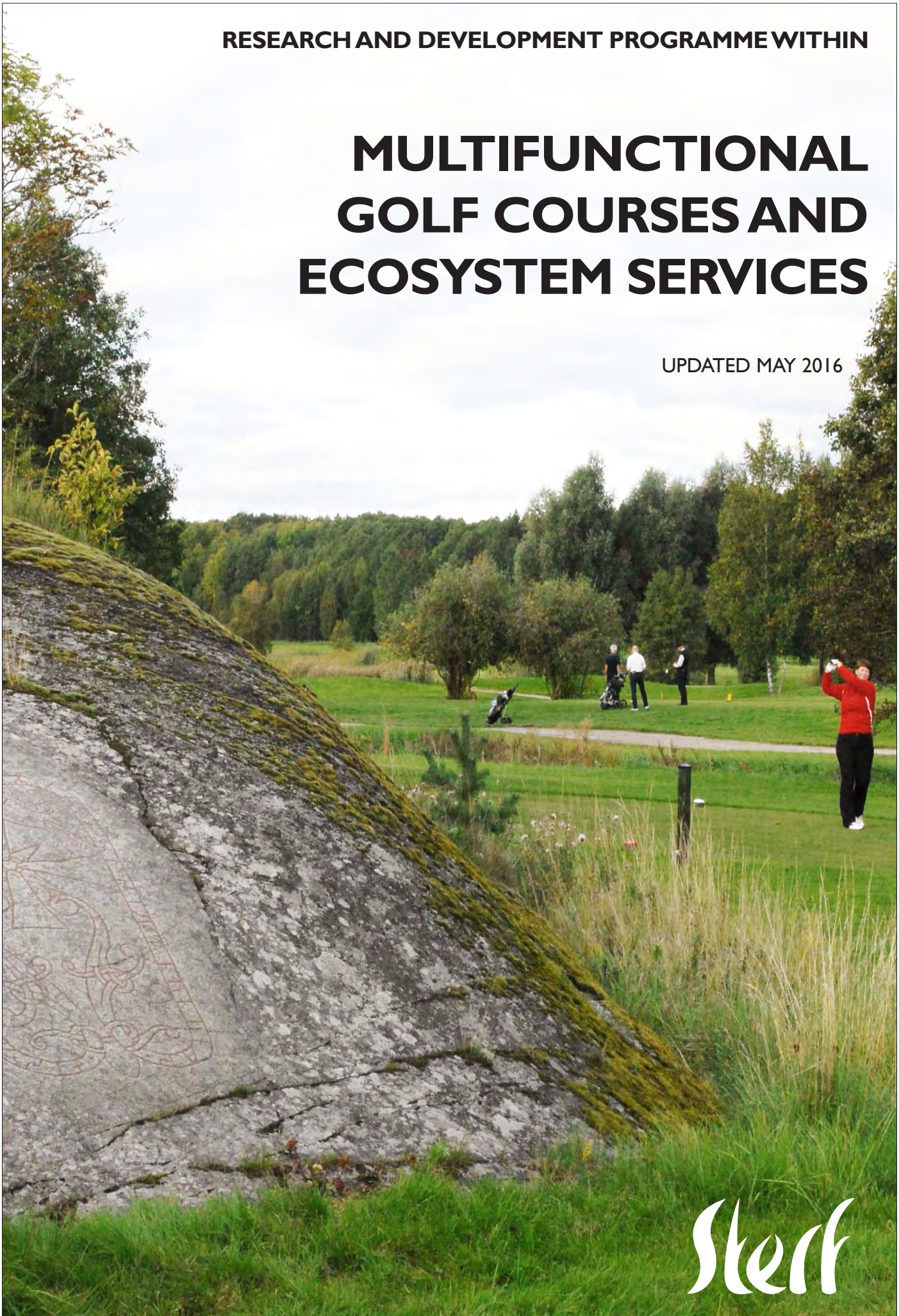


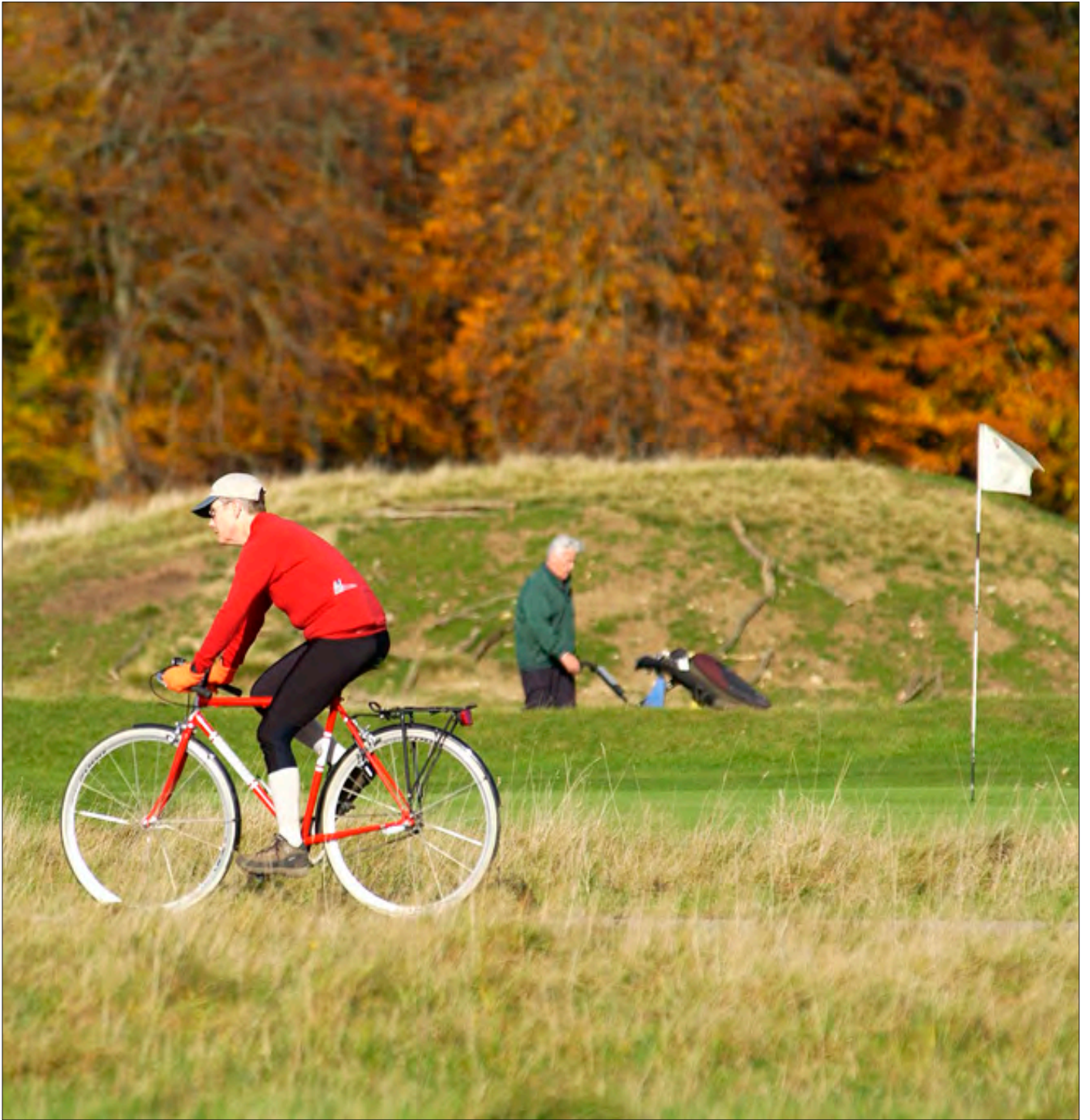
RESEARCH AND DEVELOPMENT PROGRAMME WITHIN

MULTIFUNCTIONAL GOLF COURSES AND ECOSYSTEM SERVICES

UPDATED MAY 2016



Steff



SUMMARY AND CONCLUSIONS

In this programme we describe the current position and present the need for research, development and communication so that golf courses can be transformed into more multifunctional facilities. Through the programme, we also want to demonstrate the potential of the golf sector to contribute to the achievement of important international and national environmental quality objectives, for example as an actor in the collaboration on green infrastructure, and to help improve people's health and their quality of life. Multifunctional golf courses can also contribute to implementation of the European Landscape Convention. In addition, we want to show that a multifunctional approach can be profitable for individual golf clubs.

Multifunctional golf courses are currently an under-utilised resource. If golf courses were to be used to supply a number of functions, this would provide a range of important services that are in demand by society. In addition to offering a high quality arena for golf, golf facilities could also contribute e.g. to improving biological diversity, conserving natural and cultural environments and providing recreation areas that are open to the public and to other outdoor activities.

Many golf courses are currently experiencing economic problems and are attempting to find new ways of supporting and expanding their operations. Multifunctionality can provide opportunities for alternative income and build a better foundation for the club within the local community through work on the environment. It can also provide opportunities for sustainable development, better cooperation and in many cases cost sharing with the authorities, environmental and outdoor recreation organisations and other sports as-

sociations, create a more favourable profile among the general public and attract stronger political support. The aim of this R&D programme is to create the conditions for development of greater numbers of multifunctional golf courses. In order for this to be achieved, greater competence is needed at all levels within the golf sector and among other parties in society that are interested in the land used for golf courses. The following questions must be answered:

- How can golf courses contribute to the production of biological diversity, the conservation of natural and cultural environments and the retention and expansion of ecosystem services in periurban environments and the cultivated landscape?
- How can the societal benefit of golf courses be increased by courses increasing their accessibility and participation, thereby improving the conditions for good quality of life and better mental and physical health for more groups in society, e.g. through providing a broader active outdoor life, experiences of nature and better climate adaptation in the everyday landscape?
- How can the business advantages of multifunctional activities be identified and expanded for different types of golf facilities?

STERF has identified four central research and development areas in order to answer the questions above:

1. The everyday landscape and periurban nature.
2. Nature and culture.
3. Dialogue and cooperation.
4. Business promotion.



MULTIFUNCTIONAL GOLF COURSES

Earlier work in the Nordic countries

The concept of multifunctional golf courses was created through the project “Multifunctional golf courses – an underutilised resource”, which was carried out by STERF (Scandinavian Turfgrass and Environment Research Foundation) with the support of the Nordic Council of Ministers in 2010-2011 (Strandberg et al., 2011). The project identified and described examples of multifunctional activities at seven Nordic and one Dutch golf course. These examples show that a multifunctional golf course can provide opportunities to develop a range of services that are in demand by society, for example increasing biological diversity, conserving nature and culture values and making them available to the public, and creating areas for recreation and outdoor activities for a number of groups other than golf players. The study also showed that cooperation is a critical factor for achieving multifunctionality. Other results show that a multifunctional approach can be profitable for golf clubs while also strengthening their place and benefit in society through work on the environment and sustainable development (Colding, 2009a, 2009b; Wernersson, 2009; Sörensson, 2010; Strandberg et al., 2011; Caspersen, 2014; Skarin, 2015; Dahl-Jensen, 2016).

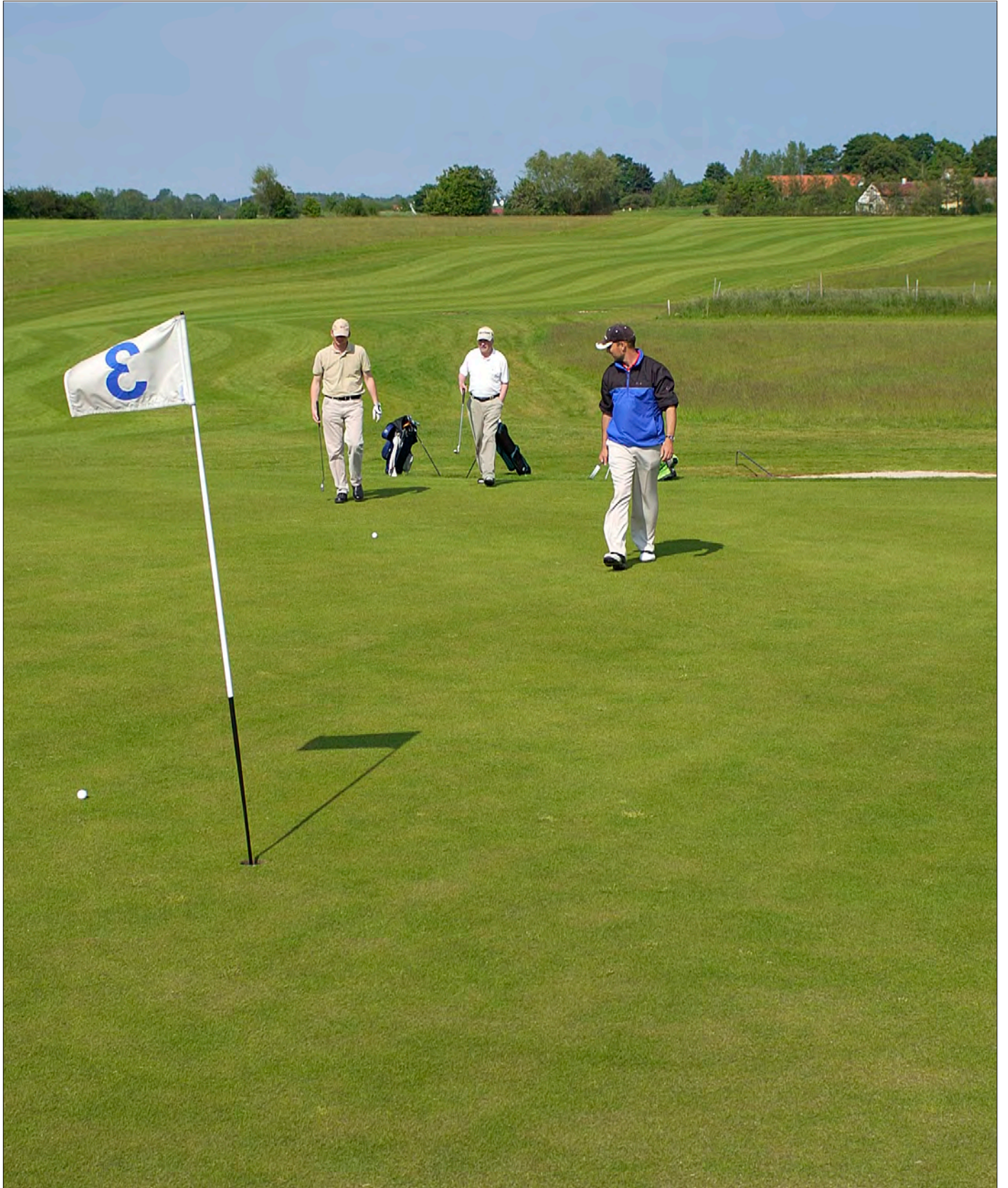
Hypotheses

Based on experiences from completed projects and in consultation with various actors in society, STERF’s hypotheses are:

- that multifunctional golf courses can help increase the societal benefits of golf through running their operations based on a holistic perspective in which efficient use of green areas and public interest in nature and recreation is central. In addition to offering a high quality arena for golf, these facilities can contribute to the achievement of important international and national environmental quality

objectives and to improving people’s health and quality of life. The potential for this is particularly great in periurban environments and in the cultivated landscape, where a large number of golf courses are located and where competition for land is high.

- that golf courses can be important actor in collaborations on green infrastructure and can make a concrete contribution to implementation of the European Landscape Convention. Multifunctional golf courses can help protect, preserve, restore and recreate important habitats, ecosystem functions and natural processes. In and around major city areas, the land available to the public is limited. Golf courses can be very significant in terms of varied uses and readily accessible recreation opportunities for many people in such areas. Golf courses can be a potential meeting place for outdoor activities, nature and sport and can promote democracy and integration in an active and efficient way. By developing procedures and methods for achieving this, golf courses can become practically applicable models and good examples of cooperation on landscape issues and of cooperation to create a wider understanding of ecological contexts.
- that a multifunctional approach can be profitable for golf clubs. It can provide opportunities for alternative streams of income and built a better foundation for the club in the local community through work in the environment and sustainable development. It can also provide opportunities for better cooperation and in many cases cost sharing with authorities, environmental and outdoor recreation organisations and other sports associations, a better public profile and stronger political support. More efficient use of land through multifunctionality can also be a necessary condition for extension of leases and securing land use for golf.



CHALLENGES AND OPPORTUNITIES FOR GOLF

Golf is a land-demanding sport, occupying more than 70 000 ha in the Nordic countries. The Nordic golf associations have around 1 million members, who play golf on over 1100 golf courses. The corresponding figures for Europe are approximately 6 900 golf courses and 6 million registered golf players. An 18-hole golf course occupies on average 65-70 ha, of which approximately 20 ha are intensively managed and used playing surfaces such as tees, fairways and greens. The remaining area, 40-70%, is extensively managed natural land.

Nordic golf is facing a number of major environmental and societal challenges. Examples of these are: climate change, new regulations and restrictions, limited access to natural resources, competition for land and weak interest and support from authorities, politicians and the public at large. In order to deal with these challenges, there is a need for new knowledge in a number of areas, together with structured, efficient work on the environment and sustainable development. In order to secure this essential new knowledge, the golf sector is investing in research and development through STERF, the joint research body of the Nordic golf associations. STERF's complete research programme and information on its approximately 20 ongoing research projects can be found at www.sterf.org.

In the years after 2006 the number of registered golf players steadily decreased and has now stabilised at a lower level. Many golf clubs are therefore experiencing financial problems and are trying to find new ways of supporting and developing their operations. Around 40-70% of golf course land consists of areas that are not directly used for the game of golf. Many golf courses have a clubhouse with good facilities that are not being utilised to the optimum. If parts of the course and the clubhouse can be used for activities other than golf, the golf club can attract a broader target group and the facility can be used more efficiently, which can generate alternative income or shared costs.

There are indications of great unused potential for multiple uses of golf courses, whether on playing surfaces, on other areas or in the clubhouse (Strandberg et al., 2011; Thulin, 2011; Caspersen, 2014; Eriksson et al., 2015). In order to exploit this potential and develop the golf course into a multifunctional site that benefits the local society and periurban nature, STERF wants to increase research and development in order to take responsibility for:

- ensuring that golf courses have access to information and tools for identifying and developing multifunctional values and activities
- identifying and developing the business advantages of multifunctional activities in both the short and long term
- providing data support for discussions and information material that golf clubs can use in dialogue and cooperation with local and regional authorities and organisations
- drawing up regulations and recommendations for how golf courses can be designed or adapted to support safer and broader outdoor recreation activities within their facilities
- charting the social and organisational conditions existing on golf courses that can promote biological diversity, quality of life, social interactions and businesses and identifying other activities and experiences, apart from the game of golf, that can be introduced on courses
- determining how coordinated planning (between the regional and local authority, clubs and associations, businesses and the golf club) regarding periurban environments and the golf course can be improved so that biological and social values increase.

OPPORTUNITIES AND RESPONSIBILITIES OF SOCIETY

Environmental quality objectives and green infrastructure

In 2011 the EU adopted a strategy for biological diversity up to 2020. One of the six objectives is to preserve and improve ecosystems and ecosystem services by introducing green infrastructure. For member states, this means that authorities and actors, for example golf clubs, must optimise and improve the efficiency of their efforts to preserve and enhance ecological links and essential ecosystem services. The concept of green infrastructure can be integrated into national environmental quality work in many respects.

In the environmental action programme devised by the Nordic Council of Ministers, there are two themes that can be clearly related to golf courses. These are (1) biological diversity and ecosystems and (2) outdoor activities, landscape and cultural environment (Nordiska Ministerrådet, 2012).

1. *Biological diversity and ecosystems*

Decreasing biological diversity of one of our greatest and most obvious problems. Species and community establishment is a slow process and today species are disappearing at a greater rate than would naturally occur. Biological diversity is an important precondition for maintaining the functions and productivity of ecosystems. This can be achieved through ecosystem-based management to ensure the conservation and sustainable use of biological diversity. This kind of management is knowledge-based and takes account of people's utilisation and impact on ecosystems (European Union, 2011; Nordiska Ministerrådet, 2012). In the Swedish action plan for building functional green infrastructure (Naturvårdsverket, 2017), there are several areas in which multifunctional golf courses could become important actors and help to create and maintain green infrastructure in periurban environments and the cultivated landscape, for example by protecting, preserving, restoring and recreating habitats, ecosystem functions and natural processes.

Examples of concrete environmental quality objectives (Regeringskansliet, 2011) that can be supported by the development of multifunctional golf courses are:

- A rich diversity of plant and animal life
- A varied agricultural landscape
- Flourishing lakes and streams

2. *Outdoor activities, landscape and cultural environment*

It is important that nature and culture values are utilised and developed and that outdoor activities are an integral part of societal development. Access to natural areas, cultural environments and outdoor activities close to cities is important for people's health and wellbeing (Kaplan et al., 1998; Lisberg-Jensen, 2008). In addition to better quality of life and better health, outdoor activities also increase awareness of the environment and understanding of the importance of sustainable management of natural and cultural resources. It is important to reach out to the public about these values (Nordiska Ministerrådet, 2012).

Examples of concrete environmental quality objectives and goals on improving quality of life and human health that can be supported by the development of multifunctional golf courses are:

- A good built environment
- A varied agricultural landscape
- Flourishing lakes and streams
- Clean air

The European Landscape Convention

The European Landscape Convention is the first international agreement to specifically present the landscape as a resource for multiple uses and an important basis for sustainable development. Landscape changes must be able to occur in a way that enhances and develops the diversity and qualities of the landscape. The Landscape Convention also emphasises that the landscape is important for people's wellbeing and for their sense of belonging and feeling for a place. Upkeep, management and, above all, planning of the landscape are positive activities that should involve local residents and others with links to the area (Sarlöv Herlin, 2012). The European Landscape Convention provides a joint

framework for the work of landscape development. It points out that the landscape is a shared asset and a shared responsibility, and that the work of conserving, planning and managing the landscape brings with it both responsibilities and rights for all. The development of multifunctional golf courses can comprise establishment or conversion of facilities and functions, with the aim of contributing to society's many different values, whether cultural, ecological, aesthetic, social or economic (European Landscape Convention, 2012).

Opportunities and responsibilities

It is important that various interests in society, such as municipalities, official authorities, NGOs, land owners, residents, businesses and others, better acknowledge the potential of the golf sector as an important actor in the collaboration on green infrastructure, including environmental quality work, and in implementation of the European Landscape Convention. It is therefore important that new knowledge is developed and good examples of multifunctional golf courses are documented, and that these are then communicated to different groups in society. It is also important that R&D activities relating to multifunctional golf courses are accommodated and prioritised by national and international authorities, for example those with responsibility for human health and quality of life, green infrastructure, the national environmental quality objectives and implementation of the European Landscape Convention, and by other parties in society.

The social significance of golf courses as a meeting place for outdoor activities, nature, culture and sport and as a contributor to good health and a richer living environment for many different interests should be exploited and enhanced. The ambition should also be to protect and positively develop the environment on and around golf courses. It is important that this occurs in a way that strengthens local conditions and makes a positive contribution to the overall regional and local strategies within the environment, nature and leisure. Close cooperation is needed between authorities, organisations, associations, businesses and individuals, so that the range of values on golf courses and in the surrounding landscape are managed in a sustainable way.

Through the development of competences based on research and development on multifunctionality, STERF together with the golf sector and other interests in society can:

- Help golf courses become an important actor in the work on green infrastructure, and a hub and an engine in implementation of the European Landscape Convention.
- Contribute to the development of biological diversity on and around golf courses, to climate adaptation work and to preserving and enhancing the value of ecological links and essential ecosystem services. Examples of this are cooperation on conservation measures to save threatened species and ecosystems, on making golf courses part of a network of ecological corridors, on providing functional green infrastructure and on collecting and purifying stormwater from surrounding areas.
- Take responsibility for presenting selected landscapes with multifunctional golf courses as good examples of shared responsibilities and good, efficient cooperation between many interests in society, for example authorities, institutions, associations and private individuals, where all parties stand to gain.
- Take responsibility for increasing knowledge and developing tools to demonstrate the importance of landscape and cultural heritage for good quality of life by stimulating environmentally friendly outdoor activities for new and existing user groups and creating meeting places for integration, and demonstrate and document the link between outdoor activities and health.
- Increase local knowledge and sense of responsibility for nature, the environment and outdoor activities and thereby create new social meeting places.
- Create international cooperation to implement and disseminate the concept of the multifunctional golf course as a potential development of the landscape.



RESEARCH AND DEVELOPMENT AREAS

In this programme we describe four central research and development areas that are necessary to increase competences within multifunctional use of golf courses. These areas are:

1. The everyday landscape and periurban nature.
2. Nature and culture.
3. Dialogue and cooperation.
4. Business promotion.

Within each research and development area, we describe the high priority project areas where new research and development are needed.

Within the four research areas, it is expected that existing, well-defined methods and models that may be of relevance for use and application to golf courses will be modified and utilised.

I. The everyday landscape and periurban nature

Access to green areas where people can exercise and take a break from their noisy and stressful everyday environments is highly important for physical health and mental wellbeing. Green areas for sport and exercise are also effective measures in the fight against obesity and health problems resulting from an increasingly sedentary lifestyle. The positive health effects and lower risk of a range of diseases that activities in green areas (green exercise) provide benefits to society in the form of lower healthcare costs (Ottosson, 1998). Periurban nature of good quality can also act as a growth factor for the surrounding area, through stimulating house prices and local businesses (Stähle, 2012).

The periurban landscape, with its positive health effects, is currently being attributed increasing importance (Laukkanen, 2010). A landscape that is rendered accessible with well-designed communication opportunities often feels safe. This becomes a form of 'Nature Lite', which for many people is an easy and important first contact with nature, compared with mountain and forest trails and other more geographically inaccessible and expensive activities. New lifestyles and value systems among the younger generation influence their interest in golf and nature. Geo-caching with GPS is an example of an IT-related activity that involves land and attracts young people.

Experiences of plant and animal life are valuable for recreation and for people's knowledge and understanding of nature and the environment (Nordiska Ministerrådet, 2012). Trends indicate a growing interest, not least among young people, in a sustainable lifestyle and locally produced food, for example through urban gardening (Sarlöv Herlin, 2012).

STERF wants to help ensure that more golf courses can develop into restorative public places that people visit to take a break and recover from their stressful lives and to experience a rich diversity of plant and animal life. In order to achieve this, methods and models

based on research and development and documentation of good examples are needed within the following project areas:

I:1 Contribution of golf courses to recreation and outdoor activities

STERF wants to create the opportunities for golf courses to make a greater contribution to green environments for recreation and outdoor activities.

In order to achieve this, new knowledge is needed within the following areas:

- **Access and design:** The potential to increase the quality of life and health by increasing the use of green environments is determined by the accessibility and design of golf courses. This means examining how multifunctional golf courses can be made accessible and designed so that health aspects can be provided in a safe way for different groups, for example golf players, the elderly, walkers and joggers, to share at the same time.
- **User group needs:** Different age groups and societal and interest groups may have different needs as regards the design of areas for different green exercise activities. An example of a study area is to examine how a multifunctional golf course can offer different systems of pathways, such as health trails, nature trails, school trails and disability access trails, to facilitate use of the area by different groups according to their abilities.
- **Adaptation in time:** It may not be possible for all activities on a multifunctional golf course to occur simultaneously. They may be of a seasonal nature or occur at different times of the day. It is important to study how various activities on golf courses can be adapted in time.



I:2 The golf course as a tool in education – integration

STERF wants to help allow golf courses to be developed into **landscape education centres** that resemble the city farms in the United Kingdom or the First Green project on golf courses in the USA, for use in teaching, for example about urban gardening, sustainability, nature and culture. These centres can also be envisaged as providing a meeting place with nature and between people and promoting integration in a tangible way. In order to achieve this, new knowledge is needed within the following areas:

- **Teaching facility:** A possible development could be to use the clubhouse for cooperation with other interests in the surrounding community and as a centre for creativity and learning. This would require knowledge on how the facility as a whole can be designed as a teaching facility, for example for courses about nature, culture or sustainable development and how they can be made attractive to the public.
- **‘Nature Lite’:** Another possibility is to offer ‘Nature Lite’. Golf courses could act as an entry portal for those wishing to get close to nature.

This would require knowledge and inventories of areas of the course that can be adapted and used to provide a simple and important first contact with nature.

- **Teaching tools:** Parts of the golf course could be used as teaching tools in learning about nature and culture. This would require development and adaptation of outdoor teaching methods that work on golf courses and development of models for cooperation between golf clubs and schools.

I:3 Contribution of golf courses to the everyday landscape

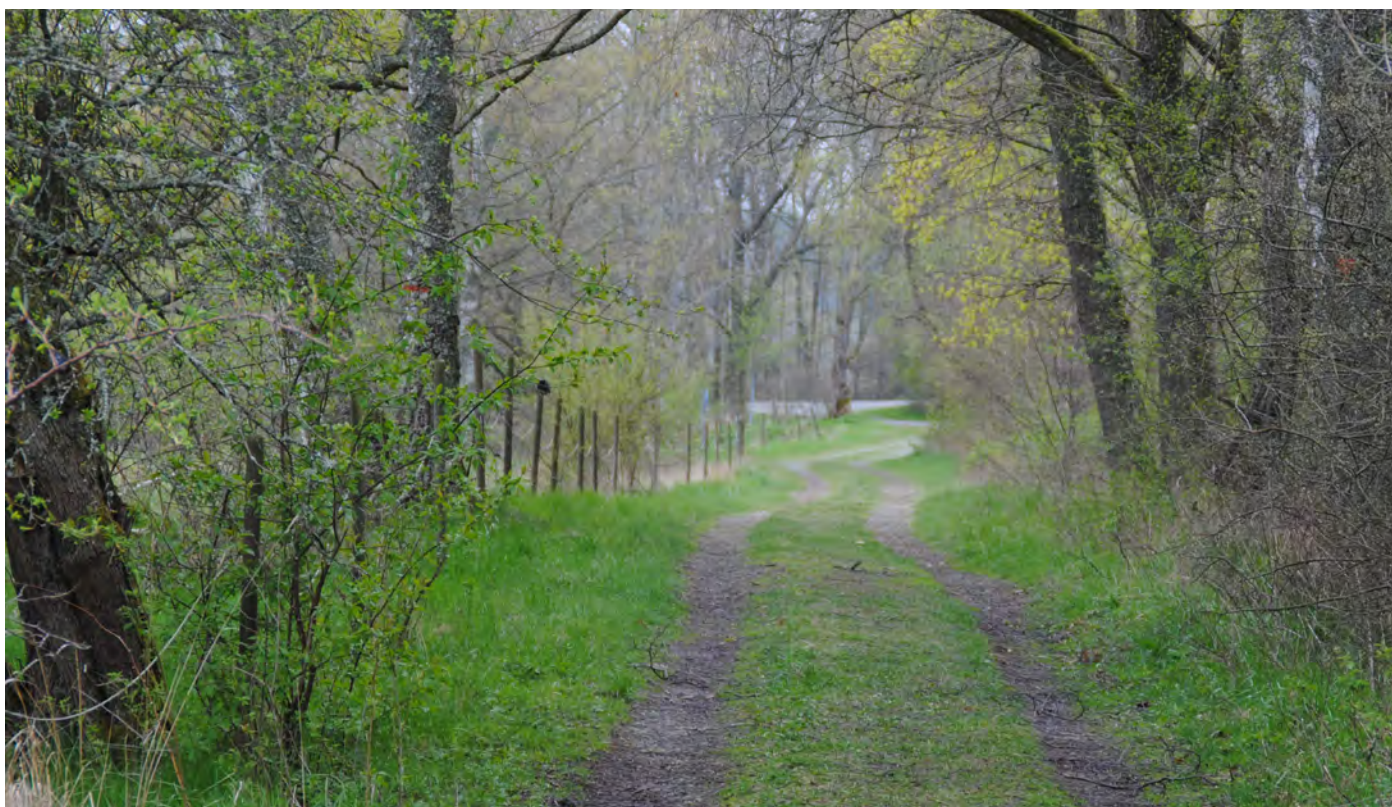
STERF wants to help enable golf courses to be used in a more varied way by local residents. In order to achieve this, new knowledge will be needed within the following areas:

- **Local residents:** Further knowledge is needed on how golf courses can be employed in more varied use of land by local residents. For example, is it possible to create allotment gardens, playgrounds, pushchair cafés, dog exercise yards, riding schools or outdoor gyms on and around golf courses?



- **Holistic view:** Many golf courses already have a restaurant as part of their facilities. Through increased knowledge of how the links between food, land and landscape can be demonstrated in different ways, these can be used to promote a holistic view.
- **New periurban nature:** Knowledge and development work is needed on how the establishment of simple golf courses can help create good periurban nature in conjunction with conversion of, for example, former industrial areas to green and outdoor recreation areas.
- **Accessibility:** In towns and cities surrounded by agricultural land, there is often a scarcity of land open to the public close to residential areas. In certain areas this scarcity has been alleviated through the creation of accessible footpaths, so-called 'greenways' on agricultural land. Such greenways can be designed from the perspective of nature experiences or cultural heritage values. There is a need for good examples and knowledge on how similar greenways can be established on golf courses.





2. Nature and culture

Many golf courses are situated in an ancient pastoral landscape. A varied natural environment with elements of cultural history is greatly appreciated by Sunday walkers, schoolchildren, orienteers and golfers. The link between past and present is important for people's understanding and interest in the landscape, but also for preserving history for the future (Strandberg et al., 2011; Vattenriket, 2012; Caspersen, 2014).

Ecosystem services are the functions in ecosystems that in some way assist mankind, in other words maintain or improve human wellbeing. There are services provided 'for free' by nature, such as climate mitigation, pollinating insects, water purification via wetlands or mussels, natural pest control and creation of soil fertility. Ecosystem services can be divided into four different categories: provisioning, regulating, cultural and supporting. The Convention on Biological Diversity (CBD) includes green infrastructure as one of the six sub-objectives for the strategy. Green infrastructure is an important component in the work to increase biological diversity and ecosystem services. Green infrastructure comprises an ecologically functional network of habitats and structures, nature areas and designed environments, for example golf courses.

These must be designed, used and managed in such a way that biological diversity is preserved and important ecosystem services are promoted in the entire landscape. This sub-objective focuses on maintaining and developing ecosystem services and restoring degraded ecosystems through integrating green infrastructure into physical planning.

STERF wants to help ensure that more golf courses become important actors in the work on green infrastructure. This means ensuring that golf courses are built, managed and used in ways that allow biological diversity, habitats, ecosystem functions and natural processes to be protected, preserved, restored and recreated. In order to achieve this, there is a need for advice and recommendations based on research and development within the following project areas:

2:1 Ecosystem services and green infrastructure

On many golf courses there are areas and structures that could be altered so that they have particular significance for important ecosystem services.

STERF wants to help in developing golf courses into a resource for ecosystem services. In order to achieve this, new knowledge will be needed within the following areas:

- **Ecosystem services:** There is a need for documentation of existing ecosystem services on golf courses and knowledge of how these can be further improved.
- **Green infrastructure:** Golf courses could play an important role in linking together important structures and ecosystem services in the landscape. There is a need for new knowledge on how the role of golf courses can be increased in the work of creating the conditions for long-term conservation and better contact between valuable areas and structures, in other words how golf courses can be integrated into the surrounding landscape. Here we need to produce advice and guidelines for different ecosystems/natural elements and for landscape conservation/management.

2:2 Biotopes and biological diversity

On a golf course there can be a mosaic of different environments and biotopes that create the conditions for rich plant and animal life and a varied recreation space. Forest and water environments are often interspersed among open environments of a meadow character, bare sand and sunny verges (Colding, 2009b; Vattenriket, 2012). STERF wants to help ensure that golf courses are built, managed and used in such a way that they become a resource for conserving and developing a rich diversity of plant and animal life. In order to achieve this, there is a need for new knowledge, new

advice and recommendations based on research and development within the following project areas:

- **Conservation and development:** There is a need for more knowledge and documentation of verified experiences on how golf courses can be used and improved as a resource in the work on biological diversity. Advice and recommendations on construction, maintenance and use need to be developed for natural elements such as wetlands, ponds, meadows, forest edges and deciduous trees. In addition, methods are needed to monitor and evaluate biotope improvement measures on golf courses.
- **New nature:** Methods are needed for providing information about new biotopes and creating these on golf courses.

2:3 Natural and cultural history

STERF wants to help develop golf courses to a higher degree into arenas for displaying the historical traces of human activity in the landscape. These traces show how people lived and worked long ago, which is important for us today in understanding the landscape and linking it to our history.

- **There is a need for knowledge** on how golf courses can be used as arenas for developing links between natural and cultural history and biological diversity, for example how knowledge of cultural history on golf courses can be used for enhancing local identity and as a ‘tool’ to foster public engagement.



3. Dialogue and cooperation

In order to secure sustainable development with its starting point in the environmental quality objectives and in the European Landscape Convention, it can often be important to include a participatory phase where the parties involved are invited in to create good dialogue. Here, there is a need to focus on a number of groups and, for example, involve existing and prospective users and the relevant authorities. A good participatory phase can help identify possible areas of conflict between user groups and other interests. In order to create a constructive process, the methods used should be tried and tested and able to help create a positive result (Rösjökilssamverkan, 2009; Sarlöv Herlin, 2012; Skarin, 2015).

Communication is the key to success. When the work is well underway and producing results, it is important to continually release information on the work to the parties concerned and the media (Rösjökilssamverkan, 2009; Skarin, 2015).

To succeed in the work of creating a multifunctional golf course, there is a need for good, efficient cooperation where all parties stand to gain. STERF wants to inspire golf clubs to take the initiative for local cooperation and support them in their dialogue with local and regional interests through research and development within the following project areas:

Cooperating with a number of actors

With the focus on multiple use of golf courses, STERF wants to document and communicate met-

hods and reference examples of cooperation between golf clubs, the authorities and other interests in society within the following areas:

- **Dialogue and cooperation:** There is a need for good examples of forms of working and methods to create dialogue, involve and cooperate with a greater number of actors and interests. In order to ensure a fruitful exchange for the parties involved, good examples are needed of how to harmonise expectations ahead of planning and during the course of the work. Such results and examples would facilitate work by the new constellations that arise in the drive towards increased multifunctionality.
- **Conflicts and misunderstandings:** A move towards increased multifunctionality on a conventional golf course may create uncertainty and resistance among the existing users and those living near the course. Good examples are also needed of methods that can be employed to avoid or resolve conflicts and misunderstandings.
- **Long-term process:** If the work on important issues such as nature and environmental conservation, recreation and outdoor activities is to be successful, an overarching approach and a long-term view are important. There is a need for good examples of how a long-term process can be maintained when, for example, political decisions change or key individuals leave a project.



4. Business promotion

Many golf clubs are under pressure due to the financial crisis of recent years. In many countries there has been a decrease in the number of registered golf players. It is usual for golf clubs to have an economic system based on a constant inflow of members and a rather static membership. They are now facing the challenge of balancing this against the new behaviour of members and the new conditions in a more variable and more competitive market.

One measure that can contribute in the long term to retaining existing members and recruiting new members is for the golf club to create new products and activities. This includes products for those who already play golf and those who do not, e.g. people living in the immediate area or friends of club members.

STERF wants to help more golf courses to develop multifunctional activities. In order to achieve this, there is a need for documented experience and new knowledge within the following project areas:

4:1 Value of multifunctional activities

STERF wants to motivate and help more golf courses to develop multifunctional activities. It can be difficult for them to decide which measures and activities they should aim for, the financial implications of these, the advantages they bring to the golf course and how they should be handled in purely practical terms. New knowledge and good examples are needed within the following areas:

- **Income and costs:** There is a need to develop methods and document examples of cost-income analyses in relation to multifunctionality. For a golf course to be inspired to begin working with multifunctionality, it is important for it to be able to transform its ideas into financial calculations. At present there are no key data available on the value of creating multifunctionality on golf courses.

Therefore it is important to develop a method that can describe the value of members, the benefits created etc. in relation to the costs arising in conjunction with multifunctionality.

- **Shared costs:** Opportunities for additional income and cost sharing through cooperation with other actors must be identified and tested in practice. These include for example shared use of clubhouse and land, production of bioenergy, food for the club restaurant or other local restaurants.

4:2 Evaluation methods and tools

Development of greater multifunctionality may require investment and greater expenses during an establishment phase, but the target is to increase the profitability of the club, for example by attracting more users to the course.

- **Evaluation:** In order to evaluate the added value of the newly initiated changes, methods are needed to determine the financial, recreational and environmental effects.

4:3 Designs for multifunctionality

Certain multifunctional measures on a golf course require changes to the course design and to the surrounding landscape.

- **Design:** Knowledge is needed on how to adjust golf course design to multifunctionality with regard to safety and contributions to the surrounding landscape. These can include new trails, benches, control stations for orienteering, etc. How can this be achieved on a golf course while still retaining its distinctiveness? What safety aspects are important to consider in the design phase and how can they be implemented with respect to the landscape?



COMMUNICATION AND IMPLEMENTATION OF NEW KNOWLEDGE

STERF delivers knowledge, based on research and development, that is ready to use. Communication of research results and new knowledge is one of STERF's high priority focus areas. Important target groups for the results delivered within this programme are: golf courses, municipalities, authorities and associations at local, regional and national level and international golf organisations, authorities and associations.

STERF can contribute to the development of competence in multifunctionality by taking responsibility, together with the Nordic golf sector, for:

- Creating a section on multifunctional golf courses on the STERF website, where ongoing projects and results are described. The material can be used for training, courses and seminars, and in practical advisory work.
- Arranging conferences, seminars and workshops with the focus on multifunctionality, thereby enabling frequent meetings between the golf sector and societal interests.

- Producing handbooks and fact sheets containing practical advice and recommendations that can be used by golf courses, municipalities, authorities and other interests.
- Producing information material and supporting data that golf courses can use in dialogue and cooperation with local and regional authorities and relevant associations.
- Increasing awareness in the media about the concept of multifunctionality and about new research results and experiences.
- Presenting good examples of golf courses that have implemented the concept of multifunctionality.
- Raising awareness among international golf organisations and societal interests about the concept of multifunctionality and about new research results and experiences.

SCHEDULE

We regard the programme period to be max. 5 years. The programme will be continuously developed and refined in relation to the needs of society and the golf sector.



REFERENCES

- Bischoff A, Marcussen J & Reiten T. 2007. *Friluftsliv og folkehelse - En kunnskapsöversikt*. Institutt for idrett og friluftslivsfag Friluftsliv og helse. Høgskolen i Telemark. 66 s.
- Caspersen, O.H. et al. 2014. *Multifunctional Golf Courses*. IGN Rapport, December 2014, Department of Geosciences and Natural Resource Management, University of Copenhagen, Frederiksberg. 180 p. www.ign.ku.dk
- Colding, J. & Folke, C. 2009a. *The Role of Golf Courses in Biodiversity Conservation and Ecosystem Management*. *Ecosystems* 12: 191-206.
- Colding, J., Lundberg, J., Lundberg, & S. Andersson, E. 2009b. *Golf courses and wetland fauna*. *Ecological Applications* 19(6): 1481-1491
- Dahl-Jensen, A-M. 2016. *A practical guide for assessing your golf course's multifunctional potential*. Handbook Scandinavian Turfgrass Research Foundation. 29 p. www.sterf.org
- Eriksson, F., T. Eriksson & M. Ignatieva 2015, *Golf courses as part of urban green infrastructure: Social aspects of golf courses and extensively managed turfgrass areas from a Nordic perspective*, Proceedings from 52nd IFLA Congress, June 6-7 2015, St. Petersburg Russia: 474-478
- Europeiska landskapskonventionen. 2012. Riksantikvarieämbetet. <http://www.raa.se/om-riksantikvarieambetet/vart-internationella-arbete/euoparadet/europeiska-landskapskonventionen/>
- European Union 2011. *Communication from the Commission to the European Parliament, the Council, the economic and social committee and the committee of the regions Our life insurance, our natural capital: an EU biodiversity strategy to 2020*. COM (2011) 244 final. Brussels: EU.
- Kaplan R, Kaplan S & Ryan R. 1998. *With People in Mind: Design and Management of Everyday Nature*. Washington DC: Island Press. 240 s.
- Konventionen om Biologisk mångfald (CBD). 1993. UNEP. <http://www.cbd.int/convention/text/>
- Laukkanen R. 2010. *Green exercise, physical activity and health - Scientific evidence on outdoor recreation and exercise based on selected studies*. Report to Friska i Naturen - ett Nordiskt projekt managed by FRIFO. Department of health science, University of Oulu, Finland. 11 s.
- Lisberg-Jensen E. 2008. "Gå ut min själ" *Forskningsöversikt om hälsoeffekter av utvistelser i närnatur*. Statens Folkhälsoinstitut. Rapport 2008:10. 28 s.
- Naturvårdsverket. 2016. *Grön infrastruktur*. <https://www.naturvardsverket.se/Miljoarbete-i-samballet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Hallbarhetsarbete/Gron-infrastruktur/>
- Nordiska Ministerrådet. 2012. *Nordisk miljöhandlingsprogram 2013–2018*. ISBN 978-92-893-2468-7. 44 p. <http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A701877&dsid=-1947>
- Ottosson J, Grabn P. 1998. *Utemiljöns betydelse för äldre med stort vårdbehov: fallstudien "Med ögon känsliga för grönt"*. Alnarp : Sveriges lantbruksuniversitet SLU. Movium. 103 s.
- Regeringskansliet. 2006. *De svenska miljö kvalitetsmålen*. <http://www.sweden.gov.se/sb/d/5775>
- Rösjökils samverkan. 2009. *Samverkan i Rösjökilen - natur i Storstockholms gröna kilar*. Rapport 2006-2009.
- Sarlöv Herlin I. 2012. *Landskap för mångbruk, erfarenheter från England*. Forskningsrådet Formas. 271 s.
- Skarin, O., M. Strandberg & K. Schmidt 2015. *Societal Benefits of Golf - Inspiration and Ideas for Local Partnership*. Handbook Scandinavian Turfgrass Research Foundation. 20 p. www.sterf.org
- Strandberg, M, m fl. 2011. *Multifunktionella golfanläggningar en utnyttjad resurs*. STERF, Box 84, 182 11 Danderyd. sterf.golf.se. 31 s.
- Ståhle, A. 2012. *Ekonomisk värdering av storstadsnatur*. *Storstadsnatur – naturen som tillväxtfaktor i Stockholmsregionen*. Seminarium arrangerat av Länsstyrelsen i Stockholms län och Stockholms läns landsting. 23 februari 2012.
- Sörensson M. 2010. *Solitärbin och andra insekter på Kristianstads Golfklubbs golfbanor i Åhus - inventering och förslag på riktade skötselåtgärder*. *Vattenriket i fokus* 2010:03
- Thulin, J. 2011. *Mångfunktionella golfbanor – rekreativa och pedagogiska platser*. Fakulteten för Landskapsplanering, trädgårds- och jordbruksvetenskap. Område Landskapsarkitektur, Sveriges Lantbruksuniversitet (SLU) Alnarp. *Landskapsarkitekturprogrammet*. 39 s.
- Vattenriket. 2012. *Mer än en golfbana – ta tillvara banans natur- och kulturvärden*. Biosfärkontoret Kristianstads Vattenrike. *Vattenriket i fokus* 2012.02, ISBN 1653-9338. 11 s.
- Wernersson, L. 2009. *Kulturbeskrivning av Kristianstads Golfklubbs golfbanor i Åhus*. Biosfärkontoret Kristianstads Vattenrike. *Vattenriket i fokus* 2009:04

Maria Strandberg, STERF
Karin Schmidt, STERF
Anne-Mette Dahl Jensen, Københavns Universitet
Carina Wettemark, Kristianstad Vattenrike
Ingrid Sarlöv Herlin, SLU
Ole Hjort Caspersen, Københavns Universitet
Torben Kastrup Petersen, Dansk Golf Union



Sterf

STERF (Scandinavian Turfgrass and Environment Research Foundation) is the Nordic golf federations' joint research body. STERF supplies new knowledge that is essential for modern golf course management, knowledge that is of practical benefit and ready for use, for example directly on golf courses or in dialogue with the authorities and the public and in a credible environmental protection work. STERF is currently regarded as one of Europe's most important centres for research on the construction and upkeep of golf courses. STERF has decided to prioritise R&D within the following thematic platforms: Integrated pest management, Multifunctional golf facilities, Sustainable water management and Winter stress management. More information about STERF can be found at www.sterf.org