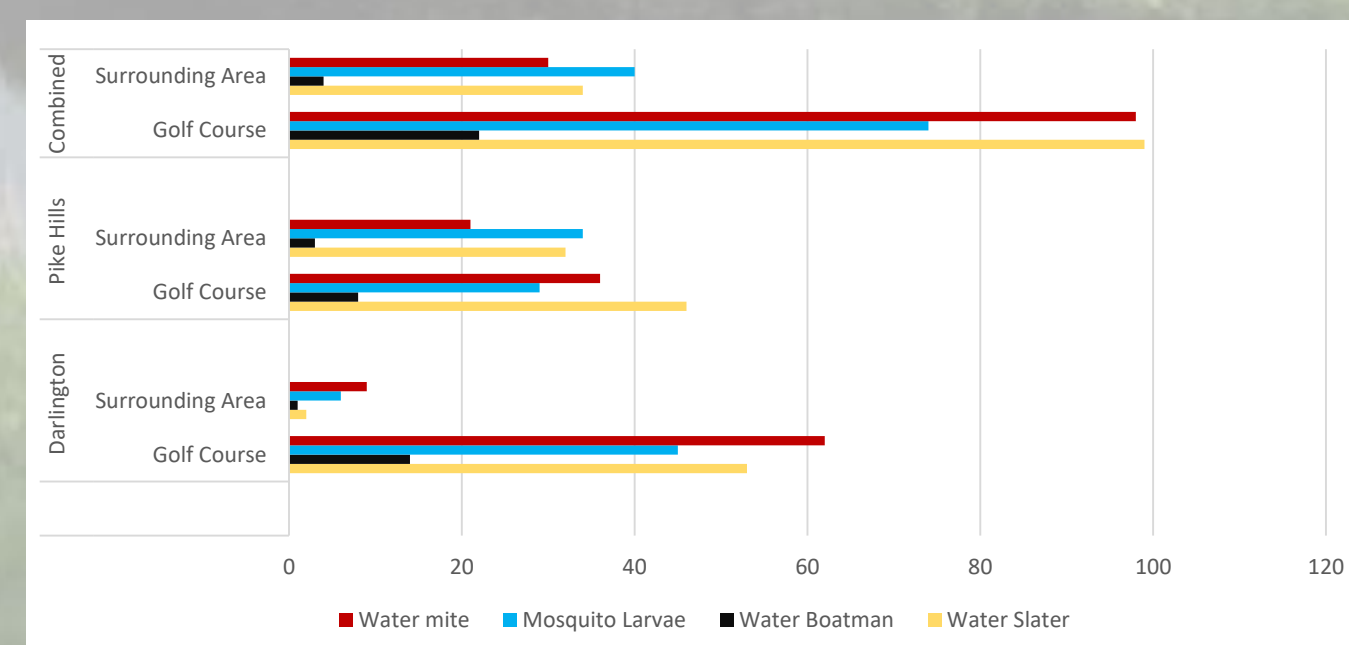


Figure 5: Bar Chart of Aquatic Biodiversity Levels

Discussion

Overall, golf courses have demonstrated strong levels of aquatic and terrestrial biodiversity, with the surrounding land even mirroring some of the resident species but just to lesser numbers.

Pike Hills demonstrated rich aquatic diversity. This is likely due to its cohabitation of habitat and surrounding landscape with Askham Bog. Askham Bog is a survivor of the ancient fenlands of Yorkshire, occupying the site of an ancient lake (Yorkshire Wildlife Trust, 2024). The findings of rich aquatic invertebrates are comparable to that of Dixneuf *et al* (2021) as seasonal ponds have been observed to attract more birds and other wildlife than permanently open water bodies.

Studies from (Colding, 2009) found that 64% of golf courses had higher ecological value than the compare set of land types. That is parallel to the findings of this study. Although there was no statistical significance in comparisons of golf courses and their surroundings ($p=0.08$), the overall abundance and individual species found specifically on golf courses fuels these findings

Analysis of data recorded from these surveys resulted in high species diversity on the Simpson's index and a statistical difference between the abundance of golf course sightings compared to their surroundings. Despite not showing a statistically significant difference between their diversity comparisons, it is safe to say that golf courses do provide a higher ecological value than that of surrounding land.



Figure 6: Red Fox and Roe Deer [Author's Own, 2024]

References

- Colding, J. and Folke, C., 2009. The role of golf courses in biodiversity conservation and ecosystem management. *Ecosystems*, 12, pp.191-206.
- Dixneuf, C., Peiris, P., Nummi, P., Sundell, J. (2021). Vernal pools enhance local vertebrate activity and diversity in a boreal landscape. *Global Ecology and Conservation* 31
- Elliot H., 2019. How many golf courses are there in the world? [Accessed 21/03/2024]. Available at: <https://www.golfmatters.com/courses/how-many-golf-courses-are-there-in-the-world-182113/>
- Fushiwaki, Y., Hamamura, T., Hasegawa, A. and Urano, K., 1995. Environmental pollution by pesticides from golf courses in Kanagawa Prefecture
- Saravanan, M., Kim, J.Y., Kim, H.N., Kim, S.B., Ko, D.H. and Hur, J.H., 2015. Ecotoxicological impacts of isoprotholane on freshwater fish *Cyprinus carpio* fingerlings: a multi-biomarker assessment. *Journal of the Korean Society for Applied Biological Chemistry*, 58, pp.491-499
- Tanner, R.A. and Gange, A.C., 2005. Effects of golf courses on local biodiversity. *Landscape and Urban planning*, 71(2-4), pp.137-146.
- Warnken, J., Thompson, D. and Zakus, D.H., 2001. Golf course development in a major tourist destination: implications for planning and management. *Environmental Management*, 27, pp.681-696.
- Yorkshire Wildlife Trust. 2024. Askham Bog. [Accessed 20/03/2024]. Available at: <https://www.ywt.org.uk/nature-reserves/askham-bog-nature-reserve>