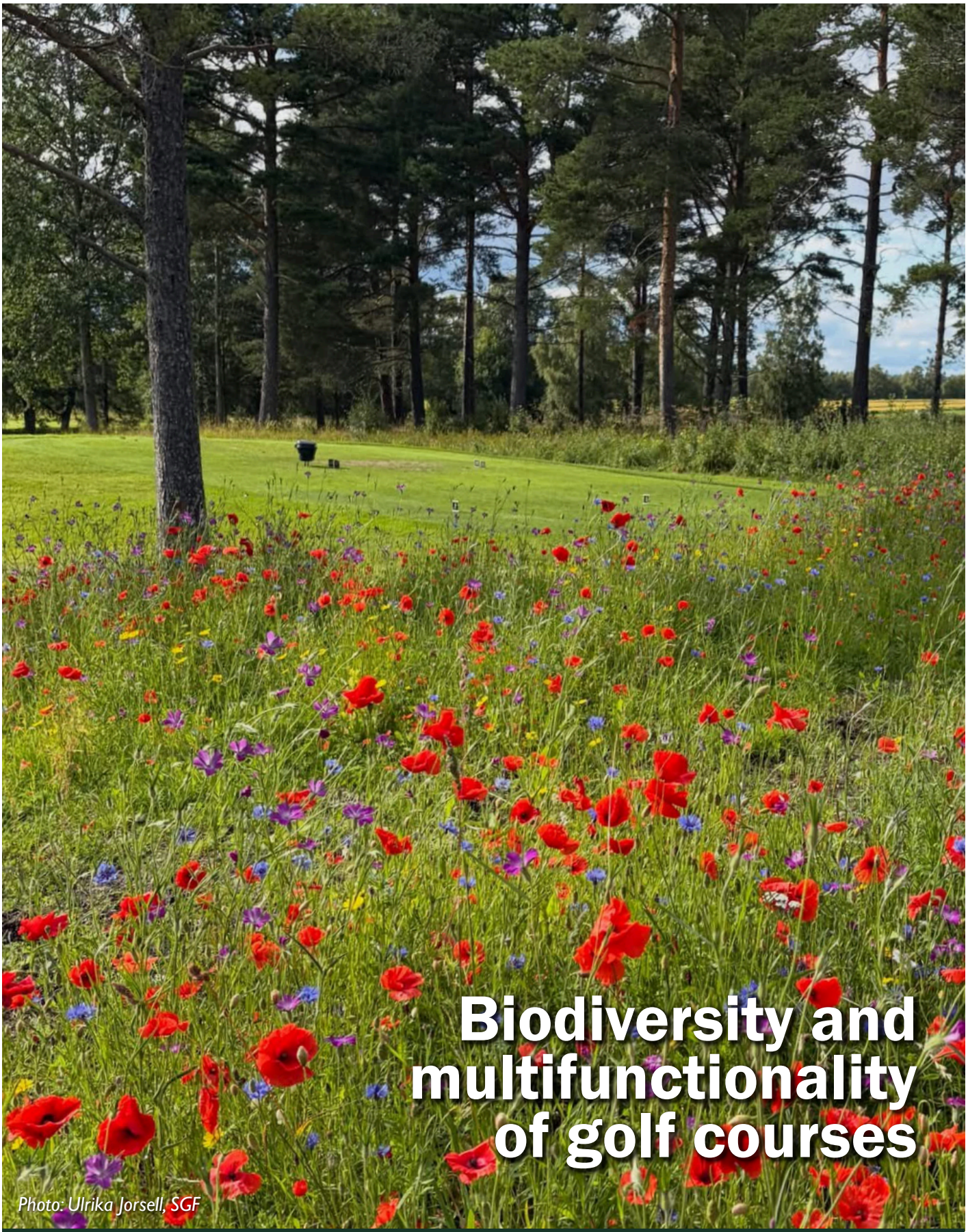


Biodiversity and multifunctionality of golf courses

Photo: Ulrika Jorsell, SGF

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Biodiversity and multifunctionality of golf courses

A landscape perspective is important for understanding and promoting biodiversity, particularly how different organisms disperse through the landscape and use different resources for food, nesting and overwintering. This knowledge could probably be used more effectively when designing, constructing and renovating golf courses. In particular, it is important to consider how measures implemented to enhance biodiversity on golf courses can have positive effects at the wider landscape scale, and how landscape characteristics can strengthen the effects of measures implemented on the course itself. See Figure 1 for an example.

Over the past few years, we have conducted a research project investigating how landscape characteristics influence biodiversity on golf courses, with support from STERF and the R&A. In total, we studied 40 golf courses around Oslo, Stockholm, Copenhagen, Munich and Manchester. We conducted landscape analyses using GIS and remotely sensed data for the golf courses and a 1-km buffer around each course, combined with field surveys to document vegetation and birds on the courses. Different habitat types on the courses and in the surrounding landscapes were classified based on vegetation characteristics (Figure 2). The courses were selected to represent different sizes and locations along an urbanisation gradient.

We found that the species richness of both birds and plants was more strongly determined by characteristics of the golf course itself than by the surrounding landscape. Particularly important factors were the amount of tree cover on the course and the number of different habitat types present. Nevertheless, we found somewhat higher species richness on golf courses in urban areas than on courses outside cities. This is a pattern that is often observed, as the combination of private gardens, parks and other green spaces can provide resources for many species compared with more homogeneous forest and agricultural landscapes. Species composition may also differ depending on the resources available.

Not surprisingly, rough and semi-rough areas are important for species diversity, but trees and wooded patches dominated by deciduous species also support many species. Together, these habitat types contained a large proportion



Figure 1. An illustration of the opportunities provided by different landscape contexts. On the left, Sola GK is situated within coastal heathland and dune systems, while Hauger GK, on the right, is in a productive ravine landscape. The surrounding landscape determines both how biodiversity measures on the golf course can contribute at a wider landscape scale and how landscape qualities affect the effectiveness of measures on the course. © Norwegian Mapping Authority, Geovekst and municipalities (Sola 2018, Nedre Romerike MOF 2023).

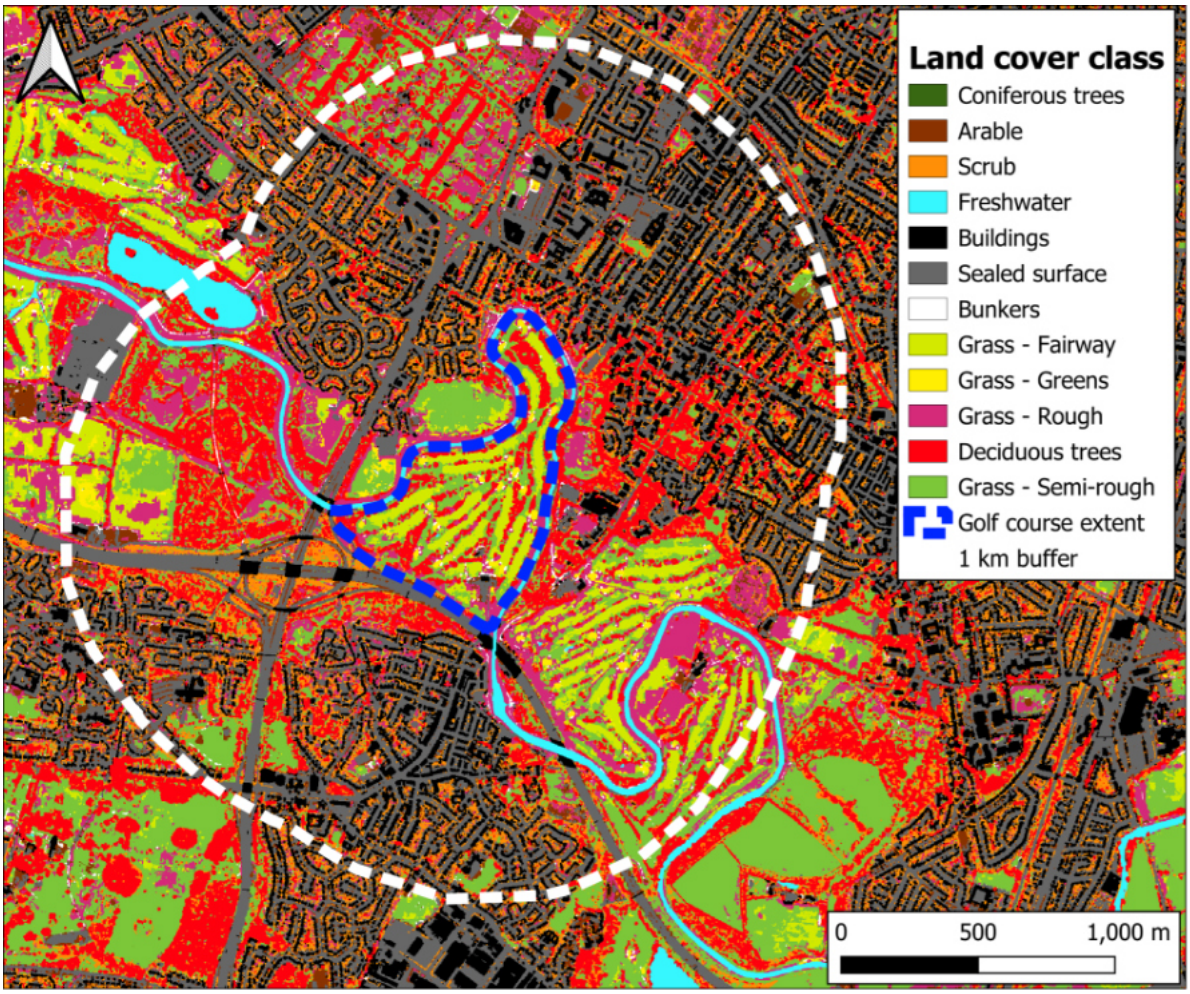


Figure 2. An example of habitat classification on and around golf courses based on remote-sensing data. Shown here are two golf courses in an urbanised area of Manchester. Illustration: Christopher Marston.

of the plant species, although most habitat types contributed unique species to the overall species pool. The importance of large, old trees and wetland habitats for biodiversity is already well documented. A couple of good examples are shown in Figure 3.

The golf courses also contributed habitat elements that were less common in the surrounding landscape. This generally increases the overall number of species supported by the landscape. Bird and plant species richness were positively correlated and increased with the number of habitat types present on a golf course. A greater diversity of habitat types is easier to accommodate on a larger course, but we also found that smaller courses can make equally valuable contributions relative to their area. However, this requires more carefully considered design and management, as well as maintaining the quality of existing habitats. Other research has also demonstrated the importance of retaining existing natural features such as wetlands, old trees, and species-rich heathlands and grasslands when designing, constructing or renovating golf courses. Such habitats often have a level of ecological complexity and quality that is difficult to recreate.

The project also examined multifunctionality on golf courses and how golf clubs can assess their own contributions to functions such as stormwater management, soil carbon sequestration and habitat provision, as well as activities and benefits such as recreation. Our recommendation is to improve the quality of functions where performance is currently low, while placing particular emphasis on a few priority areas that can be developed in collaboration with local communities, such as recreation and education.

We did not have sufficiently detailed data to estimate multifunctionality for the individual golf courses. However, we have prepared a short guidance document outlining how golf clubs can take steps towards developing more multifunctional courses. The document also reviews the most important habitats and natural features for biodiversity, which is an important component of multifunctionality. This information



Figure 3. We found that measures implemented on the golf course were more important than the characteristics of the surrounding landscape. Shown here are examples of a species-rich rough and a well-developed, low-growing riparian buffer along a stream at two of the German golf courses included in the study. (GC Wörthsee and GC Eichenried, respectively). Photo: Johannes Kollmann.

should be useful for golf clubs wishing to take a more systematic and ambitious approach to biodiversity. Both the project report and the guidance document on multifunctionality are available at https://sterf.org/projects/golf-landscapes/.

Action points

- Preserve as much existing natural habitat as possible when constructing or renovating golf courses.
- Give priority to conserving old trees, woodland patches, wetlands, grasslands and heathlands, and vegetation along wetland margins.
- Promote species-rich rough and semi-rough areas by adapting mowing regimes.
- Consider opportunities to establish additional habitat types on the golf course.

Biodiversity is the variation of life at all levels, from genetic variation within species and the diversity of species to the diversity of habitat types, ecosystems, and landscapes. The concept also encompasses interactions among organisms and between organisms and their environment, as well as the ecological processes that maintain the structure and functioning of nature and its capacity to adapt to change.

GIS refers to the use of digital tools and software to analyse and visualise spatially referenced data.

Habitat is the natural environment or home where a plant, animal, or other organism lives, grows, and reproduce. Here we use it in a broad sense, comparable to the term biotope.

Multifunctionality describes the extent to which a given area supports multiple functions simultaneously, for example biodiversity, carbon storage, stormwater management, and recreation.

Remote sensing is in this context the observation of characteristics of the Earth's surface, in our case using satellite and aerial imagery.

GOLF LANDSCAPES
Biodiversity and multifunctionality of golf courses

Period:

2023 to 2025

Objective:

Provide knowledge of how golf courses can be designed and managed to improve their contributions to biodiversity and multifunctionality at the landscape scale.

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