

East Vättern Scarp Landscape

- Biosphere reserve nomination form

In cooperation between Swedish Forestry Agency, County Administrative Board of Jönköping, Municipality of Jönköping, Federation of Swedish Farmers, Södra Skogsägarna, Gränna Skogsgrupp and World Wildlife Fund WWF



Develop the vitality of the local community



Conserve biodiversity and cultural heritage



Support knowledge and practice

Jönköping 2011

Nomination documents and contact information are available on our website, www.ostravatterbranterna.se.

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PART I: SUMMARY

I PROPOSED NAME OF THE BIOSPHERE RESERVE

[It is advisable to use a locally accepted geographic, descriptive or symbolic name which allows people to identify themselves with the site concerned (e.g. Rio Platano Biosphere Reserve, Bookmark Biosphere Reserve). Except in unusual circumstances, Biosphere Reserves should not be named after existing national parks or similar administrative areas.]

East Vättern Scarp Landscape (in Swedish: Östra Vätterbranterna)

2 COUNTRY

Sweden

3 FULFILMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

(Article 3 of the Statutory Framework presents the three functions of conservation, development and logistic support. Explain in general terms how the area fulfils these functions.)

3.1 “Conservation – contribute to the conservation of landscapes, ecosystems, species and genetic variation”

(Stress the importance of the site for conservation at the regional or global scales)

3.1.1 Starting from the landscape and the local population

The East Vättern Scarp Landscape region is centrally located in southern Sweden, with elements of habitats reflecting the country’s southern deciduous broadleaf forest region and the northern coniferous forest region. Thus, the area features both typically northern landscape types and species and classic southerly environments with flora and fauna that require warmer temperatures. The proposed biosphere reserve is characterised by mosaic-like nature in a landscape with the character of a fissure valley. The terrain is extremely rough and the area has many steep slopes, or scarps, all parallel to one another, the largest and most characteristic of which is a western facing precipice abutting Lake Vättern. The steep terrain creates a very grand, majestic setting with unique flora and fauna and good climate conditions. The plateau to the east of the Slopes of Lake Vättern, called the South Swedish Highlands, has a much colder climate. The topography, differences in local climate and soils create a wide variety of forest types. Many small waterways cut through the tall ridges, creating variation primarily in the wooded scarp down to Lake Vättern. The proposed biosphere reserve contains several deep lakes. Of these, Lake Vättern is Sweden’s largest cold water lake, and the southernmost such lake in Scandinavia.



Illustration I. Landowner Fredrik Lundberg in the “Galgen” demonstration area just south of Gränna.

The East Vättern Scarp Landscape is an area rich in contrasts, ranging in scale from giant forests to smallholder farms. On the South-Swedish Highlands, the cultivated land is broken up into a mosaic of different soil types and a wealth of lakes, providing variation in the forested communities. Farmland alternates with many natural pasture lands, and woodlands stand shoulder to shoulder with clearings, creating a large array of border zones. In addition, there are many microhabitats and obstacles to cultivation embedded in this heritage landscape.

Human beings have shaped the countryside for millennia, and they continue to do so. Centuries of hay making, grazing and pollarding have created a special grazing landscape with a wide variety of species linked to grasslands, bushes and trees. This small-scale farming landscape is beautiful and aesthetically appealing. The East Vättern Scarp Landscape is characterised by a wide variety of lands that are managed traditionally, ensuring that natural and cultural values are part of an integrated whole. The East Vättern Scarp Landscape region is very much a living countryside where people live and work. It is also an area to which visitors come to experience great natural variety and historical depth. In addition, the area has several interesting bird watching sites.

The physical environment offers many valuable ecosystem services, making it a local resource worth preserving for people in the region. The preservation of the landscape, its valuable environments and mosaics of shifting countryside is directly dependent on strong financial incentives in the form of agriculture and forestry. For the best opportunities to preserve cultural and natural environments, individual landowners must be able to continue creating jobs and revenues through multifaceted use of their properties, combining new businesses with traditional agriculture.

3.1.2 Targeted efforts regarding species and environments

The East Vättern Scarp Landscape is one of Sweden's most well catalogued areas; many targeted species and habitat surveys have been conducted here. The number of red-listed species in the area according to the national red list is 304, of which 96 are critically endangered (CR), endangered (EN) or vulnerable (VU). There are also 46 EU-listed species and 6 that are listed on the global IUCN Red List.

Several umbrella species and symbolic species have been designated in the area; their preservation confirms and symbolises protective measures undertaken in the forest and agricultural landscape as well as in water. In addition, there are five species of responsibility, which are threatened species with few or no occurrences outside the area – not in the country or in the rest of the world. See more under Chapter 13.2.

Lake Vättern is home to 31 fish species, of which the most widely discussed is the large salmonid species *Salvelinus umbla*, which is also one of the key symbolic species of the East Vättern Scarp Landscape. The lake is home to great biodiversity in a wide range of organism groups. There are several glacial relict species in Lake Vättern – a number of crustaceans and a few fish species (including grayling, *Thymallus thymallus*) – which have adapted to lake living after the last glacial period and post-glacial rebound. The insects along the shores of Lake Vättern are also notable, more reminiscent of the rivers of Northern Sweden than lakes in the south of the country.



Illustration 2. The fascinating species lung lichen (*Lobaria pulmonaria*), which is one of the umbrella species of the East Vättern Scarp Landscape, demonstrates a long continuity of old broadleaf deciduous trees. Photograph taken in Lönnemålen in the northern part of the proposed biosphere reserve.

The process of surveying and protecting valuable natural areas in the East Vättern Scarp Landscape region is often held up as a national model of good collaboration between various stakeholders in the region. This collaboration between landowners, organisations and authorities has led to a more efficient use of conservation tools. This method has also enhanced the understanding of formal protection of woodland areas. One goal of the proposed biosphere reserve is that the East Vättern Scarp Landscape will serve as a source of ideas and a testing ground for new conservation and management tools.

In the efforts to meet national environmental quality goals such as Living Forests and A Rich Agricultural Landscape, the county administrative boards work with special measures for threatened species, including targeted efforts to compile knowledge and concrete measures for conservation. Seventeen species in the area are covered by action plans; there are also programmes for rich fens and trees that are particularly worth protecting in the cultural landscape.

3.1.3 Focusing on the bio-cultural heritage

The proposed biosphere reserve is home to a living bio-cultural heritage with long continuity. This means that the East Vättern Scarp Landscape has both a national and an international responsibility to document knowledge about traditional uses of various species and varieties. The greatest biological values are normally found in environments that have been traditionally managed using grazing, hay making and pollarding. Through technological development of working methods, etc., local entrepreneurship can be enhanced and profits increased in the land-based industries, while maintaining or even increasing biological assets.

The Gränna-Visingsö area has a very special cultivated bio-cultural heritage that is clearly linked to its favourable local climate and its unique history from the 17th century on. Brunstorp north of Huskvarna has a living clonal archive, founded in 1979, which is of national significance for the preservation of many cultivars of apples, pears and cherries. The tradition of growing apples is alive and well within the proposed biosphere reserve. The southern Lake Vättern communities contain Sweden's second-largest fruit-growing district.

3.2 “Development – foster economic and human development which is socio-culturally and ecologically sustainable”.

(Indicate the potential of the proposed biosphere reserve in fulfilling this objective).

3.2.1 Collaboration

The plans to nominate the East Vättern Scarp Landscape as a biosphere reserve are the result of a collaboration between authorities and organisations that has gone on since 1998, in an attempt to resolve intense conflicts between non-profit nature conservation and landowners’ organisations, as well as a need to improve coordination of efforts between authorities. The conflicts involved, among other things, the establishment of new nature reserves and surveys of key forest habitats. To create a forum for dialogue, representatives from the authorities and other organisations joined forces in the Östra Vätterbranterna (East Vättern Scarp Landscape) project. Since then, the group consists of the County Administrative Board, the Swedish Forestry Agency, the Municipality of Jönköping, the Federation of Swedish Farmers (LRF), the forest landowners’ association Södra Skogsägarna, the World Wildlife Fund (WWF) and the Swedish Society for Nature Conservation via the local Gränna Skogsgrupp forest conservation association.

The key premise for the project was to work from the perspective of incorporating environmental protection as well as production in a holistic approach. Getting landowners and various organisations involved leads to sustainable environmental gains in many areas. The working method employed by the East Vättern Scarp Landscape Group has attracted local, regional and national attention. Above all, the social process from conflict to collaboration has generated an interest among many organisations working with natural resources, particularly universities and other institutes of higher learning. National and international collaboration on developing methods for sustainable development has evolved in recent years, in part through working with existing biosphere reserves. This has been rewarding for the efforts to develop the East Vättern Scarp Landscape into a model area for development that is socio-culturally and ecologically sustainable.



Illustration 3. Discussions on regional history in a study circle consisting of representatives from authorities, landowners and volunteer organisations. Åsens By just east of the proposed biosphere reserve.

3.2.2 Development plan and projects

The operations of the East Vättern Scarp Landscape follow a flexible development plan that is updated annually and when the need arises. The plan is based on the following vision: "To create a robust rural area, a sustainable ecosystem and an attractive landscape for users, residents and visitors, through active collaboration". This vision was broken down into an overall goal and specific priorities. The priorities and goal define various development projects headed, coordinated or otherwise supported by the biosphere candidate office.

3.2.3 Theme issues and theme landscapes

To set priorities and bring together the three functions of a biosphere reserve, the work in the East Vättern Scarp Landscape area has been divided into six theme issues and six theme landscapes. These divisions help clarify and communicate the operations within the biosphere reserve candidate. These theme issues and theme landscapes provide thematic and geographical limitations to the vision and goal. As with the development plan, the themes remain flexible. The goal of all theme issues is to promote conservation and development work through local collaboration. In the long run, research, education and demonstration projects will be developed for the themes.

The three functions of a biosphere reserve permeate all efforts, and usually each of the individual projects. The priority challenges according to the Madrid Action Plan – climate change, ecosystem services, and urbanisation – are included in all themes in various ways.

The theme landscapes are:

1. Grazing lands
2. Valuable trees in the agricultural landscape
3. Woodland and slope environments
4. Water in the landscape
5. Natural environments near population centres
6. The county and the smallholder farming landscape

The following theme issues are in focus:

1. The East Vättern Scarp Landscape brand
2. Small-scale wood refinement and set-aside woodland
3. Tourism
4. Locally produced goods
5. Renewable energy
6. Landscape history and ecology

3.2.4 Biosphere centre

A preliminary study to create a hub in the East Vättern Scarp Landscape region has begun. The goal is to investigate the opportunities for and interest in a biosphere centre containing all three functions of a biosphere reserve in one building. The vision is that this facility will demonstrate how conservation and development can go hand-in-hand based on local tradition. The aim of the centre will be to combine an exhibition centre, farmers' market, tourism and experiences with offices and meeting facilities, making it a very concrete illustration of the methods and goals of the biosphere reserve.

3.2.5 Ecosystem services

Within the proposed biosphere reserve, ecosystem services will be generated that will contribute to maintaining and improving important functions of society and people's well-being. Many of the area's ecosystem services also form a foundation for entrepreneurship. Examples of this include the production of fruit and grass-fed meat. Successful companies in the East Vättern Scarp Landscape region sell these products by the crate directly to consumers. Increasing awareness and use of the tool and concept of ecosystem services is a priority on the global, national and local levels (that is to say, in the proposed biosphere reserve). In a new Swedish research project entitled Multifunctional Agriculture: Harnessing Biodiversity for Sustaining Agricultural Production and Ecosystem Services, the East Vättern Scarp Landscape region will be a case study area for a review of agriculture, how it is controlled and managed and its effect on biodiversity and ecosystem services.

3.2.6 Tourism

Within the proposed biosphere reserve, Gränna-Visingsö is one of the nation's most famous tourist destinations. This area has a long tradition of tourism and is one of the municipality's most important tourist attractions. However, nature tourism can still be developed. The city of Huskvarna is also a popular tourist destination, while much can still be done to promote the countryside, such as fishing tourism, sports tourism, guided tours, ecotourism, agricultural tourism etc. The region already has excellent opportunities for horseback riding, orienteering, hiking, skiing, cycling, boating and canoeing. The East Vättern Scarp Landscape has good opportunities to develop its potential and market for tourism through local and international networking, profiling and brand building.



Illustration 4. Carriage rides in the village of Hovaskog in the central parts of the proposed biosphere reserve.

3.3 "Logistic support – support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development"

(Indicate current or planned facilities).

3.3.1 Facilities for research and education

Within the proposed biosphere reserve, Grenna Museum has extensive activities teaching about current climate and environmental research. Lake Landsjön has a field station for activities such as bird ringing. Currently there are no specific plans for new research facilities in the East Vättern Scarp Landscape region, but the stakeholders are investigating the opportunity of connecting a research station to the future biosphere centre featuring all three functions of the MAB concept.

A large number of facilities in the proposed biosphere reserve provide education regarding sustainable development and biodiversity. Several schools have advanced facilities for teaching about the environment and related subjects. Some schools have their own forests for outdoor instruction. For this purpose, both compulsory and upper secondary schools have access to the Eco-bus, a mobile nature school with access to advanced measurements and examination of animals and plants. There are also many museums and informational signs within the proposed biosphere reserve describing the natural and cultural assets of the area. Many associations conduct extensive studies and provide a lot of information about local history, flora and fauna and outdoor activities.

3.3.2 Meeting places between interdisciplinary research, traditional knowledge and practice

Within the East Vättern Scarp Landscape region, several workshops and conferences have been arranged in recent years to provide information to research and its users with various themes related to biodiversity and land use. A large number of excursions and presentations, as well as

training courses and programmes, have been arranged to enhance knowledge about and interest in concrete issues such as landscape conservation and management. Creating flexible meeting places between different sectors, faculties, authorities and special interest organisations is a high priority within the proposed biosphere reserve. This contributes to raising common awareness of various social challenges related to the use of natural resources. Above all, the East Vättern Scarp Landscape has an important niche to fill by bringing together scientific and traditional knowledge that can be used in the practical care and conservation of the landscape.

3.3.3 Environmental monitoring

The East Vättern Scarp Landscape has several sampling and monitoring areas for studying environmental conditions and biodiversity. For many of the valuable lands in the buffer and transition areas, for example wooded grazing lands, the Swedish Rural Development Programme has a specially developed monitoring procedure. Environmental monitoring of the forests is conducted by the Swedish Forestry Agency and the Swedish University of Agricultural Sciences (SLU). The Water Conservation Association (Vattenvårdsförbundet) for Lake Vättern has special facilities for research and monitoring of conditions in the waters. The East Vättern Scarp Landscape collaboration therefore works closely with the Water Conservation Association to enhance its own skills in the area and also to provide its knowledge to the association. The proposed biosphere reserve is also a part of the “Water Council for Vättern” under the EU’s Water Framework Directive. The ongoing gap analysis will show threshold values and key factors for the area’s most important environments and species.



Illustration 5. Restorative pollarding of an ash tree in the Måleskog demonstration area in the northern part of the proposed biosphere reserve.

3.3.4 Demonstration areas and good examples

One of the most powerful tools for creating interest in and increasing awareness about sustainable development, such as the management of valuable natural areas, is setting a good example. For this reason, the East Vättern Scarp Landscape project has specific demonstration areas, which aim to highlight good collaboration and its results in order to create attention and interest from the local community. The idea of these areas is to serve as i) visiting areas for the general public, ii) outdoor classrooms for education and instruction and iii) outdoor laboratories for research and methods development. You can visit three types of demo areas around the East Vättern Scarp Landscape: pollarding, giant trees and woodland grazing. Further categories have been discussed and are under development, including ones related to the care of natural environments and waters near population centres. The areas are unique and each required their own solutions for restoration and care.

4 CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve, which are given in order below.]

4.1 "Encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human intervention"

(The term "mosaic" refers to a diversity of natural habitats and land cover types derived from human uses such as fields, managed forests, etc. The term "major biogeographic region" is not strictly defined but it would be useful to refer to the map of the "World Network of Biosphere Reserves" which presents 12 major ecosystem types at a global scale).

4.1.1 Biogeographical region

According to the Swedish definition, the East Vättern Scarp Landscape lies in a boreonemoral zone, i.e. at the borderline between the country's southern broadleaf deciduous forest region and its northern coniferous forest region. The topography of the proposed biosphere reserve, its proximity to Lake Vättern and its location in the country have led to the existence of typically northern environments side-by-side with more southern habitats.

4.1.2 A characteristic mosaic landscape

On a stretch of just a few kilometres there are four different hardiness zones and extensive biodiversity. Lake Vättern has a clear influence on the local climate, with cold springs, but long, mild autumns. Because of this, several post-glacial warm relicts have been able to survive in the region and in the slopes down to Lake Vättern, which have an oceanic climate. For example, the only incidence in all Scandinavia of the symbolic species *Ena montana*, the Bulin snail, is in the ravine environments near the lake. Gisebo and Gränna are home to one of the country's largest fruit growing districts, which is not a common occurrence at this latitude and altitude. Due to the central location of the East Vättern Scarp Landscape in the southern one-third of Sweden, both eastern and western species are found here, as well as typically northern coniferous forest environments and typically southern Swedish wooded meadows. From a macro perspective, the East Vättern Scarp Landscape can be seen as a large border zone that gradually transitions from more open, broadleaf-dominated landscapes near the lake to more dense wooded landscapes on the South Swedish Highlands. For this reason, the hazel dormouse (*Muscardinus avellanarius*) has been named the symbolic species for these environments.



Illustration 6 and 7. The symbolic species Hazel dormouse (*Muscardinus avellanarius*) and Bulin snail (*Ena montana*).

4.1.3 A scale of human influence

The extreme topography of the fault scarps and the agricultural landscape make the area unusually small-scale and rich in variation, with nearly untouched escarpments alongside well-managed wooded meadows. One feature of the region is a transition from completely urban

environments (Jönköping/Huskvarna is Sweden's ninth largest urban area) to a living farming environment in a more sparsely populated rural area. This great variety means that the East Vättern Scarp Landscape contains both frequently used natural environments near population centres and deep forest landscapes with hardly any evidence of human activity. The majority of the wooded landscape consists of productive forests with good growing conditions. Large parts of the forested areas that are close to urban areas are protected as nature reserves. In clear contrast to the scree slopes and the urban areas, the region is also home to smallholder farming communities with patchwork fields, traditional old gardens, wooded grasslands, forest-edge environments and pollarded trees surrounding tiny red painted crofts, farmhouses and outbuildings. Thanks to the topography of the landscape and the farming tradition that lives on in the local communities, the agrarian environments are unusually well preserved and tended. Another contributing factor is that there are good employment opportunities within an easy commute. This widely varied landscape is an extremely valuable resource for residents and visitors to the area. In total nearly 40,000 people live in the area, of whom about 31,000 live in the larger urban environments.

4.1.4 Lake Vättern and other waters in the area

Parts of Lake Vättern – the fifth largest lake in Europe – are included in the biosphere reserve candidate. Lake Vättern is a part of the primary drainage basin of Motala Ström and consists of a graben that was formed about 800 million years ago when the area was subjected to massive faulting. At its greatest depth, south of the island of Visingsö, the lake measures 128 metres deep. The surface of Lake Vättern is 90 metres above sea level, while the highest point of the biosphere reserve candidate is 345 metres above sea level. Both over and under the water's surface the slope angles change suddenly; for example, near the community of Gränna the land area suddenly rises 200 metres over a stretch of just 2 km.

4.2 “Be of significance for biological diversity conservation”

(This should refer not only to the numbers of endemic species, or rare and endangered species at the local, regional or global levels, but also to species of global economic importance, rare habitat types or unique land use practices (for example traditional grazing or artisanal fishing) favouring the conservation of biological diversity. Give only a general indication here.)

4.2.1 A traditionally farmed landscape with a unique bio-cultural heritage

Traditional use of natural resources is still a way of life in much of the proposed biosphere reserve, and is still preserved in the memories of many locals. This means that the East Vättern Scarp Landscape region offers many opportunities to document knowledge of traditional use of various types of lands, species and their varieties. Above all, the preservation and use of the bio-cultural heritage connected to agricultural activities based on long continuity of grazing, harvesting with scythes and pollarding. By combining traditional knowledge with new technology and new methods, this cultural heritage can also contribute to economic and social development. This landscape is unique from both the European and the global perspective. There is a unique, living cultural heritage in the cultivated diversity of gardening culture, the local fishing traditions in Lake Vättern and the forest cultivation history of Visingsö Island.



Illustration 8. Sheep being fed with lime leaves in the village of Fattarp.

4.2.2 Species that are important to the economy and ecosystem services

Within the proposed biosphere reserve, ecosystem services are being generated that will contribute to maintaining and improving people's well-being. There is a need to develop knowledge about the direct and indirect advantages the local population has of ecosystem services in the East Vättern Scarp Landscape. This will largely be provided by the planned research project SAPES (see chapter 5.1.4). One example is that species that contribute to pollination are an extremely vital and sensitive ecosystem service for the local population, not least for the fruit and berry growers in the region. The small-scale farming landscape produces many raw materials that can be used for food, medicine, construction material, fuel, fodder etc. Some ecosystems and species are more important than others in agriculture, forestry, hunting, berry and mushroom picking and fishing, both for the local economy and for the resilience of the ecosystems. A well-managed agricultural landscape is also important for the cultural services in the ecosystem, which is also reflected in property values and the health and well-being of the local population. There is no way to know with certainty what parts of the local biodiversity will be most important in the changing community and climate of the future; however, we can assume that the species and varieties found throughout the region are well adapted to local conditions and likely have good resistance to disruptions, in part because of the many habitats and climate zones that are represented here.

4.2.3 Biodiversity in figures

There are many protected areas within the proposed biosphere reserve:

- 28 Natura 2000 sites
- 16 nature reserves. Another 14 are in the process of being established.
- 23 habitat protection areas
- 22 nature conservation agreements

Numbers of species observed thus far in the East Vättern Scarp Landscape region:

- 6 on the global red list
- 38 under the EU Bird Directive
- 8 under the EU Habitat Directive
- 304 on the national red list, including:
 - 3 mammal species
 - 40 bird species
 - 1 fish species
 - 4 mollusc species
 - 80 insect species
 - 40 vascular plant species
 - 14 moss species
 - 73 fungus species
 - 44 lichen species
 - 1 alga species



Illustration 9. Aerial photo of the village of Fingalstorp.

4.3 “Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale”

(Describe in general terms the potential of the area to serve as a pilot site for promoting the sustainable development of its region (or “eco-region”).

4.3.1 Unique and representative landscape

The proposed biosphere reserve East Vättern Scarp Landscape is both unique and a typical example of the landscape in the central part of southern Sweden. The East Vättern Scarp Landscape is one of the landscapes in northern Europe in which the history of agriculture and the landscape is clearly visible. The great variation in height of the landmass in the proposed biosphere reserve also makes it representative of a large part of the boreonemoral region.

What makes the area representative is largely that these traces are result of the type of land use that was common in large parts of Sweden and Europe in the past. However, similar values also exist in nearby, more rationalised landscapes. This makes the East Vättern Scarp Landscape ideal for testing and modelling for other landscapes in the region. Conservation efforts in the East Vättern Scarp Landscape region have long been conducted in accordance with the ambitions of the European Landscape Convention, aiming to increase awareness, participation and a holistic view of the landscape.

On the same basis, but a smaller geographic scale, demonstration areas have been created in the East Vättern Scarp Landscape region to give clear examples of how the unique character of this area can be preserved. The purpose of these areas is to serve as valuable, representative nodes for generating and disseminating knowledge about sustainable methods of using natural resources.

4.3.2 People, organisations and networks

Twelve years of active project work with the East Vättern Scarp Landscape, along with the practical location near Jönköping, make this an ideal test area. The seven organisations involved in the biosphere reserve project – Södra Skogsägarna, the Federation of Swedish Farmers (LRF), the World Wildlife Fund (WWF), Gränna Skogsgrupp, the County Administrative Board, the Swedish Forestry Agency and the Municipality of Jönköping – are all important and have key people representing them in good horizontal and vertical networks.

The geographical location of the East Vättern Scarp Landscape is highly advantageous for spreading information and influencing policy. Among other things, the area has direct proximity to national authorities responsible for land-based industries – the Swedish Board of Agriculture and the Swedish Forestry Agency – as well as the regional seat of the County Administrative Board. Many officials and decision-makers from these and other authorities visit the East Vättern Scarp Landscape to learn about efforts to achieve, for example, sustainable landscape management. This creates a great opportunity to use the East Vättern Scarp Landscape as an arena for national and international excursions and conferences, which is already occurring to some degree. For example, groups from India, Finland, Poland, Russia and South Africa have visited the East Vättern Scarp Landscape during the biosphere candidacy.



Illustration 10. Excursion in Ormenäs with a delegation from the biosphere candidates of Magaliesberg in South Africa and Lake Päijänne in Finland.

4.3.3 Examples of innovative methods of promoting sustainable development

One successful example of how the East Vättern Scarp Landscape has served as a proving ground is the pollarding project, which involved study circles, courses, a study trip to Romania, surveys and interviews, the establishment of pollarding teams, articles in local and national media and the production of reports and a brochure. The activities and publications largely aim to reflect article 8J in the Convention on Biological Diversity, which emphasises the importance of documenting and disseminating local traditional knowledge related to biological phenomena.

Another example is the national development of a scientific method for biological gap analyses, which is under way through a collaboration between the East Vättern Scarp Landscape and the Biosphere Reserve of Lake Vänern Archipelago and Mount Kinnekulle. This methods development will form the basis of a landscape strategy based on measurable goals and with all players involved in the implementation. The method should be usable in other valuable regions and landscape initiatives in Sweden and abroad.

4.4 “Have an appropriate size to serve the three functions of biosphere reserves”

(This refers more particularly to (a) the surface area required to meet the long-term conservation objectives of the core area(s) and the buffer zone(s) and (b) the availability of areas suitable for working with local communities in testing out and demonstrating sustainable uses of natural resources.)

4.4.1 Area for long-term preservation goals

The proposed biosphere reserve encompasses both Lake Vättern with Visingsö Island in the small-scale agricultural and forested landscape east of the lake. The total area of the region is 105,500 ha, which is relatively large considering its mosaic-like structure. Opportunities to meet the three functions of a biosphere reserve – preservation, development and support – within this varied region are perceived to be very good.

A project is under way to develop new methods for gap analyses, which will be used to assess what physical area and what landscape quality are required to create long-term ecological functionality. The methods will be used to assess how well the conservation goals in the core areas, buffer zone and transition areas are being achieved. The goal for the entire proposed biosphere reserve is a functioning ecological infrastructure with cohesive stands of valuable trees, or wildlife corridors between different types of value clusters. The zoning of the area into core areas, buffer areas and transition areas is a tool for large-scale geographic priority setting. The “Swedish model” of forestry and other land-based industries is based on a common vision in society regarding the goals of both formal protection and voluntary set-asides. Altogether, these valuable natural areas will build up a sufficient biodiversity at the landscape level.

4.4.2 Accessibility for sustainable use of resources

The East Vättern Scarp Landscape consists mainly of privately owned land. Accessibility to areas that are suitable for testing and demonstrating as models of sustainable use of natural resources in collaboration with land users and residents of the areas must therefore be based on a willingness by landowners to make their land available. The concept of creating demonstration areas for this purpose has proven very successful and garnered interest in the community and surrounding regions. The large number of properties in the proposed biosphere reserve (over 1000) ensures great variation in how the land is used. This also means that there is a varying, but usually fairly great interest in participating in common measures and activities. This will allow the establishment of models for sustainable use of resources that are relevant for landscapes dominated by privately owned land.

4.5 “Through appropriate zonation”

(a) a legally constituted core area or areas devoted to long-term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives.

(Describe the core area(s) briefly, indicating their legal status, their size, the main conservation objectives)

The core areas are existing nature reserves, Natura 2000 areas, habitat protection areas and shoreline protection areas, protected under the Environmental Code in Swedish law, which went into effect in January 1999 (SFS 1998:808). The core area of the proposed biosphere reserve is about 2,120 ha (just over 2% of the total area).

- | | | |
|------------------------------|----------|----------------|
| • Nature reserves | | 660 hectares |
| • Habitat protection areas | | 8 hectares |
| • Natura 2000 sites | on land | 640 ha |
| | in water | 1,150 hectares |
| • Shoreline protection areas | on land | 260 ha |
| | in water | 1,150 ha |

Some of the protected areas overlap.

The primary conservation goal in the core areas is mainly linked to broadleaf deciduous forest and natural forage land. In addition to these areas, there are also smaller core areas consisting of lakes and waterways, other woodlands and small marshlands. Business activities in the core areas are limited to those permitted according to the regulations for the protected areas described above.



Illustration 11. View of the fault scarp in the core area in Lake Vättern and on land, and the buffer zone above the motorway.

(b) a buffer zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place.

(Describe briefly the buffer zones(s), their legal status, their size, and the activities which are ongoing and planned there).

The buffer zone is existing area that has been designated of national interest for nature conservation. To some degree the area is also designated as being of national interest as a cultural environment, and the Swedish Forestry Agency has signed nature conservation agreements with landowners for some of the lands. The buffer zones of the proposed biosphere reserve cover about 41,800 ha (just over 38% of the total area). Of this area, about 31,800 ha are water in Lake Vättern and Lake Landsjön. National interest is covered by the Swedish Environmental Code (SFS 1998:808). The following areas, which overlap to some degree, are included in the buffer zone:

- National interest for nature conservation, 39,600 ha
- National interest for cultural environment, 6,500 ha
- Nature conservation agreements for forest land, 110 ha

The various types of protected areas often overlap. Forestry, agriculture and fishing are pursued in the buffer zone. In addition, tourism, recreation in the form of angling and outdoor activities, education, research and environmental monitoring are pursued in the area. The buffer zone on land consists primarily of privately owned forest and agricultural land. The majority of the buffer zone consists of Lake Vättern. Commercial activity in the buffer zone is limited by the regulations for the above described forms of protection. It will be possible to use the values in the buffer zone to enhance financial and practical opportunities to benefit businesses in the area. More nature reserves and habitat protection areas are planned in the buffer zone, and more nature conservation agreements are likely to be signed as well.

(c) an outer transition area where sustainable resource management practices are promoted and developed

(The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time. Describe briefly the transition area as envisaged at the time of nomination, the types of questions to be addressed there in the near and the longer terms. The size should be given only as an indication).

The transition area in the proposed biosphere reserve is 61,600 ha, nearly 59% of the total area. The transition area consists of woodland, agricultural land, smaller lakes, urban areas and smaller built-up areas. As in the core area and buffer zone, the transition area has great potential to promote sustainable development through joint projects and research, information and education. Several initiatives for sustainable development are under way in several social sectors in the transition area. The goal is that the biosphere reserve will facilitate the creation of financial resources and allow the development of networks with common initiatives over various special interest areas and sectors. Sustainable development of agriculture, forestry and fishing, local food production and green tourism are examples of activities already being pursued in the transition area and which the proposed biosphere reserve sees great potential in further promoting. Three nature reserves and further nature conservation agreements and habitat protection areas will be established in the transition area through agreements between landowners and the state. Voluntary setting aside of land and nature conservation planning in agriculture and forestry will be stimulated intellectually and financially.

4.6 “Organisational arrangements should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve.”

(Are such arrangements in place or foreseen)

4.6.1 Extensive experience of conflict resolution and collaboration

A key premise for the East Vättern Scarp Landscape project, which began in the late 1990s, was to work from the perspective of incorporating environmental protection as well as production in a holistic approach. This means that authorities in various roles and the special interest groups have been jointly responsible. The seven organisations involved in the biosphere reserve project – Södra Skogsägarna, the Federation of Swedish Farmers (LRF), the World Wildlife Fund (WWF), Gränna Skogsgrupp, the County Administrative Board, the Swedish Forestry Agency and the Municipality of Jönköping – are all important and have key people representing them in the project. The process in the East Vättern Scarp Landscape has been long, progressing from conflict to gradual understanding to constructive collaboration with a strong team spirit in the old project team. This multi-sector conflict-resolving method has attracted local, regional, national and international attention.

To locate a permanent arena that can take advantage of the progress so far and further develop the East Vättern Scarp Landscape, the group has jointly decided that a biosphere reserve best meets the needs that the stakeholders have identified. It may be worth noting that it was a local need for a framework and the organisations’ reluctance to end such a successful collaborative project that led to the decision to join the MAB programme, after carefully investigating multiple options. Representatives of landowners, authorities and nature conservation volunteer organisations collaborated in a work group with an executive committee to establish a development plan for the proposed biosphere reserve. A reference group, ÖVB-Forum, consisting of representatives of the organisations in the work group, local history societies, businesspeople, entrepreneurs, etc., was formed to give local communities a say in decisions regarding the East Vättern Scarp Landscape.



Illustration 12. Members of ÖVB-Forum on a trip to Omberg in the province of Östergötland.

The East Vättern Scarp Landscape region has a long tradition of participation in voluntary organisations, creating a social infrastructure and allowing local populations to make their voices heard. The parts of the region that are included in the nomination, but were not a part of the original geographic delimiters of the East Vättern Scarp Landscape project, were included through the participation of two organisations, Visingsörådet on Visingsö Island and Framtidsgruppen in Adelöv.

The Municipality of Ödeshög in the County of Östergötland, which borders on the proposed biosphere reserve in the north, has been collaborating with the project throughout the biosphere reserve candidacy. A work group was formed here consisting of representatives of authorities, landowners, business associations and non-profits. The proposed biosphere reserve will continue this cross-border (both geographical and organisational) collaboration in the hope that this will lead to concrete projects involving the local community with positive results.

4.6.2 Organisation for continued collaboration and administration

The proposed biosphere reserve will be run as a non-profit organisation, proposed to consist of a reference group, a work group, an executive committee and a board of directors. With the task of watching over the association's interests, the board will consist of members from the association and reflect the composition of the work group. The work group, consisting of representatives from the member organisations, will meet regularly to discuss the concerns of the biosphere reserve.

The executive committee will be associated with the biosphere candidate office and serve as a direct link to the organisations involved. The primary goal of the executive committee is to conduct projects on the local to international levels related to the vision and goals of the East Vättern Scarp Landscape and to the priorities of the biosphere reserve. The reference group should serve as a discussion forum and idea shop for work in the biosphere reserve, and serve as ambassadors for the East Vättern Scarp Landscape. As a discussion forum it should represent all elements in society.

During the biosphere candidacy, suggestions have arisen to expand our commitment with additional organisations, including the County Council of Jönköping and the county hospital Ryhov, the Regional Development Council and Smålands Turism, researchers from an array of disciplines, as well as business associations and business consultants. These organisations may play an active part in the creation of new projects, the further evolution of the development plan, etc.

4.7 Mechanisms for implementation

(This refers to the administrative mechanisms, which often are determined at the national level.)

Does the proposed biosphere reserve have:

(a) mechanisms to manage human use and activities in the buffer zone or zones?

There are mechanisms for regulating activities in the buffer zone of the East Vättern Scarp Landscape. Some operations are regulated through existing national statutory regulations (such as the Environmental Code and the Planning and Building Act). In addition, there are national agri-environmental payments for such things as exemplary use of valuable woodlands, grazing lands and hayfields, as well as the industries' own agreements, for example certification of forests (e.g. FSC and PEFC), organic farmlands (e.g. KRAV) and ecotourism (Nature's Best). Various types of voluntary agreements and contracts (such as the Swedish Forest Agency's nature conservation agreements) are also used for valuable portions of the landscape that are privately owned.

(b) a management plan or policy for the area as a biosphere reserve?

A development plan has been established to guide the operations in the East Vättern Scarp Landscape region. This plan is set up in a logical way and is based on the following overall vision: *“To create a robust rural area, a sustainable ecosystem and an attractive landscape for users, residents and visitors, through active collaboration”*.

In addition to the specific development plan for the East Vättern Scarp Landscape, there are also several regional and municipal documents that provide a solid foundation for sustainable development in the proposed biosphere reserve. On the county/regional level, there is a regional development programme (RUP), and about ten important planning and policy documents for the municipalities within the region. Several plans have been approved for Lake Vättern, including a water resources management plan, an administrative plan for fishing and a conservation plan for the Natura 2000 area.



Illustration 13. Aerial photo of the city of Huskvarna with Lake Vättern in the background.

The East Vättern Scarp Landscape is primarily owned by a large number of private owners, and therefore fall under a variety of management plans. Individual properties are often covered by voluntary forest management plans, commitments in order to receive agri-environmental payments (for example for grazing lands under the EU rural development programme), etc. The nature reserves have their own specific management plans.

To create a knowledge base on conservation shortcomings and ecological functionality in the landscape, a project has begun to develop methods for biological gap analyses, which will form the basis of a new landscape strategy for the proposed biosphere reserve that also includes economic, cultural and social aspects.

(c) a designated authority or mechanism to implement this policy or plan?

The planned non-profit organisation “*Biosfärområde Östra Vätterbranterna*” will have overall responsibility for the formulation and application of the development plan. Several arenas are available for translating the plan into action on various levels. The biosphere candidate office will have the practical responsibility for working with the development plan and keeping it up-to-date.

(d) programmes for research, monitoring, education and training?

(Describe briefly research/ activities monitoring (ongoing or planned) as well education and training activities)

Research and educational activities have long been pursued in the East Vättern Scarp Landscape region, and extensive effort is put into expanding contacts with universities and schools. The Water Conservation Association (Vattenvårdsförbundet) for Lake Vättern has long had a solid programme for environmental monitoring and research, which the future biosphere reserve will be able to take advantage of and contribute to through its many contacts. A specific research strategy for the proposed biosphere reserve will be developed in the coming years, and will include ongoing and planned research activities that will form the basis of a bridge between scientific findings and their application. It will also strive to achieve a mutual exchange of information between the academic world and local players, ensuring that research is also aware of the local, practical needs and traditional knowledge. In this interplay between academia and the practical world, the biosphere candidate office plays a key role mediating contacts, areas of research (both geographic and thematic) and other issues, as well as communicating scientific findings and helping to translate them into practical applications.

Therefore, creating meeting places between interdisciplinary research, traditional knowledge and practice will be a top priority in the future, with a focus on the theme issues and theme landscapes defined in the area (see chapter 14.1). Through established contacts with Jönköping University, Stockholm University, the University of Gothenburg, Lund University, the Swedish Biodiversity Centre (CBM) and the Swedish Agricultural University (SLU), research and student projects will be able to focus on the biosphere reserve and fields such as environmental communication, rural development and biological functionality.

Lectures, excursions, seminars and workshops involving researchers have been arranged in the East Vättern Scarp Landscape region for many years, and many of the participants have been people who work in forestry and agriculture as well as administrators. The themes of scientific workshops and seminars have covered a wide field, from the biology of individual species to nature conservation in a broad sense and sustainable forestry methods. Issues and problems regarding land-based industries as opposed to conservation values have been particularly popular.



Illustration 14. Ringing of a peregrine falcon (*Falco peregrinus*).

The proposed biosphere reserve has long been subject to continuous environmental monitoring of lakes and waterways, air, meadows and grazing lands and woodlands. One job of the County Administrative Board is to coordinate regional environmental monitoring in the County of Jönköping, which is conducted by many non-profit and public players. The most relevant environmental monitoring for the proposed biosphere reserve falls under the Regional Environmental Monitoring Programme 2009–2014 for the County of Jönköping.

There are many examples of environmental education and community information activities in the proposed biosphere reserve, for example through the environmental work of various businesses, agricultural and forestry organisations and through lectures and excursions conducted by non-profit organisations and study associations for their members and the general public. The proposed biosphere reserve has no specific programme for education, but has begun developing a communication strategy for joint measures in the East Vättern Scarp Landscape.

5 ENDORSEMENTS

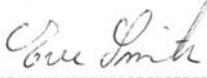
5.1 Signed by the authority/authorities in charge of the management of the core area(s):

For Natura 2000 areas and nature reserves:

Institution: Swedish Environmental Protection Agency

Full name: Eva Smith

Title: Deputy Director General

Date and signature: 2011-04-07 

Institution: County Administrative Board of Jönköping

Full name: Monica Flodström

Title: Deputy Governor

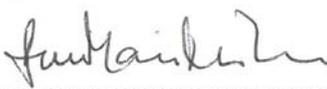
Date and signature: 2011-03-28 

For municipal nature reserves:

Institution: Municipality Jönköping

Full name: Ann-Mari Nilsson

Title: Leading Councillor

Date and signature: 2011-03-28 

For forest habitat protection areas:

Institution: Swedish Forest Agency

Full name: Carl-Olof Thulin

Title: Chief District Forester

Date and signature: 2011-03-30 

5.2 Signed by the authority/authorities in charge of the management of the buffer zone(s):

For areas of national interest for the purpose of cultural heritage and nature conservation, and shore protection areas:

Institution: Municipality of Jönköping

Full name: Ann-Mari Nilsson

Title: Leading councillor

Date and signature: 2011-03-28 

For forests with nature conservation agreements:

Institution: Swedish Forest Agency

Full name: Carl-Olof Thulin

Title: Chief District Forester

Date and signature: 2011-03-30 Carl-Olof Thulin

5.3 Signed as appropriate by the National (or State or Provincial) administration responsible for the management of the core area(s) and the buffer zone(s):

Responsibility in Sweden for managing the forms of protection pertaining to the core areas rests at institutional level within national and local government agencies.

There is no institutional responsibility in Sweden for managing the forms of protection pertaining to the buffer zones. However, there is a general responsibility and, in certain instances, a statutory supervisory responsibility in accordance with current Swedish legislation.

See above, chapters 5.1 and 5.2.

5.4 Signed by the authority/authorities, elected local government recognized authority or spokesperson representative of the communities located in the transition area:

Institution: Municipality of Jönköping

Full name: Mats Green

Title: Mayor of the City of Jönköping

Date and signature: 28th of March 2011

Institution: Municipality of Tranås

Full name:

Anders Wilander

Title:

Mayor of the City of Tranås

Date and signature:

2011-03-28

5.5 Signed on behalf of the MAB National Committee or focal point:

Full name: Göran Blom

Title: Chair

Date and signature: 2011-04-07



PART II: DESCRIPTION

6 GEOGRAPHIC LOCATION

Indicate coordinates of the central point of the proposed biosphere reserve and if possible, the outer limits of the buffer zone to be used for a Geographic Information System (GIS)

Centre of the proposed biosphere reserve

Latitude and longitude 64°30'00"N, 14°21'60"E

Outer borders of the proposed biosphere reserve:

Northernmost point: 64° 52' 80" N, 14° 18' 40" E

Easternmost point: 64° 36' 50" N, 14° 38' 60" E

Southernmost point: 63° 92' 20" N, 14° 08' 90" E

Westernmost point: 63° 95' 50" N, 14° 04' 80" E

7 SIZE AND SPATIAL CONFIGURATION:

For maps of the area, see annex 1-10.

7.1 Size of Core Areas:

Size of terrestrial Core Area(s): 970 ha

If appropriate, size of marine Core Area(s): 1,150 ha

7.2 Size of Buffer Zones

Size of terrestrial Buffer Zone(s): 10,000 ha

If appropriate, size of marine Buffer Zone(s): 31,800 ha

7.3 Size of Transition Area

Approx. size of terrestrial Transition Area(s) (if applicable): 58,900 ha

If appropriate, approx. size of marine Transition Area(s): 2,700 ha

7.4 Brief rationale of this zonation

(in terms of the various roles of biosphere reserves) as it appears on the zonation map: In the cases where a different type of zonation is also in force at the national level, please indicate how it can coexist with the requirements of the biosphere reserve zonation system:

The proposed biosphere reserve is divided into three zones with different purposes: core areas, buffer zones and transition areas (see Annex 2). Core areas are protected by law and are intended to preserve the natural and outdoor-recreation values. In the proposed biosphere reserve, the core areas are either existing nature reserves, protected woodland habitats, Natura 2000 areas and/or areas with shoreline protection. The shoreline protection regulations included in the area are primarily also Natura 2000 areas or existing or planned nature reserves. The core areas are productive land providing several ecosystem services. They are areas with very high conservation value and high biodiversity. They are also vital sources for the spread of threatened and rare organisms. Long-term care and environmental monitoring in the core areas provides a basis of

knowledge that can be used in research and education. Business activities in the core areas are limited to those permitted according to the regulations for the protected areas described above.

Buffer zones surround or link the core areas. The buffer zone has the same boundaries as those of the national interest for nature conservation. The vast majority of the area is also of national interest for cultural heritage preservation and outdoor recreation. According to the Swedish Environmental Code (chapter 3, paragraph 6), areas of national interest shall be protected against measures that can significantly harm the natural or cultural environment. Parts of Lake Vättern are included in the buffer zone, and because Lake Vättern in its entirety is a Natura 2000 area, the majority of the water area in this zone falls under Natura 2000 protection. Activities and use of resources that are compatible with protection of the core areas are encouraged. In the buffer zone, the lands are utilized with consideration of the above forms of protection.

The transition area is the outer zone of the proposed biosphere reserve, where locally supported, long-term sustainable development work is a priority, as in the other zones.

The methods development regarding biodiversity as well as the theme landscapes affect all three zones. It should be pointed out that all major woodland value clusters with high biological values within the proposed biosphere reserve are either formally protected or being evaluated as potential nature reserves. Thus, the primary focus of future conservation, restoration and sustainability measures in the buffer and transition zones are voluntary agreements between landowners and the community. In the rolling landscape of the East Vättern Scarp Landscape, with significant elements of agricultural influence, the dedication and participation of individual land users is necessary to achieve long-term conservation goals.

The mutual relationship between the three zones and the Jönköping-Huskvarna region is important for long-term sustainable development. The interdependence of urban and rural areas is clear in the East Vättern Scarp Landscape. The proximity to major population centres is a key reason that the area has been relatively spared from the problems of depopulation that are otherwise common in the Swedish countryside. The extensive amount of commuting and relatively short distance from the rural to urban areas is crucial here. Many small farms have been able to survive as part-time occupations for people who work in industries in the urban areas. In the long term, there are good opportunities to sell local products in the area.

The core area and buffer zone in particular, but also the area as a whole, is an important recreation area for the people of Jönköping and Huskvarna.

The three functions of a biosphere reserve: conservation, development and logistic support, are relevant in all three zones, but in different ways. For example, conservation and development of biodiversity will occur in all areas, not just the core areas. There is also an economic potential for tourism and nature conservation entrepreneurs. Economically and ecologically sustainable development of agriculture and forestry is a necessity to ensure the conservation and development of high natural and cultural values. All types of research – scientific, economic and social – are needed to support individuals and the community in making good decisions. (See Chapter 15.)

The zonation of the proposed biosphere reserve was designed according to Swedish environmental legislation and the Swedish MAB committee's advice based on UNESCO's key documents. The zonation gives a foundation for priorities and description of the area. In the zonation model, protected core areas are surrounded by a buffer zone, which indicates how different zones are dependent on each other both ecologically and socioeconomically. The

zoning of the area into core areas, buffer zones and transition areas is a tool for large-scale geographic priority setting. The ‘Swedish model’ of forestry is based on a common view in society that even relatively small natural areas can be taken out of production and set aside for nature conservation throughout the countryside. This common view has resulted in the goals for formal national protection, and in the commitments from forestry actors to voluntarily set aside areas under the principle of general considerations. Altogether, these valuable natural areas will build up a sufficient biodiversity at the landscape level. In the East Vättern Scarp Landscape region, the 12-year collaborative project has led to greater achievements than in many other parts of the country. Extensive surveys of all tree-bearing areas (woodland as well as natural grazing lands) have been conducted and currently all major woodland-type areas are either under formal protection or in the process of gaining such protection. Despite this, however, there is a great need to develop knowledge about small-scale functionality in this mosaic-like landscape, and so a project has begun to develop methods for biological gap analyses (see chapter 17.6.2).

In addition to strict geographical priorities (or zonation), the East Vättern Scarp Landscape is divided into six theme issues and six theme landscapes. These divisions help clarify and communicate the operations within the biosphere reserve candidate. The theme issues and theme landscapes expand the vision and goals for the area with the aim of enhancing the functions of development, conservation and logistic support. The priority challenges according to the Madrid Action Plan – climate change, ecosystem services, and urbanisation – are included in all themes in various ways (see chapter 14.1).

8 BIOGEOGRAPHICAL REGION

[Indicate the generally accepted name of the biogeographical region in which the proposed Biosphere Reserve is located. You may wish to refer to the map of the World Network of Biosphere Reserves presenting 12 major ecosystem types.]

UNESCO’s definition: Temperate and sub-polar broadleaf forests or woodlands

EU definition: Boreal region

According to the Swedish definition, the East Vättern Scarp Landscape lies in a boreonemoral zone, i.e. at the borderline between the country’s southern broadleaf deciduous forest region and its northern coniferous forest region. The topography of the proposed biosphere reserve, its proximity to Lake Vättern and its location in the country have led to the existence of typically northern environments side-by-side with more southern habitats.

9 LAND USE HISTORY

[If known, give a brief summary of past/historical land use(s) of the main parts of the proposed biosphere reserve]

The following summary is based on the thematic division into three primary types of land use: i) agriculture, ii) forestry and iii) water use. This division is not fully historically relevant, because the sectorisation of land-based industries is a fairly recent phenomenon. Until the latter half of the 19th century, agriculture was the primary industry of the region and forestry in the modern sense had not yet been developed. The way the land is currently administered, a division between agriculture and forestry feels artificial. For example, wooded grazing lands are home to many species that are dependent on old trees and bushes with plenty of sunlight. Instead of these divisions, the East Vättern Scarp Landscape project has worked to transcend borders in the landscape.

The actual scarp down to Lake Vättern represents just one of many districts in the area between Visingsö Island in the northwest; the forest parishes in the northeast; the city of Huskvarna in the

southwest; and the agriculture parishes in the southeast. The process of settlement and the introduction of agriculture in the area occurred at different rates in the flatlands around Gränna-Visingsö, in the Skärstaddalen Valley and along the Huskvarnaån and Lillån Rivers. The same is true between the heights in and above the scarp down to Lake Vättern and in the valleys and around the lakes and rivers in the eastern parts. Through multifaceted use of natural resources, people have created richly varied, dynamic landscapes. This development has been characterized by continuous interaction on a range of geographic scales. In the proposed biosphere reserve, administrative rights to the land and local geographical conditions have affected local specialization and exchange of resources. Looking back, we can see key transitions when the development of the landscape significantly changed direction (see the subheadings for each type of land use below).

9.1 Agriculture

9.1.1 Cultivation and the advent of cattle farming

The latter half of the Stone Age, the Neolithic era, saw the introduction and spread of agriculture. In the earliest days, cultivation of cereal crops began in districts that even today are best suited to farming. In an area like the East Vättern Scarp Landscape, which encompasses flatlands and inland areas, it is clear that cultivation must have been introduced earlier on Visingsö Island and in the Gränna region, in the Skärstaddalen Valley and in the area along the Huskvarnaån and Lillån Rivers. Settlement came later in the inland parts of the landscape. The distribution of stray finds of shaft-hole axes and other Stone Age artefacts from the Neolithic culture clearly show how these finds are primarily located in areas with the best arable soil – along lakes Bunn, Ören, Ylen, Stensjön and Tenhultasjön, and in the areas along the Huskvarnaån and Lillån Rivers – where settlements and cultivation of cereal crops occurred. Much evidence indicates that in this early phase people had extensive unfertilised fields, created by burn-beating and using shifting cultivation.

9.1.2 Cultivation in the Bronze Age and Iron Age

Farmlands and settlements became increasingly permanent during this period and the agricultural communities of the era largely correspond to the core areas of agriculture today. There are signs that there were small villages in the area even in the early Iron Age, but the majority of buildings consisted of lone farms. However, there is little evidence of these structures before the late Iron Age. There may also have been a division at this time between infields – buildings, fields and meadows – and outfields – forest and grazing land. People began to keep animals now, and this led to a need for winter fodder, which in turn led to the gradual development of meadow management and pollarding. The plains and valley districts alongside the lake systems in the east still made up the agricultural region at this time. We can only assume that the cattle grazed the broad reaches above the slopes of Lake Vättern. Temporary fields may also have been created here through burn-beating or ring-barking trees in the broadleaf forest. These fields were cultivated extensively and then converted to grazing land.

9.1.3 The Viking Era and the Middle Ages

The many grave fields on Visingsö show that the island played an important role in southern Sweden during the late Iron Age. The physical establishment of royal power on the island in the castle at Näs, which can be described as the capital of Sweden during the 12th and 13th centuries, had a significant effect on the landscape and the focus of production in the region. The royal administration was divided into estates called *bushys*, which were found both on Visingsö and in Gränna, with a network of central farms throughout the area that were operated by thralls under the rule of various local aristocrats. Thralldom was abolished during the Middle Ages and the former thralls were given small farms that they worked as tenants. The effects of this on the

landscape cannot be overestimated. Infields and outfields developed a more permanent layout and villages developed, regulated in a system called *solskifte* (in which farmlands were distributed according to the landowner's level of taxation in the village). Grazing animals and various types of pollarding and harvesting carried nutrients from the outfields to the infields. Some of those nutrients returned to the outfields in the form of manure when the cattle grazed in the woodlands. Two-field rotation was the dominant farming method on Visingsö Island, in the Gränna region, in the Skärstaddalen Valley and along the Huskvarnaån and Lillån Rivers between Hakarp/Huskvarna and Rogberga/Lekeryd. New settlements on the outskirts of the core district probably established fields that were used with no crop rotation. Because the king owned so much land on Visingsö that was extensively cultivated, the islanders were given grazing lands and forest in the province of Västergötland and on the Gränna side of Vättern. Spruce began invading this previously broadleaf-dominated region, but not until the end of the period did coniferous woodlands begin to form. Burn-beating inhibited the spread of spruce. Villages and farms were established in the forest districts, but in between them the woodlands were still used for grazing. Perhaps this is when pollarding began on Visingsö, but we have no proof of this until the next period.

9.1.4 16th-17th century

A new power factor in the region was the establishment of a shire, or county, with Visingsö at its heart. It was the home of the noble Brahe family. Some key elements that changed the landscape during this period were the elimination of three villages on Visingsö to create a large deer enclosure and the establishment of many crofts and other new settlements in the previously uninhabited forest areas above the scarp of Lake Vättern. New settlements in the shire provided the people of Visingsö with leaves for fodder from the areas around Lönnemålen. The landscape came to be characterised by an exchange of resources and services between the plains and woodland communities. In addition to the permanent fields in the new settlements, which used three-field rotation or without crop rotation, the large forest areas were gradually burned off to create new temporary fields. Not until this era could it be said that the East Vättern Scarp Landscape area was fully settled. A similar development occurred in the south, where the defence of the Jönköping region laid claim to large expanses of land.

9.1.5 The patchwork landscape

The basic characteristics of the landscape that developed over the first centuries of the modern era were still visible up until the extensive land redistribution reforms of the 18th and 19th centuries. The maps that were drawn then are a unique historical treasure in Sweden and are a vital source of knowledge and understanding of the current biological content and cultural distinctiveness of the region. The straight lines of the land redistribution reforms were drawn right through the old infields and outfields that followed the natural landscape. The ambition was that the properties would have as few land parcels as possible. In addition, farmers were forced to move from the villages where they had lived before the redistribution. This eliminated the local community associations that used to work together. However, some villages in the East Vättern Scarp Landscape, such as Uppgränna, still retain the layout of buildings and properties they had before the land reforms. In the agricultural revolution of the 19th century, over one million hectares of meadow lands in Sweden were converted into fields and later intensively grazed. Old oaks on private land were owned and protected by the crown from the 16th century to the 1830s, but they were felled in the mid-19th century. Tall pines, called 'mast wood', were also reserved for the Royal Navy in those days.

9.1.6 Mechanised, rationalised agriculture

During the Second World War, there was a huge shortage of animal fodder as Swedish imports were blockaded and the country suffered several years of dry summers and harsh winters. The 1950s were also a period with dry, low-productive summers east of Lake Vättern. Grazing put a

strain on the land and the practice of pollarding for fodder had a brief renaissance. The post-war years were dominated by rapid mechanisation of agriculture. Tractors became the new ‘draught horses’ in the fields, and with them came new tools for working the soil. Because of this, many obstacles on the fields, such as clearance cairns, stone walls, open ditches and trees were removed. However, in the East Vättern Scarp Landscape, this rationalisation of agriculture was much less intrusive than in the plains and forest districts on the northern and eastern borders of the region. This is likely due to the topographical conditions of the landscape – the steepness and the exposed bedrock – and the strong land-use traditions already in place in the community.

Mechanisation also dissolved the relatively closed ecocycles in the villages. Energy was imported to farms in the form of diesel and artificial fertiliser. After the war, chemical products began to flood the market. Any risks associated with these products had not yet been found; for example, not until 1970 was the use of DDT banned.

In the past fifty years, the number of agricultural companies in the East Vättern Scarp Landscape has dropped dramatically. In 1975 there were 300 agricultural companies in three of the ten parishes of the East Vättern Scarp Landscape (Gränna, Ölmstad and Skärstad). That number has been halved in the last thirty years, which changes the conditions for rural development here. However, the number of farmers who pursue organic production has grown, and agri-environmental payments for managing traditional hay meadows and grazing lands have caused many valuable environments to be restored and put back into use.

9.2 Forestry

9.2.1 Early use of the forest

In prehistoric times, forestry in the sense of actively growing forests did not exist, but the forest has been very important to the survival and development of human life in the region. During the hunter-gatherer era, forested lands were a great resource for game and fish, berries and nuts, and for fuel and materials for buildings, tools and more. There were few people and they lived a largely nomadic existence. Their influence on the landscape was thus extremely local and temporary. As the farming culture took hold, the population became more settled and their local influence on the forest was more significant. Humans created grazing and meadow lands mainly by burning, grazing and cutting down or ring-barking trees. This was a targeted, and eventually very extensive assault on the broadleaf forest. The measures created much less dense stands of trees, between which the grass was cut with a scythe. Shifting cultivation, which affected large areas through burn-beating, created a forest landscape with significant geographic influence resulting in many different types of forest successions.

The creation of villages and the establishment of the infield/outfield system led to more differentiated land use. In the outfields – the forest – animals grazed in the summer. There were also large areas of burn-beaten fields. Grazing pressure was greatest in the areas closest to the infields and less in the more peripheral areas. At times, grazing pressure and the use of the forest resources could be hard for long periods of time, resulting in sparsely forested outfields. Until the 18th century, the forest was primarily a resource for food production. The exception was the trees that were claimed by the crown in the 16th century for ship building – oaks (*Quercus robur*) and pines for masts (*Pinus sylvestris*).

9.2.2 Successively increasing impact on forested lands

From the Middle Ages on, human impact on forested lands was powered by new technology and a growing population. In Taberg, a few dozen kilometres outside the proposed biosphere reserve, there was a medieval mining operation, which was granted privileges as a mining district in the

17th century. Mining of this sort required huge amounts of charcoal, and the remains of charring pits and charring stacks are very common in the southern part of the East Vättern Scarp Landscape. Charcoal production demanded large areas of forest, so these lands gained an economic value at this time. Other pressures on the forested lands and specific types of trees included the production of tar, pitch, potash and firewood, both for personal use and for sale.

In the 17th century, two new forest-based industries began to take shape, which are still key income sources for Swedish forestry today: paper mills and sawmills. The village of Röttle By outside Gränna was a hub of this development. Many crafts industries were founded in the middle of the century along the roaring rapids. One example is that Count Per Brahe established the first paper mill in the province of Småland for manufacturing rag paper. This paper was primarily used at a printing house on Visingsö Island. There was also a sawmill in Röttle, but water-powered sawmills were also common in smaller waterways. The influence of these two industries on the forest landscape and its users was still very marginal. The waterfalls in the Huskvarnaån River have attracted industries since the 17th century, and small communities have formed around them. Thanks to timber floating on the Huskvarnaån River in the 19th century, the Stensholm paper mill, established in 1703, was able to expand its sourcing area in the forests around the lakes at the upper mouth of the river.

9.2.3 The beginnings of rational forestry

The great transformation of Swedish and Smålandish forestry occurred from the mid-19th to the mid-20th century. At the beginning of this period, the Jönköping match factory was founded. The company became internationally known and eventually had five separate plants operating in the nearby City of Jönköping. Because matches are made of aspen (*Populus tremula*), the factory had a local effect on the felling, and later cultivation, of aspen in the proposed biosphere reserve.

The requirement of replanting and planting of new forest did not come until the Swedish Forestry Act of 1905, but an interest in planting had come about much earlier. The most interesting example of this is the oak plantation on Visingsö Island, which began in the 1830s. The purpose was to provide the Royal Navy with materials for ship building. At the time there was huge public opposition to the crown's claims to oaks, but a stock-taking of the oak population in the 1820s showed that the privately owned oak woodlands would not meet the navy's needs. The original documentation is still preserved, showing the oak populations on each individual farm. The trees grew on the most fertile lands, in meadows and fields. In the outfields where animals grazed, oak trees (*Quercus robur*) were essentially nonexistent by the 17th century. When the crown's claims to the land were eliminated, 85% of the oaks in the county were felled in about ten years. The exceptions were lands belonging to nobles and the Church, where we can still find remnants of what were once extensive oak-woodland species. This example of historical land use gives a clear example of modern conservation challenges. The middle spotted woodpecker (*Dendrocopos medius*), which was common in the mid-19th century, vanished completely about 100 years after the major clearings of forest lands, and similar extinction debts are likely to exist in other ecosystems. Intense management of the oak woodland on Visingsö has led to its becoming Sweden's largest cohesive field plantation and a normative example for the establishment and care of broadleaf deciduous forests.

9.2.4 Development of machine-based forestry

Compared with agriculture, forestry took a few more decades to replace horses with machines that ran on fossil fuels. The Huskvarna factory, which is located within the proposed biosphere reserve, was deeply involved in this technological development when it introduced the chainsaw in the late 1950s. Now 60 years later, Huskvarna AB still holds a strong position on the international market, offering many motorised products for forestry and gardening. As late as the

mid-20th century, horses and sometimes oxen were still the most important means of transport in the forest, and trees were felled with axes and saws. Machines gradually took over in the 1960s with the slogan: “not a foot on the ground, not a hand on the wood”. A few decades later, this vision was achieved and individual lumberjacks were largely replaced by machines such as harvesters and forwarders. However, more traditional, small-scale methods are still used on many smaller properties. For many landowners the forest is also important as a source of wood and a place of recreation. The vast majority of forest plantations have consisted of spruce (*Picea abies*), which was seen as giving the highest yield. In some areas, pine (*Pinus sylvestris*) was an alternative, but the swelling deer populations in the past decades make it very difficult to pursue forestry with these tasty trees without fencing them in.

9.3 Use of water

9.3.1 Use of water until the Great Power Era

Several areas of the East Vättern Scarp Landscape have been key fishing areas for thousands of years, for example Visingsö Island and the inflow to the Huskvarnaån River. Below the current water level in the Huskvarnaån there have been many historical monuments near the river, including a series of poles driven into the ground, dated to the 6th century, that were probably used as fixed fishing equipment. Several interesting structures and finds by the Huskvarnaån also indicate that the area has been a hive of activity throughout the centuries. Historical sources tell us that there were good breeding grounds for roach (*Rutilus rutilus*) and that the river offered good trout fishing. Lake Vättern has never been particularly rich in fish.

In the Middle Ages, lake fishing was very popular in Sweden because the Catholic Church imposed days of fasting when the only flesh that could be eaten was fish for nearly half the year. In those days farmers fished along the shores during the spawning season. Migratory fish were also caught in waterways. In general the farmers owned migratory fish, while the State owned the more important fishing. There was no deep-sea fishing and only a handful of professional fishermen, generally employed by castles and royal demesnes. In the 16th century Jönköping Castle had seiners on staff (see below), but there were no fishermen on staff at Visingsborg Castle during the Great Power Era. However, Count Per Brahe collected fish from his shire. For example, salted and dried brown trout (*Salmo trutta*), char (*Salvelina umbla*), burbot (*Lota lota*) and eel (*Anguilla anguilla*) were to be paid to the potentate. Much of this collection consisted of eel, which is largely because of the fishing methods of the era, but it also gives an indication of a larger eel population than today. Count Per Brahe’s cookery book dating back to the 1670s or 80s also shows a great interest in crayfish (*Astacus astacus*). The Count had crayfish planted in Lake Vättern’s tributaries to ensure a bigger supply. He also had several ponds dug around Visingsborg Castle.

9.3.2 Use of water in the 18th and 19th centuries

Trout had probably disappeared from many of the smaller waterways through the East Vättern Scarp Landscape by the early 19th century, as these waters were heavily used for hydropower in later centuries. Several rivers that had fixed fishing equipment for salmon that are completely ruined today. As a compensatory measure, the power company was required to plant out ‘Vänern salmon’ each year. This species does not reproduce in the lake and the planting out has decreased in recent years out of fear that it may compete with the lake’s char populations.

The outflow of Lake Landsjön via the Edeskvarnaån River no longer exists because the entire river now follows a short wooden channel down to the power plant on Vättern’s shore. The Huskvarna Falls are also mostly dry these days. The water level in many lakes has been reduced to create more arable land, which has also affected the smaller lakes and wetlands in the area. In

the parish of Skärstad, an estimated 95% of the wetlands have been drained, and the same is true for other parishes such as Ölmstad and Gränna. Currently many wetlands are being restored to reduce methane emissions from agriculture, stop the leaching of nutrients from fields and increase biodiversity.

In the 18th century Gränna was a small church village with an economy based on agriculture and gardening. It had no ships or port until 1855. In the old days, fishing was pursued, but only for household needs. In the early 18th century the Gränna bourgeoisie bought cod from distant Växjö and herring from the west-coast province of Halland. On Visingsö Island in 1850, the population of about 1,000 pursued primarily agriculture and 'some fishing'. Seine fishing – drawing a narrow-gauge net towards land – for above all common whitefish (*Coregonus lavaretus*) was long a staple in Lake Vättern and other lakes and rivers. As late as the 1950s there were some 50 seines around Vättern and several were active. Several other traditional fishing methods have been used in Vättern, such as spearfishing of char (*Salvelina umbla*) with a holder for glowing coals at the stern of the boat to attract the fish; fishing for spawning whitefish using stake nets; and night-time ice fishing for burbot (*Lota lota*) in small ice huts around Visingsö and Gränna. There was no real establishment of professional fishing on the lake until the latter half of the 19th century, when the farmers no longer had time to fish.

Travelling and transporting goods by maritime routes was preferable in the past, because it was often surer, faster and required less investment. However, Lake Vättern is known for its storms and rough seas. With the opening of the Göta Canal in 1832 it became possible to travel by boat between Lake Vättern and the Baltic in the east as well as the North Sea in the west, and also to the big cities of Gothenburg and Stockholm. The first regular boat traffic began in 1862-63, when two steamers trafficked all the ports on Lake Vättern a few times a week. This steamboat traffic was extensive as late as the 1950s-60s, but these days only a handful of steamers cross Vättern during the tourist season. Cargo traffic has ceased entirely. A *Vättersnipa* is a local high-speed, seaworthy type of vessel available in several models for cargo, fishing or passenger transport. Thanks to their ideal suitability for the lake, the landscapes on both sides of Vättern were linked together, with significant exchange long before the advent of roads.

9.3.3 Use of water in the modern era

As late as the 1940s, professional fishermen in Lake Vättern had to supplement their income with forestry or quarry work during cold winters when the lake was frozen. A limited amount of fishing as a sideline was carried out in the lake throughout the 20th century, but this has gradually disappeared. The lake's fishing fleet didn't see motorised boats until the Second World War. But when motors came along, they created conditions for a new form of trawling for char (*Salvelina umbla*) and for the expanding downrigger fishing in the late 19th century and net fishing in the early 20th century. Modern professional fishermen use an array of tools, including crayfish traps, cages and low double hoop nets because of the increase in crayfishing. Wide-gauge nets are the dominant type, used year round to catch char, whitefish and perch. There is also some floating-net fishing for salmon and to some degree trout. Salmon are also trapped.

Professional fishing in Lake Vättern has long been based on char, salmon and whitefish, but catches have decreased in the past decade. The prognosis for continued professional fishing of the character species char (*Salvelina umbla*) and vendace (*Coregonus albula*) is poor, but in the late 1990s a new core species appeared – signal crayfish (*Pacifastacus leniusculus*). In 2001 signal crayfish represented about 25% of all fishing revenues, and by 2004 that figure had swelled to 75%. The crayfish have created a new security for the future of professional fishing, and have probably reduced the fishing pressure on species such as char. The influence of crayfish on the ecosystems is unknown at this time. Due to the expansion of hydropower, wastewater discharge, acidification

and other influences, waterways with suitable living environments for grayling (*Thymallus thymallus*) and brown trout (*Salmo trutta*) have dwindled. In recent years, restoration of these key environments has begun. A new threat to char is climate change; winter storms on a Lake Vättern that is increasingly ice-free creates waves on the shores that destroy their reproduction.

The number of professional fishermen has steadily dropped, from 173 in the early 20th century to around 20 today. Because Lake Vättern is relatively low-yielding, its fishermen offer related services to a much greater degree than elsewhere: Smoked fish, local fish markets and even charter fishing trips are offered to eke out the fishermen's meagre income. In contrast to professional fishing, sport fishing and angling have increased in recent years. These activities are regulated and monitored to ensure a minimum size of caught fish, limited catch sizes per day and person and areas that are off-limits during given seasons or year round, making this type of fishing a sustainable use of resources. There is excellent potential to develop a tourism industry focused on fishing, and the whole of Lake Vättern is open for artisanal fishing. There are currently about 15 organised guest marinas around Lake Vättern and a very large number of natural harbours. There are two guest marinas in the proposed biosphere reserve, at Gränna and on Visingsö Island.

10 HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE

[Approximate number of people living within the proposed biosphere reserve]

10.1 Core Area(s)

47

10.2 Buffer Zone(s)

6,945

10.3 Transition Area(s)

32,698

Information on the number of seasonal residents is extremely uncertain and is therefore not included in this summary.

See Annex 6 for a map of the population in various parts of the proposed biosphere reserve.

10.4 Brief description of local communities living within or near the proposed Biosphere Reserve

[Indicate ethnic origin and composition, minorities etc., their main economic activities (e.g. pastoralism) and the location of their main areas of concentration, with reference to a map if necessary]

10.4.1 Villages and scattered buildings

The majority of the proposed biosphere reserve is dominated by agricultural and forestry land, with villages and scattered settlements consisting of small farms and individual homes. There are also several large-scale farms and manors in the East Vättern Scarp Landscape. An increasing proportion of the lands in the proposed biosphere reserve is owned by people who live in a different municipality. The many lakes in the East Vättern Scarp Landscape make it an attractive summer home region. Some parts of the area have extensive summer homes. The proximity of urban areas has prevented much of the depopulation that many other rural communities have

suffered. For example, the population of Ölmstad is about the same today as it was in the mid-19th century. Many young people take over their family farms or build new homes on the property. Job opportunities close to home have allowed many people to pursue agriculture or forestry part-time. This has facilitated the creation of a living agricultural landscape. There are also many good examples of successful entrepreneurs in the land-based industries, such as those who sell meat or fruit crates, or who sell vegetables, food and snacks from their farms.

10.4.2 Built-up areas in the countryside

The rural towns in the proposed biosphere reserve all developed out of a traditional agrarian society with a clear spirit of small-scale entrepreneurship. Both within and outside the built-up areas there are several small and medium-sized companies. There are many microcompanies with a great variation of operations, as well as engineering and wood-processing companies with many employees. The towns are surrounded by woods and a small-scale agricultural landscape. Several of the smaller towns evolved at crossroads and some of them are main parish towns, such as Skärstad, Kaxholmen and Ölmstad along the old Riksettan highway, and Öggestorp and Lekeryd in the east. Örserum is near Gränna in the northwest and Tunnerstad is on Visingsö Island. Since most of the settlements serve as suburbs with commuters to Huskvarna and Jönköping, they are subject to extensive construction. For maps of employment and commuting, see annex 7-10.

10.4.3 Larger towns

The three urban areas of Huskvarna, Gränna and Tenhult are located in the East Vättern Scarp Landscape. Historically, Huskvarna belonged to the parish of Hakarp. The waterfalls in the Huskvarnaån River have attracted industries since the 17th century, and small communities have formed around them. Around the turn of the 20th century, the introduction of electrical power led to explosive community expansion. Huskvarna was granted city privileges in 1911. The small communities in Hakarp developed around their local industries. In 1968 the Municipality of Hakarp and the City of Huskvarna reunited and later, in 1971, became a part of the Municipality of Jönköping.

The population of Huskvarna is now about 20,000; in Hakarp it is close to 5,500. The districts along the Huskvarnaån River are typical industrial communities around the internationally known companies of Huskvarna AB, VSM Group AB, SAAB Training Systems and Carlfors Bruk. All of these companies have been important workplaces for a very long time, active on the local, national and international markets. Like Huskvarna, Gränna evolved around an industry, based on the generation of hydropower in the Röttle and Huskvarna Falls. Today Gränna is a well-known tourist attraction and home to about 2,500 people, very many of whom work in various ways with the tourism industry.

Tenhult in the southern part of the area has a population of about 3,000 and is a typical station community with a strong tradition of small businesses. One company in the community is KABE AB, one of Sweden's biggest manufacturers of caravans and mobile homes. Tenhult also has an upper-secondary school with a focus on natural resources that has about 260 students. The Municipality of Jönköping recently developed an expansion strategy that will enable the municipality to grow from its current population of 125,000 to 150,000. See annex 6 for a map of the population in the area.

10.5 Name(s) of nearest major town(s)

Jönköping

The county town of the County of Jönköping and Sweden's ninth largest town, with 84,000 residents. Located right on the border of the biosphere reserve, just south of Lake Vättern and due west of the town of Huskvarna (see more above).

Gothenburg

The county town of the County of Västra Götaland and Sweden's second largest town, with 510,000 residents. Gothenburg lies 145 km west of the area.

10.6 Cultural significance

[Briefly describe the proposed Biosphere Reserve's importance in terms of cultural values (religious, historical, political, social, ethnological)]

The original population of the proposed biosphere reserve followed the Norse pagan religion, as evidenced by remnants of pagan cult centres like the burial ground from just before the common era, located by Lundaberget Hill east of Huskvarna. One very exciting ancient monument is the recently excavated village at Öggestorp.

The cultural identity of many people is tied to their role as farmer, forester or businessperson. Social belonging is largely determined by being part of a parish. Christianity arrived in the region relatively early and churches were built on the southern shore of Lake Vättern on the Hakarp plateau and on Visingsö Island in the 12th century. In the 16th century, King Gustavus Vasa proposed the building of a Protestant church in the spirit of Martin Luther. Currently there are 15 active churches and four parishes.

Representatives of the Church of Sweden have stated that the separation of church and state has led to a growing sense of alienation and a loss of typically church-related traditions. The Church is therefore seeking a partially new role in the community, a challenge related to the modern lifestyle and people's relationship to nature and those around them. Bearing this in mind, the lands owned for a thousand years by the Church of Sweden, including meadow and forest lands in the proposed biosphere reserve – many of them containing key biotopes with high natural values – may be of vital significance.

Besides the Church of Sweden, the Mission Covenant Church of Sweden and the Pentecostal Church have a strong position in the region. The latter two developed out of the rural revival movements of the 19th century, a phenomenon that corresponded to the evolution of the labour movement in Huskvarna at the same time (see more below). Political views in these rural parts tend to lean centre-right. The rural population is primarily ethnically Swedish, while Huskvarna has a more mixed population.

On Visingsö Island and in the Gränna region there is also an awareness of the historical roots of the area, especially the part of history that can be related to the Brahe shire era in the mid-17th century. The visible relics of that period are many, including the ruins of Visingsborg Castle and Brahehus Castle, Brahe Church, memorial stones to Count Per Brahe the Younger on the island, Storgatan Street and the church in Gränna, the watermill environment on Röttleån River, Västanå Castle and the ruins of the Brahehälla hunting castle. The Grenna Museum featuring S. A. André's Arctic Balloon Expedition of 1897 and the Polar Centre featuring mainly Swedish polar history have put the community on the map. The museum offers extensive programmes focusing on current research in the polar regions. For Swedes in general, the town is probably best known as the origin of the popular striped candy sticks, or rock, known as *polkagrisar*. At the beginning of the 20th century, Gränna pears were a common concept. Even today, fruit growing is a strong tradition in the area. The well-preserved wooden buildings give the town a picturesque charm and a clear feel of a summer community with swimming, camping and restaurants down at the pier.

The woodland areas above the Vättern scarp have not been emphasised in the same way as the areas around Huskvarna-Hakarp and Visingsö-Gränna. Cultural values here are more tied to the land-based industries, particularly forestry. Those with a burning interest in nature and culture can visit historical village environments and individual historical buildings, as well as areas of valuable meadow and pasture lands that can be enjoyed from an array of walking trails. However, there are many open landscapes: For example, to the north at Lakes Bunn and Ören. South of this we meet the wide open Skärstaddalen Valley surrounding Lake Landsjön, with many lovely small lakes within its slopes. Finally, in the southeast are relatively large agricultural areas near Lakes Ylen, Stensjön and Tenhultsjön, all a part of the upper reaches of the Huskvarnaån River. This is also a region of tourism, with swimming, canoeing and fishing as attractions. Near the forested areas is another one of the great assets of the East Vättern Scarp Landscape: the many small villages, often consisting of 2-4 farms with well-tended buildings. These are all located in beautiful surroundings with grazing lands and access to stables for many horses, to meet the needs of city people.

10.6.1 Central district and forest district

The many variations within the proposed biosphere reserve – plains districts, forest districts and in-between areas have been mentioned above. If we add categories of ancient relics reflecting various eras, it becomes very clear how the settled, farmed communities developed where conditions were best for farming. However, the outlands have always been necessary for the expansion of farm districts. This was where cattle could be grazed, wood could be gathered for construction, firewood and fencing, and temporary farmlands could be established. The forest districts in the East Vättern Scarp Landscape includes a part of the storied Holaveden Forest, which is jointly owned by farmers in the district. All the tales about robbers and outlaws hiding out in the forests of the past can probably be taken with a pinch of salt. Although this area included a large pine forest and far-reaching outlands, the lands have constantly been utilised. Documents of historical legal proceedings show how the entire landscape was used, how people worked in the forests felling trees and burn-beating and how people travelled through forest areas on beaten paths.

A new element of the landscape that undid some of the logical division into a lower (Visingsö/Gränna) and an upper (the Vättern scarp and eastwards) area of the landscape was the new European motorway, the E4, which was built in the 1960s. Previously the main road between Stockholm and southern Sweden went straight through Gränna and the Skärstaddalen Valley. East of this road was nothing but forest and outfields. Count Per Brahe the Younger intentionally built the main street through Gränna as a broad road where two horse-drawn carriages could meet. This was one step in the efforts to elevate Brahe's Gränna as the capital of the shire and an important city in the Kingdom of Sweden. However, the old Riksettan highway still remains as a tourist route and is promoted as an alternative to the motorway. Today the motorway is a barrier, splitting the landscape into two parts above the natural zonation.

10.6.2 History of the shire

When King Erik XIV was crowned in 1561, Sweden's three first and the last shires were founded. Count Per Brahe the Elder received a newly created royal demesne on Visingsö Island, where he had his residence, Visingsborg Castle, built. Construction took 100 years and it was his grandson Count Per Brahe the Younger who set his mark on the castle. It was not only a royal residence and representation building, but was also a veritable showpiece. In the mid-17th century, the castle was surrounded by large bulwarks in a Vitruvian architectural style. Although the Danish armies were not fully defeated at this time, Visingsö in the middle of Lake Vättern was not of particular strategic value to an attacker. Rather, the defences should be seen as showing off the art of fortification of the day.

The construction of Visingsborg Castle came to affect the landscape on the eastern side of Visingsö significantly. While one village had already been eliminated to create a royal demesne in the 1550s, two more were now evicted and their lands included in the estate of Visingsborg Castle. In their new, expanded property the Brahe family created an agricultural landscape consisting primarily of fields in the north and meadows and woodlands in the south. Around the castles and northwards, an elegant continental-style garden was established, which is described in detail in the castle's accounts.

As in the early Middle Ages, the greatest worldly and financial power in the 16th and 17th centuries once again became a tangible physical reality for the people of Visingsö and all who lived within the borders of the shire. The parishes east and west of Lake Vättern, and also a bit further inland, were included in the shire and a city was also established, Brahe-Gränna, which was previously a part of the *husby* lands. The physical presence of political power in the region naturally affected the landscape. Although the Brahe family had full jurisdiction within the shire, there is little information to indicate that they exploited the peasants. In fact, 'in the count's time' is a common Swedish expression, meaning 'in the nick of time' and referring to Count Per Brahe's last-minute intervention in a legal dispute. Thus, the memory of the count lives on (and in a positive sense) in everyday speech. Sources indicate that the region flourished during the 100-plus years that the Brahe family strove to run the shire in an exemplary fashion. In the 1580s Count Per Brahe the Elder wrote a book for 'young nobles' teaching them how to conserve resources and operate large-scale agriculture; these ideas were brought to fruition in the shire.

Having a local base of power allowed for regional specialisation within the shire. In this way, the Brahes indirectly influenced the shaping of the landscape. In addition to the basic production of farms and villages, there were probably farmers who specialised in wool, eggs, leaf fodder or crafts. In the parish of Vireda, a small farm has been excavated that specialised in wrought iron, and it is possible that this village was also included in an intricate network of relationships with Visingsborg Castle.

In the 1680s, the Crown began seizing lands it had once granted, and this led to the end of the shire. The next major landscape change on the island occurred in 1820-1850, when its eastern part, which previously belonged to the Visingsborg Estate, was planted with oak trees to provide wood for future shipbuilding for the Royal Navy.

10.6.3 The importance of popular movements for democracy and public education

The Nordic countries have a long tradition of voluntary work. All the major popular movements: the labour movement, the sobriety movement, the free church movement and various farmer movements, developed in the latter half of the 19th century and had great public support. These movements represented and organised a spirit of solidarity and striving for freedom. Other movements evolved in the 20th century, for sports, women's rights, peace, solidarity and environmentalism. These organisations have been crucial in the development of representative democracy and the Nordic welfare model and they are still of central importance in Swedish society, even in rural areas and in the East Vättern Scarp Landscape. Today 94% of all adult Swedes are involved in at least one organisation, which is a very high percentage internationally.

In the East Vättern Scarp Landscape, the free church and farmer movements are particularly prominent, but others such as sports clubs, local history societies, business organisations and nature conservation organisations are also vital players in the social life of the proposed biosphere reserve. The extensive amount of organisation allows the creation of a social infrastructure where like-minded people get together to discuss common interests. An extensive,

effective dialogue is conducted with locals when elected representatives channel information from the East Vättern Scarp Landscape operations or survey individuals' opinions. It enhances credibility when a message is conveyed by representatives you know personally and have faith in. Popular movements are the way most residents choose to express their opinions and make their voices heard in public matters. When strong opinions are expressed, they are often channelled to other players by various associations. This method of conflict resolution through dialogue is typical throughout the community and was an important factor for the growth of the East Vättern Scarp Landscape project, in which representatives of landowners' and environmental organisations met with representatives from authorities.

From the very beginning, all popular movements emphasised public education in the form of courses, lectures, study circles etc. This is another tradition we can build on. Continuing education in a field of interest is very common. The East Vättern Scarp Landscape tries to continuously offer and convey various skills in sustainable development (sustainable forestry methods, socially adapted use of resources, pollarding, grass-fed meat, nature tourism, conservation biology, bio-cultural heritage etc.). Types of instruction vary from study circles to lectures to written information to concrete advising on individual properties or at companies. Often the boundaries between the proposed biosphere reserve and the popular movements' organisations are somewhat fluid when it comes to providing information – many operations are pursued in close collaboration and informational material is produced jointly.

The goals of the East Vättern Scarp Landscape are made public at various types of meetings: Forest days arranged by associations or by the Swedish Forest Agency, annual events in the villages, association meetings etc. Public events are organised through the proposed biosphere reserve, but the biosphere candidate office is increasingly trying to participate in the often very well-attended (200-1000 people) meetings of other organisations. People from all parts of society come to such meetings: landowners, residents, businesspeople, association members and visitors.

10.6.4 Famous people

Many people from the proposed biosphere reserve are well known. Several have been important political figures, while others are celebrated cultural personalities. Below is a list of some of the most important people for the identity of the East Vättern Scarp Landscape:

- King Magnus III (also known as Ladulås), born around 1240, King of Sweden between 1275 and 1290. Died at his residence, Näs Castle on Visingsö Island in 1290
- Count Per Brahe the Elder. 1520-1590. Count and statesman, received Visingsö Island as a land grant, which later became the centre of the shire. Began construction of Visingsborg Castle
- Count Per Brahe the Younger. 1602-1680. Count, government official and politician. Completed the construction of Visingsborg, built Brahehus Castle and founded the city of Gränna
- Erik Dahlberg. 1625-1703. Count, military man, architect and government official. County Governor of Jönköping 1687-1693
- Viktor Rydberg, Jönköping, author, 1828-1895
- Wilhelm Tham, CEO and chairman of the board of Husqvarna Vapenfabriks AB, and to a great degree responsible for the development of both his company and the city, 1839-1911

- Katherine Tingley, Massachusetts, USA, head of the Theosophical Society, established a theosophy centre on Visingsö (Tempelgården) and organised an international theosophical conference on the island in 1913, 1847-1929
- Ellen Key, Örebro, author, teacher and women's rights ideologist, 1849-1926
- Salomon August Andrée, Gränna, engineer and polar explorer 1854-1897
- Georg Pauli, Jönköping, artist, 1855-1935
- Alfred Dalin, educator in Huskvarna and a pioneer of the development of the Swedish national school system, 1855-1919
- John Bauer, Jönköping, artist, 1882-1918
- Elin Wägner, author and national pioneer in environmental thinking and feminism, 1882-1949
- Vera Nilsson, Jönköping, artist, 1888-1978
- Alf Henriksson, Huskvarna, author, 1905-1995

II PHYSICAL CHARACTERISTICS

II.1 Site characteristics and topography of area

[Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes etc.) which most typically characterize the landscape of the area.]

The name, character and to some degree also the boundaries of the East Vättern Scarp Landscape are based on its unique, varied topography. Two parallel fault zones frame the terrestrial part of the proposed biosphere reserve in the west and east. Both originate from the faulting that occurred 800 million years ago when the graben in which Lake Vättern lies was created. Seismological measurements show that it has over 600 metres of height difference between the highest and lowest elevations on the bedrock surface in the faults. The two fault zones are clearly visible in the terrain and on the map. The western fault cuts sharply down toward Lake Vättern while the eastern fault is lined with several small lakes like a string of pearls. In between them is a small-scale, topographically heavily broken landscape with a thin layer of soil and exposed bedrock.

The area primarily lies above the highest coastline, which consists of unwashed sediment and till. The parts of the area located more than 200 metres above sea level are a part of the South-Swedish Highlands, which belong to hardness zones 3-5 and consist of forest and raised bogs. In the east-west direction, several Vättern brooks cut through ridges and deep soil layers and create deep ravines and canyons that are special for this part of the country. Fertile farmlands lie like sloping tongues in the Landsjödalen and Tenhultsdalen Valleys, and as flat peneplanes on Visingsö Island and the scarp toes in Gränna.

The East Vättern Scarp Landscape is located entirely in the drainage basin of Motala Ström, subdivision Lake Vättern, in the South Baltic Water District. Lake Vättern is Sweden's second largest lake, and the fifth largest in Europe. It is characterised as a cold, oligotrophic clear-water lake and might best be described as an 'inland fjord'. The southern part of the lake is completely free of islands, except for Visingsö. The 25,000-hectare island has a unique geography and history. Visingsö consists of sedimentary rock types, which gives it a flat topography and extremely fertile soil.

11.1.1 Highest elevation above sea level:

345 metres

11.1.2 Lowest elevation above sea level:

On land: 88.5 metres (along the Vättern shore)

In Lake Vättern: –40 metres (south of Visingsö Island)

11.1.3 For coastal/marine environments, greatest depth under average sea level:

N/A

11.2 Climate

[Briefly describe the climate of the area using one of the common climate classifications]

The East Vättern Scarp Landscape lies in climate zone Dfb according to the Köppen climate classification. This makes it a cold, damp continental climate, but with warm summers. The weather in this zone is often varied, with large seasonal variations. Summers are often warm and humid with relatively frequent thunderstorms. Winters can be very cold with recurrent snowfalls and a continuous blanket of snow. The average temperature in this climate zone is below -3°C in the coldest month and below 22°C in the warmest month.

Due to the proximity of Lake Vättern and the great increase in altitude to the east, both temperature and precipitation vary drastically within the area. This difference is clearly visible in the statistics from the measuring stations in the area (see below), which are in hardiness zones 2-5. Around Lake Vättern the climate is more maritime – sunnier, windier and with a higher average daily amplitude. This reduces the risk of frost on Visingsö Island and on the scarp toes on the mainland down toward Vättern, making them ideal for cultivation of berries and fruit that require a warmer climate. The more highland areas can experience extreme differences in temperature between heights and valleys, where cold winter air can collect in depressions in the topography. The average annual temperature in the East Vättern Scarp Landscape is around 6-7°C and the number of sunlight hours is around 1,500-1,700 per year.

11.2.1 Average temperature of the warmest month:

- On Visingsö Island in Lake Vättern the average temperature is 15.7°C
- In the western part of the mainland (Huskvarna) the average temperature is 16.6°C
- In the eastern part of the mainland (Ramsjöholm) the average temperature is 14.9°C

11.2.2 Average temperature of the coldest month:

- On Visingsö Island in Lake Vättern the average temperature is –2.1°C
- In the western part of the mainland (Huskvarna) the average temperature is –2.4°C
- In the eastern part of the mainland (Ramsjöholm) the average temperature is –3.9°C

11.2.3 Average annual precipitation:

- On Visingsö Island in Lake Vättern the average annual precipitation is 486 mm
- In the western part of the mainland (Huskvarna) the average precipitation is 642 mm
- In the eastern part of the mainland (Ramsjöholm) the average precipitation is 581 mm

11.2.4 If a meteorological station is in or near the proposed Biosphere Reserve, indicate the year since when climatic data have been recorded:

a) manually: 1908 (Högemålen), 1914 (Huskvarna), 1961 (Ramsjöholm) and 1962 (Visingsö)

b) automatically: 1995 (Visingsö)

c) station name and location:

Visingsö	94 m above sea level	64° 42' 06" N, 14° 17' 47" E
Huskvarna	99 m above sea level	64° 07' 86" N, 14° 09' 55" E
Ramsjöholm	225 m above sea level	64° 13' 95" N, 14° 18' 26" E
Högemålen	298 m above sea level	

11.3 Geology, geomorphology, soils

[Briefly describe important formations and conditions, including bedrock geology, sediment deposits, and important soil types]

11.3.1 Bedrock

Sweden's bedrock consists primarily of basement rock. Tectonically it belongs to the Baltic Shield. The proposed biosphere reserve East Vättern Scarp Landscape has a heavily broken landscape topography of basement rock, in some places covered with sedimentary rock. The basement rock belongs to the Transscandinavian Magmatic Belt (TMB), also called the Småland-Värmland Granite Belt. The belt passes from southeastern Småland province to northern Värmland province and consists of relatively well-preserved magmatic rock types. The majority consists of granite that has been dated to 1,800 million years of age, with elements of granite gneiss, volcanic rock, Småland porphyry and gabbroic intrusions. One unique rock type, grännaite, is found in Norra Kärr, north of Gränna. The western portion of the East Vättern Scarp Landscape is a part of the Protogine Zone – a zone of weakness in the bedrock – which is one of Scandinavia's biggest tectonic boundaries. This zone can be followed from the province of Scania to northern Värmland and can also be traced under the Scandinavian mountains. In the region south of Lake Vättern, the zone is marked with a significant gravity gradient, and magnetic anomalies indicate that it is approximately 25 km wide. It is a broad movement zone with steep structures and faults running in a north-south direction, of which the East Vättern Scarp Landscape is the largest. The Lake Vättern graben was formed 800 million years ago, but it has been changed by a number of geological events. See annex 4 for a map of the bedrock.

As early as the Precambrian Era, the bedrock in the Baltic Shield had already eroded to a denudation surface, the sub-Cambrian peneplane. During the Cambrian Period and later, it was covered by a kilometre-thick layer of sedimentary rock. Later, in the Mesozoic Era, from the Jurassic to the Cretaceous Period, the bedrock rose out of the sea and the majority of the sedimentary layers weathered away. During this period the Baltic Shield lay in a tropical and subtropical climate in which significant weathering occurred. Rift valleys and rocky hills were reinforced to various degrees into a landscape with the character of a rift valley. Such valleys are located in many places in Scandinavia and are characteristic of the proposed biosphere reserve.

A sedimentary rock type called the Visingsö Group, formed 850-700 million years ago, has its primary distribution in the Lake Vättern graben. The layers measure about one kilometre thick, with three distinguishable levels. At the bottom is yellow sandstone, called Visingsö sandstone. The intermediate layer is a more complex composition of sandstone and another type of stone that has no English name, called *mosten* in Swedish, and on top shale with elements of limestone. The rock from the Visingsö Group was previously spread out over a large region, but is now primarily located in topographically protected parts of the Lake Vättern graben. It can be found on Visingsö Island and the shores of Lake Vättern, by Lakes Stensjön and Landsjön and under

the soil layers in Huskvarna. The sedimentary rock types in the Visingsö Group crumble easily and the shale creates fertile soil.

11.3.2 Ice Age

The most recent (and ongoing) geological period, the Quaternary, covers the past 2.5 million years and is characterised by shifts between colder and milder climates. In Scandinavia, this has led to glacial periods and warmer interglacial periods. In the past 250,000 years, three glaciations and three interglacial periods of forestation have occurred. The latest glacial period is referred to as the Weichsel glaciation, or more commonly in English, the Wisconsin glaciation, in reference to how far south the ice reached. A dome of ice covered the whole of Scandinavia and measured 3,000 metres thick at the Gulf of Bothnia. The weight of the ice there pressed the earth's crust down 800 metres, while around Lake Vättern it was compressed about 200 metres. The primary phase of the Wisconsin glaciation began 75,000 years ago and reached its widest expansion 22,000 years ago. At that time, so much of the earth's water was frozen to an inland ice sheet and glaciers that the surface of the sea was 120 metres lower than it is today.

11.3.3 Retreat of the inland ice sheet

When the climate became warmer, deglaciation occurred. The inland ice sheet melted faster in the south than the snow and ice from the north could build it up. The runoff ran down into moulins and cracks to the bottom of the ice and formed a drainage network in and under the ice where the water collected in tunnels that followed the direction of the glacial motion, ending at the glacier terminus. The glacial striation, moraines and sub-glacial drainage patterns indicate that the inland ice sheet spread south like a fan in a sector from south-southeast towards the modern-day province of Blekinge to south-southwest towards the province of Halland. In this perspective, Lake Vättern is a geological central point in southern Sweden. See the map of soils and soil cover in annex 5.

Quaternary geologists realised early on that the Lake Vättern graben was important to the glaciation and deglaciation of the inland ice sheet. From southern Vättern there are obvious traces of at least two glacial advances with an intervening period of glacial retreat. As the inland ice sheet melted, the climate varied so widely that the edge of the ice stood still or even progressed forward during several periods. About 50 km south of Lake Vättern, the South-Swedish Highlands became ice-free about 14,500 years ago. Three hundred years later, a brief cold period called the Older Dryas put a stop to the glacial retreat south of Vättern. When the climate warmed up again, the heights between the Skärstaddalen and Ramsjödalen Valleys melted and formed Nunatak glacial lakes. The lakes gradually expanded and local glacial lakes formed between the ice sheet and the sides of the valleys. Eventually, 13,400 years ago, only one giant glacier remained, which filled the Lake Vättern graben with valley glaciation in what are now the Tabergsdalen, Tenhultsdalen and Skärstaddalen Valleys. In Tenhultsdalen and Tabergsdalen, the glacial lakes drained first south into the Lagan River.

Skärstaddalen Valley shows clear traces of both the influence of the glacier and a glacial lake. The local glacial lakes changed position as new thresholds were created by glacial retreat and post-glacial rebound. Northeast of Skärstaddalen Valley, the glacial lake drained at some point through the Ingerydsdalen Valley towards Bunn. All sediment was washed out of Ingerydsdalen and deposited in a fan-shaped delta east of the threshold. Lake Store Glan in the northeastern part of the proposed biosphere reserve was also once a glacial lake that drained to the east. South of Lake Vättern are far-reaching sandurs and stagnation zones towards the South-Swedish Highlands that are dead ice landscapes, called kames, deposited in front of the glacier terminus.

The massive sediment layers along the south of Lake Vättern show that the graben has had major influence on the drainage patterns of the inland ice sheet. Sweden's greatest soil depth, measuring 195 metres, lies just south of the lake. One of Scandinavia's best known ice margin formations, the Rosenlund Banks, are on the southern shore of Lake Vättern just outside the proposed biosphere reserve. Quaternary geologists noted early on double moraines in a particularly fine-grain hard-packed till, called Rosenlund till, which is likely laminated glacial lake sediment. Rosenlund till has a regional distribution south of Lake Vättern. The phenomenon of folded and displaced sediment is also a clear sign of glacial advance. The soil layers in Mjälaryd south of Tenhult have three generations of till with different mineral composition.

11.3.4 Soils

The main part of the East Vättern Scarp Landscape is covered by a mostly thin layer of till. The valleys have deeper soils with sediment from glacial rivers and lakes. See annex 5 for a map of soil types. North-south stretches of sediment, including the Lekeryd Belt and the Nätare Belt, run through the southeastern part of the proposed biosphere reserve. They converge in fields of glacial river sediment at Östra and Västra Höreda. Both till and sediment in the area contain the Visingsö rock type from a cleft in the Lake Vättern graben. Most of the East Vättern Scarp Landscape is located above the highest coastline and consists of unwashed sediment, except in a few places in the north. The soil layer on top of the bedrock is thin and the topography reflects the shapes of the bedrock. Exposed bedrock and outcrops are common, and therefore so are glacial striations. Older striations document a glacial advance along the course of the Lake Vättern graben from the north and north-northeast, while younger striations follow the local topography more. Clear drumlins are rare, but do occur between Tenhult and Rogberga. Kame landscapes with dead-ice morphology are found in the southeastern part of the proposed biosphere reserve.

Fertile farmlands with glacial lake clay are found in the Skärstaddalen and Tenhultsdalen Valleys, while those on Visingsö Island and the scarp toes of Gränna consist of till. Tenhultsdalen has glacial river sediment in the northern part near Huskvarna, while the southern part consists of glacial lake sediment. Similar patterns are found in Skärstaddalen Valley, which has glacial river sediment nearest Lake Vättern and glacial lake sediment further away. Along the slopes of the valleys are examples of glacial fluvial erosion forms. Glacial lake sediment is also found in the rift valley stretching from Lakes Rävlingssjön, Ramsjön and Stensjön, as well as in Stensholm in Hakarp. At Huskvarna, the landscape eroded post-glacially into a ravine in the deep soil layers. The biggest ravine is the 50-metre deep Lillån River Valley. Lillån is a tributary of the Huskvarnaån River. Erosion was greatest in the period immediately after glacial retreat, before vegetation had gained a solid footing; but an active geological process is still under way today. The Huskvarna Falls have many kettle holes, which were probably initiated during the deglaciation, but fully took shape in the modern Huskvarnaån River.

11.3.5 Lake stages of Lake Vättern

The Lake Vättern graben can be compared to a fjord located in the middle of Sweden. Its greatest depth is 128 m, which is 40 m below sea level. The lake bed contains deep layers of sediment. Fjords form through deep glacial erosion, which often follows large fissure zones in the earth's crust and is characterised by a threshold at the mouth of the fjord. The Lake Vättern graben has both of these geomorphological traits. During the deglaciation, which went on for thousands of years, the Lake Vättern graben directed the flow and drained large amounts of ice and meltwater.

Of the local glacial lakes north of the South-Swedish Highlands, Vättern was one of the largest. Its outflows have varied – first south and later east – while the ancient Lake Vättern had a

northerly outflow. Spreading out over what is now the Östgöta Plains, Vättern was a bay of the Baltic Ice Lake. Old shorelines are visible all around Lake Vättern, including a very sharply defined one at a level of 105 metres above sea level in Norrängen in Huskvarna. Just south of this are the central parts of Huskvarna, built on sandy soil at a level of 100 metres above sea level – a delta from the outflow of the ancient Huskvarnaån River into the Baltic Ice Lake. Similar old shorelines are located at 128 metres above sea level in Gränna and 122 metres above sea level at Fingals Brygga. When the Örlendalen Valley, southwest of Karlsborg on the western shore of Lake Vättern, became ice-free, the waters of the glacial lake were able to flow west to the Billingen mesa. When the ice left the northern tip of this mesa, the water level in Lake Vättern diminished in just a few years to the same level that the North Sea had at the time. In modern-day Huskvarna, that sea level would have been 11 metres under the current surface of Lake Vättern, and in Gränna it would have been 12 metres higher because post-glacial rebound was greater to the north. Spreading across the Närke Plain, Lake Vättern became a bay of the Yoldia Sea, which lasted for about 1,000 years. Post-glacial rebound was quite rapid during the initial period after glacial retreat, and that meant that the shoreline continuously moved downwards. At the southern end of Lake Vättern the shoreline reached its lowest point at 32 metres below the current shoreline, and the mouths of tributaries were much further out. The giant Huskvarnaån River and even smaller waterways such as the Girabäcken, Röttleån and Rosendalsbäcken, eroded deep, wide valleys and ravines in former deltas. Two maritime plant species, blue lyme grass (*Leymus arenarius*) and sand sedge (*Carex arenaria*), still grow on these shores, and date back to the era when Lake Vättern was a bay of the sea. Some animals also exist from the early stages of Lake Vättern, as well as in the cold-water Lake Ören. Fish include the large salmonid species *Salvelinus umbla*, fourhorn sculpin (*Myoxocephalus quadricornis*) and smelt (*Osmerus eperlanus*). Crustaceans include *Saduria entomon*, opossum shrimp (*Mysis relicta*), *Relictacanthus lacustris* and *Pallasea quadrispinosa*. The plankton *Limnocalanus macrurus* is also a glacial relict. All of these species are living relics of the past.

As post-glacial rebound continued, the water in the Lake Vättern graben became isolated from the North Sea. The ancient Lake Vättern had its outflow in the Askersund region; later, Motala was the lowest outflow point. Because glacial rebound is faster at the north of the lake than at the south, the surface of the lake tips slightly southward. Currently, the surface of southern Lake Vättern rises 1-2 mm per year. As the water rises, banks erode and shallows flood. Sea cliffs are particularly common on Visingsö, but are also found along the mainland shore. On the bottom of the lake are submerged marshlands and old stumps – in the Huskvarnaviken bay, among other places. On Visingsö, centuries of farmers have complained about paying taxes on farmland that has been swallowed by the waves of Lake Vättern.

11.3.6 Geological reference sites

The proposed biosphere reserve encompasses several reference sites and objects of national interest to the earth sciences. The East Vättern Scarp Landscape has a bedrock morphology typical for rift valley landscapes with blocks of bedrock separated by rift valleys. Visingsö, Girabäcken and Norra Kärr are reference sites for lithostratigraphy and unique rock types and minerals, respectively. Along the shores of Lake Vättern, both on Visingsö and on the mainland, there are typical examples of sea cliffs, raised beaches and shingle. Regarding erosion forms in soil, the Lillån River is a sharply defined ravine landscape. The Rosenlund Banks in the southern part of Lake Vättern are a reference site for soil stratigraphy and complex ice margin formations. This is where the idea came about, in the late 19th century, that glacial retreat did not occur all at once, but progressed and oscillated with the climate.

12 BIOLOGICAL CHARACTERISTICS

[List main habitat types (e.g. tropical evergreen forest, savannah woodland, alpine tundra, coral reef, kelp beds) and land cover types (e.g. residential areas, agricultural land, pastoral land). For each type circle REGIONAL if the habitat or land cover type is widely distributed within the biogeographical region within which the proposed Biosphere Reserve is located to assess the habitat's or land cover type's representativeness. Circle LOCAL if the habitat is of limited distribution within the proposed Biosphere Reserve to assess the habitat's or land cover type's uniqueness. For each habitat or land cover type, list characteristic species and describe important natural processes (e.g. tides, sedimentation, glacial retreat, natural fire) or human impacts (e.g. grazing, selective cutting, agricultural practices) affecting the system. As appropriate, refer to the vegetation or land cover map provided as supporting documentation.]

12.1 First type of habitat/land cover: LAKE VÄTTERN

Lake Vättern (REGIONAL) is the fifth largest lake in Europe. In terms of its size, the lake has a relatively small catchment basin. The whole surface area to which precipitation drains totals 6,700 km², and the actual lake surface makes up nearly a third of this (1,970 km²). Lake Vättern has a mean depth of around 40 metres, which gives a lake volume of around 74 km³, signifying a theoretical replacement time of around 60 years.

Lake Vättern's clear, cold waters make it an excellent source of drinking water. Raw water is pumped in from a total of 14 different water intakes around Lake Vättern. A total of around 28 million m³ per annum is pumped, most of which is accounted for by three water treatment plants. Lake Vättern supplies around 300,000 people a year with drinking water. The volume extracted has increased despite water-saving measures in the 1970s and 1980s. The trend is towards a greater rate of connection to Lake Vättern water.

The water surface of Lake Vättern is around 88.5 metres above sea level and normally shows little variation, around ± 0.3 m. The deepest point in the lake is just to the south of Visingsö Island, at 128 metres. Seismological measurements show that there is a difference in altitude of more than 600 metres between the highest bedrock of the fault and the lowest. The fault scarp is most clearly visible on the section between Huskvarna and Gränna.

The clear waters of Lake Vättern enable vegetation to grow on bottoms down to great depths. Older literature refers to 'stonewort meadows' in Lake Vättern at depths down to 30-40 metres. Species characteristic of lakes with clear, oligotrophic and well-buffered waters include stoneworts (*Chara* and *Nitella*) and several smaller rooted underwater macrophytes (for example quillwort (*Isoetes* spp), water lobelia (*Lobelia dortmannia*), shorweed (*Plantago uniflora*), fennel-leaved pondweed (*Potamogeton pectinatus*), slender-leaved pondweed (*Plantago filiformis*) and awlwort (*Subularia aquatica*)), which are listed in Natura 2000.

The near-shore bottom fauna community is unique and reminiscent of species communities in flowing waters in the mountain chain. Lake Vättern accommodates several (>20) rare and/or unusual species. In addition, there is a mayfly species that in Sweden is encountered only in Lake Vättern, and the biodiversity of insects and bottom fauna is rare and has extremely high conservation value.

Several of the rives discharging into the lake are important spawning grounds for trout (*Salmo trutta*), river lamprey (*Lampetra fluviatilis*) and grayling (*Thymallus thymallus*), which is of significance for the survival of these species and for fishing in Lake Vättern. Many of the rivers and streams contain natural assets among both flora and fauna which, taken together, signify great conservation value for the waterways. A total of 148 waterways are estimated to carry water throughout the year; the greatest inflow comes from the Forsviksån River, which lies outside the proposed biosphere reserve (mean water discharge around 9 m³/s) in the west and the Huskvarnaån River within the reserve (average around 6 m³/s) to the south. The largest lakes in

the catchment basins in terms of surface area are Uden, Viken, Tåkern and Örlen outside the reserve, and Ören, Bunn and Lake Landsjön within the proposed biosphere reserve.

Thirty-one of Sweden's just over 50 freshwater fish species occur in Lake Vättern. Lake Vättern is principally known for its population of Vättern char (*Salvelinus umbla*) and common whitefish (*Coregonus lavaretus*), which provided the basis for professional fishing in the 20th century. Regulation in the 1920s made it impossible for the population of giant trout, capable of reaching a weight of 20 kg, to survive. This trout population is now extinct. The rich presence of various species points to a stable and rich ecosystem where succession takes place continuously and no species is 'allowed' to dominate for long periods.

12.1.1 Characteristic species:

Species of fish typical of Lake Vättern, in addition to Vättern char (*Salvelinus umbla*) and common whitefish (*Coregonus lavaretus*), are fourhorn sculpin (*Myoxocephalus quadricornis*), grayling (*Thymallus thymallus*), vendace (*Coregonus albula*) and brown trout (*Salmo trutta*). Characteristic species also consist of glacial relics, left behind in Lake Vättern after the Ice Age, including several crustaceans, such as the amphipod *Monoporeia affinis*, the isopod *Saduria entomon* and the amphipod *Pallasea quadrispinosa*. In addition, there are more than 110 zooplankton species, around 300 phytoplankton species and around 30 benthic fauna species on deep bottoms. Among birds associated with the ecosystem are common tern (*Sterna hirundo*), red-breasted merganser (*Mergus serrator*), osprey (*Pandion haliaetus*), black-throated diver (*Gavia arctica*) and common sandpiper (*Actitis hypoleucos*). See Annex 13i for a list of characteristic species.

12.1.2 Key natural processes:

Post-glacial rebound

Because of the length of Lake Vättern in the north-to-south direction, around 150 km, post-glacial rebound after the receding of the inland ice sheet occurs differently in the north and south. Post-glacial rebound is taking place more rapidly in the north, at around 3.5 mm per year, while in the south it is around 2.5 mm/year. The consequence is that the surface of Lake Vättern is rising by around 1-2 mm per year in the south and is thus eroding the southern part of the lake's shore. There are clear areas of erosion here, for example at the Rosenlund Banks (national geological interest).

Climate

The climate in the immediate vicinity of Lake Vättern is almost maritime, with high air humidity and warm autumns. The level of precipitation is around 600 mm per annum. Precipitation is heaviest over the heights around the southern and northern parts of the lake. When the sunny days of summer warm up the large volume of water in the lake, Vättern acts as a heat reservoir, giving the immediately surrounding area a mild climate well into the winter. Ice forms irregularly and may be absent for several years as a consequence of the warmer climate. When ice does form, the lake may have an ice cover for several months, even into the spring, and influence the local climate.

Wave washing

The flushed beaches are an important habitat type for many aquatic species that require a sandy, flushed bottom. The shore zone is used as a nursery ground for fish that normally require flowing rivers and streams, such as trout (*Salmo trutta*).

12.1.3 Main human impacts:

Lake Vättern has been subject to stresses for the past 100 years, including eutrophication, depletion of fish stocks, spread of environmental toxins and unacceptable use as a recipient body of water. As a result of the expansion of hydropower, wastewater discharge, acidification and other impacts, the number of waterways with suitable habitats for grayling (*Thymallus thymallus*) and trout (*Salmo trutta*) has decreased from the natural state. Problems have been caused by high inputs of nutrients and oxygen-consuming substances.

Fifteen species were introduced into Lake Vättern in the 20th century (principally fish and plants). There are species that have disappeared from the lake, for example ide (*Leuciscus idus*) and dace (*Leuciscus leuciscus*). Migration in the Motala Ström River has been blocked for eel (*Anguilla anguilla*), and the species was therefore stocked in the 20th century. The eel population has now more or less disappeared. The most definite information concerning the disappearance of a fish species relates to the downstream-spawning large Vättern trout (*Salmo trutta*). It is also likely that the former population of noble crayfish (*Astacus astacus*) has disappeared as a result of crayfish plague introduced by the stocking of signal crayfish (*Pacifastacus leniusculus*) in 1969.

In total, it is likely that three fish species, one fish population and noble crayfish have become extinct in the lake. It may be worth mentioning in this context that the south-Swedish stock of Vättern char (*Salvelinus umbra*) is classified as critically endangered (CR).

12.1.4 Relevant management practices:

The following requirements need to be met to conserve the assets of Lake Vättern:

- Nutrient inputs must not be increased in such a way that unnatural growth of algae and plankton takes place
- Fishing must be carried out in a sustainable way for each fished species
- Introduced species must have as little impact as possible on the ecosystem, and if active introductions are found to have an impact on the ecosystem they must cease
- Natural reproductive sites for fish and other groups of animals in the drainage basin must be made available
- Diffuse impacts from society and traffic must be minimised by various ‘treatment stages’

12.2 Second type of habitat/land cover: LAKES AND WATERWAYS

There are several different aquatic environments within the proposed biosphere reserve in the four drainage basins, the Huskvarnaån River, the Edeskvarnaån River, the Röttleån River and the Noån/Svartån River. In addition, there are smaller streams in the area surrounding Lake Vättern. The flowing waters take up a small proportion of the surface area of the proposed biosphere reserve, but they fulfil an important function as broadleaf tree-dominated wildlife corridors, often rich in shrubs and deadwood, particularly in the lower parts of the waterways where they form ravines that discharge into Lake Vättern.

The lakes cover a significant area and comprise around ten larger lakes and around thirty smaller ones, all of varying types. The lakes and waterways are important to biodiversity, and the lakes in particular are of great economic significance.

Ecosystems: Flowing water (LOCAL)

The Huskvarnaån River is the largest waterway in the area. Smaller rivers that run through the East Vättern Scarp Landscape are the Röttleån, Adelövsån, Lyckåsån, Lillån and Stensjöån Rivers. There are a large number of small streams within the proposed biosphere reserve. Some are tributaries of the larger waterways, while others flow directly into Lake Vättern.

Ecosystems: Lakes (REGIONAL)

The East Vättern Scarp Landscape contains around ten major lakes of variable character, from the eutrophic Lake Landsjön to the oligotrophic clear-water lake Ören. Most of the lakes are originally oligotrophic in nature but have become more eutrophic as a result of human impact. These lakes are Bunn, Noen, Valen and Stensjön. Other major lakes such as Ören, Vänstern, Sötåsasjön, Kåven, Ramsjön and Tenhultasjön retain more of their original oligotrophic character.

12.2.1 Characteristic species:

Several vascular plants grow in the lakes and waterways, such as common reed (*Phragmites australis*), common club-rush (*Schoenoplectus lacustris*) and water lilies (*Nymphaea alba*, *Nuphar lutea*), and alongside beaches and banks there is usually profuse goat willow (*Salix caprea*) and black alder (*Alnus glutinosa*). A very large number of birds are dependent on water, including various songbirds, sparrows and predatory birds. Fish such as northern pike (*Esox lucius*), perch (*Perca fluviatilis*), common whitefish (*Coregonus lavaretus*) and roach (*Rutilus rutilus*) are very common in the lakes within the area. Among insects, there are usually various species of dragonfly, and mammals found may include the European otter (*Lutra lutra*) and bats. See Annexes 13j and 13k for a list of characteristic species.

12.2.2 Key natural processes:

Variations in water level

Both the waterways and the lakes are influenced by seasonal variations in water level linked to the level of precipitation. These are, however, limited by the water regulation that affects most of the lakes and waterways.

Encroaching vegetation

The successive encroachment of vegetation and infilling with sediment is a natural process in itself; lakes become more shallow, are transformed into wetlands and over time shrubs and trees become established. Many factors affect this process, both natural and human-related; for example, the nutrient content of the water, erosion in upstream areas, flooding patterns, water regulation, drainage of wetlands etc.

Meandering

Slow waterways flowing through areas with fine sedimentary soils naturally follow a winding (meandering) course. Natural meandering is extremely uncommon today in the proposed biosphere reserve, as most of the land has been drained, particularly in the 19th and 20th centuries.

Other important natural processes

- Rate of water turnover in lakes
- Rate of flow in waterways
- Climate (drought, flooding)

12.2.3 Main human impacts:

Several of the lakes and waterways in the area receive water from buildings that is sometimes insufficiently treated. This, together with leaching of nutrients from forest and agricultural soils leads to undesirable plankton blooms and increased encroaching of vegetation. Leaching of nutrients from surrounding farmland is notable in Lake Landsjön. A laundry that produces phosphate emissions was previously also located at the lake. Efforts are being made to improve manure management and create no-cultivation zones and nutrient traps in the form of wetlands

along the Lyckåsån River. Drainage of wetlands, lake lowering and straightening of waterways have also led to a decrease in natural cleaning capacity.

Increased humus contents that cause brown discoloration and reduced visibility depth are, to some extent, a natural process, but the combination of humus leaching from forest soils and climate change has speeded up the brown discoloration of the water in lakes and waterways in recent years.

Surface water is extracted from some of the waterways principally to meet agricultural needs, which in periods of drought and low flows may have consequences for flora and fauna. Several of the lakes have been regulated since the 1920s. The waterways have been affected by interventions aimed at extracting power or altering their flow. Cleaning of rivers and straightening of their courses have changed the waterways and their flows.

Recreational fishing is a widespread human activity in the area's lakes and waterways. This takes place in controlled ways through a large number of fishery conservation associations. Active commercial fishing of naturally occurring fish takes place solely in Lake Vättern, not any of the smaller lakes in the proposed biosphere reserve. However, fishing tourism has great potential throughout the East Vättern Scarp Landscape.

Other impacts

- Extraction of groundwater
- Clearing of waterways and felling along the shoreline
- Summer homes
- Leisure activities (fishing, hunting, canoeing etc.)
- Climate impacts
- Environmental toxins, dioxins
- Introduction of alien species, e.g. signal crayfish (*Astacus astacus*)

12.2.4 Relevant management practices:

- Conservation and restoration of aquatic habitats, salamander ponds and wildlife ponds
- Creation of migration routes in waterways
- Preservation and restoration of meandering waterways
- Species-oriented conservation measures, for example nesting platforms for osprey (*Pandion haliaetus*), pipes for white-throated dipper (*Cinclus cinclus*) and spawning bottoms for fish

Reduction of eutrophicating substances

- Application of cultivation techniques and farming methods that reduce leaching of nutrients from fields and forest lands
- Recreation of wetlands
- High efficiency of public and private sewage treatment facilities

Fisheries management

Sustainable fishing, with methods, quotas and fishing seasons in the lakes and waterways of the proposed biosphere reserve, to guarantee good stocks of all naturally occurring fish species.

Other relevant management practices

- Control of visitors and boat traffic
- Water conservation through sustainable extraction of surface water and groundwater

12.3 Third type of habitat/land cover: HARDWOOD FORESTS

Based principally on climatic and biotic but also historical factors, the country has been divided into five major forest ecosystems according to the specific features of the different forest environments. The proposed biosphere reserve lies in the boreonemoral region, but the area closest to Lake Vättern and Skärstaddalen Valley shows purely nemoral features with species-rich broadleaf forests. Broadleaf forests constitute the most species-rich environments in the country. Much of the hardwood forest in the rolling rift valley landscape is located in scarp environments. Scarp forest of the hardwood type and oak and pine forest of the rocky type are the dominant types of stands, but wooded meadows with encroaching vegetation and pastures are also present in large numbers. The hardwood forests are often mixed forests of hardwood trees, ‘soft’ broadleaf trees and in some cases also coniferous trees.

Ecosystems: Rocky oak and pine forest (LOCAL)

The vegetation on flat rock is dominated by slow-growing Scots pine (*Pinus sylvestris*), spruce (*Picea abies*) and oak (*Quercus robur*). These are sparse, sun-exposed forests, often on slopes with a south-southwesterly exposure. Oak and pine forests generally have long continuity as they have been excluded from forestry because their productivity is low and they are difficult to cultivate (‘technical impediment’). The type is heavily dependent on the slope of the scarp. The occurrence of other hardwood trees and a more species-rich flora increases in the lower parts of the scarp. In the upper parts and on poorer soils, pine takes over as the sole type of tree.

Ecosystems: Hardwood forest in scarp environment (LOCAL)

Broadleaf forests rich in hardwood trees cover large parts of the fault scarps alongside Lake Vättern, principally in the fertile lower parts of the scarps. The mild climate benefits warmth-loving hardwood trees such as small-leaved lime (*Tilia cordata*), Norway maple (*Acer platanoides*), ash (*Fraxinus excelsior*) and elm (*Ulmus glabra*). The tree layer is varied, and most domestic hardwood trees may be represented. Elements of other broadleaf trees such as aspen (*Populus tremula*), birch (*Betula pendula/pubescens*), goat willow (*Salix caprea*), bird cherry (*Prunus padus*), wild cherry (*P. avium*), wild apple (*Malus sylvestris*), whitebeam (*Sorbus intermedia*) and rowan (*S. aucuparia*) are also common. The scarps are often rich in boulders, and there are vertical rock surfaces as well. Pollarded trees are common.

Ecosystems: Wooded meadows and pastures with encroaching vegetation (REGIONAL)

A common occurrence in the East Vättern Scarp Landscape is hardwood forests that have arisen on land that was previously traditionally managed with grazing or hay-making. There are also older trees left from the period of traditional grassland management such as pastureland oaks and pollarded ash and lime. Most of the encroachment consists of various types of broadleaf trees, but conifers also occur. These stands are often located alongside the lower parts of the scarp environments or are interspersed among fields that are still farmed.

12.3.1 Characteristic species:

Hardwood forests contain a large diversity of species from several species groups. The types of trees here include seven of Sweden’s eight hardwood species: ash, elm, beech (*Fagus sylvatica*), oak, wild cherry, lime and Norway maple (hornbeam is absent). The shrub layer is often species-rich with typical occurrences of hazel (*Corylus avellana*), mountain currant (*Ribes alpinum*) and fly

honeysuckle (*Lonicera xylosteum*). The flora of the field layer includes characteristic forest-clearing vegetation such as wild garlic (*Allium ursinum*), common hepatica (*Hepatica nobilis*), wood anemone (*Anemone nemorosa*) and dog's mercury (*Mercurialis perennis*). A very large number of mosses and lichen grow on trunks and stones in the hardwood forest, including shaggy moss (*Rhytidiadelphus triquetrus*) and pendulous wing-moss (*Antitrichia curtipendula*). Most mushrooms and bracket fungi are directly dependent on the structures created in valuable hardwood forests, and there are also a large number of insects and arachnids in the forest ecosystems. Characteristic birds include large numbers of tits and woodpeckers, and mammals include, for example, elk (*Alces alces*) and roe deer (*Capreolus capreolus*). See Annex 13l for a list of characteristic species.

12.3.2 Key natural processes:

Landslides

A natural disturbance to the scarp environments is the landslides caused by the slope. The disturbance is often small-scale in nature.

Ecological disturbances

Ecological disturbances such as storms, droughts, floods, fires etc. are rapid changes that are natural to the ecosystem. Fires and floods are disturbances that are now uncommon due to human intervention in extinguishing fires and regulating waterways. Extreme winds that fell large areas of forest occur at varying intervals. Natural woodland-type forests of varied age and mixture of tree types often withstand storms better than plantations. Wind and drought put forests in exposed locations under stress. Scots pine (*Pinus sylvestris*) and oak (*Quercus petraea*) tolerate these stresses better than spruce (*Picea abies*), for example.

Climatic variations

The flora and fauna of hardwood forests in the proposed biosphere reserve are adapted to the local climate and its seasonal variations. However, several relics occur with species such as small-leaved lime (*Tilia cordata*), which are present after the period of post-glacial warming before the start of the common era, when the climate was significantly warmer than it is today. These species may acquire an increasingly significant role in a future warmer climate.

Internal forest dynamics

Hardwood forests that are allowed to develop with internal dynamics are characterised by a natural mixture of types of tree and succession, wide age variation and the presence of large trees and deadwood of various dimensions and in various stages of decomposition. The density and gappiness of the stands varies. Important structures for the ecosystem, such as old trees and deadwood, may be absent due to earlier land use. A generation gap in stands is also common. For example, trees that are hundreds of years old may be surrounded by a large number of young ones (less than 100 years old).

Impact of grazing

Pollen analyses show that broadleaf forests in southern Sweden have been mosaic-like and semi-open. One explanation is considered to be that grazing livestock and burn-beating have had a great impact since time immemorial. Spruce, which today is the dominant type of tree in plantations, migrated in from the north around 1,000 years ago. It did not form stands on the most fertile soils until the latter part of the 20th century, when it was planted.

Other key natural processes

Rot fungi, pests and the impact of pathogens (ash die-back (*Chalara fraxinea*) and Dutch elm disease (*Ophiostoma novo-ulmi*)) are common. Grazing by wildlife takes place continuously in the area. The absence of wolves (*Canis lupus*) but a growing population of lynx (*Lynx lynx*) has an impact on the populations of cloven-hooved wildlife, which in turn has an impact on the possibility of raising new hardwood trees.

12.3.3 Main human impacts:

Agricultural activity

Over long periods, human activity has successively transformed large parts of the original forest landscape into a more or less open, cultivated, hay-making and grazing landscape. Many of the individual hardwood trees in the landscape were pollarded. A large area of land was reforested during the latter part of the 20th century: with regard to hardwood forest, this occurred mainly through encroachment when traditional grassland management has ceased. Pollarding also ceased in the middle of the last century. In the 21st century, some land has been returned to traditional grassland management, and the number of newly pollarded and restoration-pollarded trees has sharply increased.

Forestry

The hardwood forests in the proposed biosphere reserve are utilised to a small extent for commercial forestry. Wood is principally taken as individual trees and as a source of firewood. The forests are often cleared of deadwood in connection with the collection of firewood. As a result of the forestry taking place on surrounding land, the hardwood forests are subject to increased seeding, as well as planting, of spruce (*Picea abies*).

Other influences

The introduction of alien species such as the invasive giant hogweed (*Heracleum mantegazzianum*) has a local impact on the flora in the area.

12.3.4 Relevant management practices:

Conservation-adapted forestry

The Swedish model and the country's forest policy are based on two equally important objectives – a production objective and an environmental objective – while forestry and the forest owners are permitted to operate with freedom under responsibility. Measures in forestry have to be reconciled with both general consideration by law and to an ever-increasing extent in-depth consideration and voluntary commitments through forest certification. Work is based on the environmental quality objective of Sustainable Forests set out by the Swedish Parliament, which states that: “the value of forests and forest land for biological production must be protected, at the same time as biological diversity, cultural heritage and recreational assets are safeguarded”. The intention in the proposed biosphere reserve is to bring about collaboration between forest owners, for instance by developing green forestry plans in a landscape perspective and the majority of forest owners choosing to certify their forestry. This would improve the prospects of finding complete solutions in which formal protection and voluntary set-asides complement one another.

Broadleaf forestry

Parts of the forestry in the East Vättern Scarp Landscape should be focused on naturally occurring broadleaf trees. Because of high levels of grazing by deer and wild boar, shoots and seedlings often have to be fenced off to allow a new hardwood forest to grow. The Swedish

Forest Agency offers several kinds of support for the establishment of hardwood forest. There is very great potential for the processing of hardwood, and cooperation with the Svenska lövträdföreningen [the Swedish Broadleaf Tree Association] has been initiated, partly for this purpose.

Grazing and pollarding

Particularly in the secondary hardwood forests in which vegetation has encroached, grazing by domesticated animals is beneficial in conserving and developing natural values as many functions are linked to sunlight and blossoming shrubs and herbs. Liberating solitary trees (removing brushwood) and restoration pollarding and regular harvesting of leaves contribute to preserving an important environment of responsibility in the East Vättern Scarp Landscape.

12.4 Fourth type of habitat/land cover: CONIFEROUS AND MIXED FORESTS

Coniferous forests dominate above the crests and in the fault valleys further to the east (REGIONAL). Both bilberry spruce forests and leafy coniferous forests of a more herb-rich type occur. The occurrence of 'soft' broadleaf trees increases particularly on steeper north and northeast slopes, for example with aspen (*Populus tremula*), birch (*Betula pendula/pubescens*), goat willow (*Salix caprea*) and rowan (*Sorbus aucuparia*). The flat rocks are dominated by Scots pine (*Pinus sylvestris*), which in sunny locations close to Lake Vättern change over to oak and Scots pine forest of the rocky type. Some coniferous forests have been managed with exploitation felling and grazing until recent times and thus have greater natural value as they have never been affected by stand harvesting. These forests are often multi-layered and contain several tree types and open areas. Scots pine or 'soft' broadleaf trees dominate on wooded wetlands.

12.4.1 Characteristic species:

The coniferous and mixed forests have many characteristic species in most species groups. The tree types are dominated by the two coniferous species that occur naturally in Sweden, spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*), as well as the broadleaf trees not classified as hardwood, i.e. aspen (*Populus tremula*), birch (*Betula pendula/pubescens*), black alder (*Alnus glutinosa*), goat willow (*Salix caprea*), rowan (*Sorbus aucuparia*), whitebeam (*Sorbus intermedia*), bird cherry (*Prunus padus*) etc. The shrub layer is normally poorly developed, but may contain species from a previously more open period, such as hawthorn (*Crataegus*), common blackthorn (*Rhamnus catharticus*) and hazel (*Corylus avellana*). Among vascular plants, the field layer is often dominated by either heather (*Calluna vulgaris*), bilberry (*Vaccinium myrtillus*) or lingonberry (*V. vitis-idaea*), with elements for example of wood sorrel (*Oxalis acetosella*), twinflower (*Linnea borealis*) or wavy hair grass (*Deschampsia flexuosa*). Many mosses, lichen and fungi can be found, as can a large number of insects and arachnids. Mammals include elk (*Alces alces*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). Woodpeckers and tits are characteristic among birds. See Annex 13m for a list of characteristic species.

12.4.2 Key natural processes:

Internal forest dynamics

Coniferous forests that are allowed to develop with internal dynamics and natural ecological disturbances acquire a natural composition and succession of tree types, age variation and the presence of large trees and deadwood of various dimensions and in various stages of decomposition.

Few coniferous forests in the area are now unaffected by forest production, and they are all to some extent affected by previous land use, which has led to a frequent lack of important

structures for functioning internal dynamics. Advice given to private land-owners on nature conservation issues is intended to increase the quantity of deficient substrates in the landscape.

Ecological disturbances

Ecological disturbances such as storms, droughts, floods, fires etc. are rapid changes that are natural to the ecosystem. Fires and flooding are uncommon disturbances these days as a result of human intervention with extinguishing fires and regulating waterways. Extreme winds that fell large areas of forest recur at varying intervals. Natural forest-like forests of varied age and with a varied mixture of tree types often withstand storms better than production stands. Wind and drought expose forests in exposed locations to stress, making insect attack easier.

Climatic variations

The forest flora and fauna in the proposed biosphere reserve are adapted to the local climate and its seasonal variations. However, several relics occur with species and genetic variations that only occurred after the post-glacial period of warmth before the beginning of the common era, when the climate was significantly warmer than it is today. An example of such a species is the insect *Notborbina muricata*, which needs warm environments with sunlit Scots pine. These species may acquire an increasingly significant role in a future warmer climate.

Landslides

A significant natural disturbance in the scarp environments is the landslides caused by the slope. This disturbance is often of a small-scale nature.

Other key natural processes

Rot fungi, grazing by wildlife and pests such as spruce bark beetle are common in the area. The spruce bark beetle (*Ips typographus*) plays a major role as a natural disruption factor in spruce stands. In the case of formally protected areas, however, it is difficult to allow bark beetles to develop freely as the impact on surrounding production forests may be great. This is particularly applicable to smaller reserves and habitat protection areas where management must instead include human measures that mimic the natural ones. An increased proportion of broadleaf tree production would also reduce the risk of bark beetle damage.

12.4.3 Main human impacts:

Agricultural activity

Over long periods, human activity has successively transformed large parts of the original forest landscape into a more or less open cultivated, hay-making and grazing landscape. In the 20th century a large amount of reforestation was carried out, in the case of coniferous forests largely through active planting and sowing. Forest grazing still takes place, but on a very limited scale. Forest grazing creates coniferous forests that are more open to light and have more gaps.

Forestry

Most of the East Vättern Scarp Landscape's forest lands are used today, and will be used in the future, for production forestry with general consideration. Many stands are dominated by spruce, with elements of Scots pine. In the long term, the proportion of broadleaf trees will increase in the stands, but the trend is rather in the opposite direction for Scots pine. There is generally a shortage of old, large trees and deadwood in managed forests, and the broadleaf element is usually small. The stands are also usually harvested at a relatively young age for the trees. After the severe storms Gudrun and Per (in 2005 and 2007 respectively), the proportion of deadwood has increased, and foliage is sprouting on the clear-felled areas. Production-oriented forestry is

also affecting ecological conditions in the landscape, with fragmentation as a result of clear-felled areas, spruce-dominated forests that can make it easier for pest organisms and to a lesser extent the introduction of alien tree types and alien provenances. A small number of forests are still operated as farm forests with exploitation felling. Coniferous forests in scarp environments, like the hardwood forests, are rarely subject to forestry, but firewood is collected.

Other influences

Introduction of alien species, pollution by fallout and hunting influence the coniferous and mixed forests of the proposed biosphere reserve in different ways.

12.4.4 Relevant management practices:

Conservation-adapted forestry

Measures in forestry have to follow the environmental quality objective adopted by the Swedish Parliament, which states that: “the value of forests and forest land for biological production must be protected, at the same time as biological diversity, cultural heritage and recreational assets are safeguarded”. In a small part of the proposed biosphere reserve, green forestry plans have been devised in a landscape perspective through collaboration between several owners. A similar effort for the whole area would improve the prospects of finding complete solutions in which formal protection and voluntary set-asides complement one another. Most of the forest land will continue to be managed forests, and the challenge here is to prioritise considerations in forestry for the most functional areas. Greater diversity in forestry is to be expected, and as a result of the proposed biosphere reserve, we will be able to develop adapted advice and various package solutions to create financial incentives for landowners to try out alternative stewardship methods.

The issue of sustainable utilisation and striking a balance between financial and ecological purposes has long been a key concern of the project group behind the biosphere reserve nomination. The consensus is to exclude the areas of greatest biological value from production targets. An estimated 10% of the forest landscape has some kind of nature conservation goal (formal or voluntary set-aside).

12.5 Fifth type of habitat/land cover: ARABLE LAND

The agricultural landscape in the East Vättern Scarp Landscape consists partly of large, open agricultural landscapes in valleys and partly of smaller-scale arable land in forest districts in the South-Swedish Highlands. The valleys, including Visingsö Island, have a fertile soil with clays, while the South-Swedish Highlands are covered by tills. The conditions for crop growing alongside Lake Vättern below the scarp are favourable, with Zone 2, but a few kilometres away the climate is harsher. Fruit growing has been undertaken for a long time in the East Vättern Scarp Landscape. In the 17th century, the shire contributed to developing the cultivation of fruit and berries; see Chapter 13.3 for further details.

Arable land (REGIONAL)

Six large, open agricultural landscapes can be differentiated. These are the Rogberga Plateau/Tenhultsdalen Valley, Stensholm/Tovrida between Huskvarna and Lekeryd, Djuvarp/Roestorp north of Lekeryd, Skärstaddalen Valley, the scarp toes at Gränna and Visingsö Island. The large farms and manors in the area with tree-lined avenues and oak groves are located in the open agricultural landscape. In the other parts of the proposed biosphere reserve, the agricultural land is semi-open and embedded in a forest landscape. The countryside here is mosaic-like, rich in microhabitats and with many forest-edge zones between the forest and cultivated landscape.

Fruit cultivation (LOCAL)

In the best locations, fruit and berries are grown commercially, for instance in Skärstaddalen Valley north of Huskvarna and on the scarp toes at Gränna. There are a few plant nurseries in Gränna that raise fruit trees. One of the clonal archives of the Nordic Gene Bank is located in Brunstorp just north of Huskvarna.

12.5.1 Characteristic species:

The characteristic species of farmland largely consist of those that have adapted to the special conditions that exist on or alongside arable land. As well as the cultivated species, there are a large number of other vascular plants such as scentless false mayweed (*Tripleurospermum perforatum*) and red dead-nettle (*Lamium purpureum*). There are also a large number of insects and birds associated with arable land, including various species of sparrows and predatory birds. Mammals such as roe deer and wild boar are also present around the farmland. See Annex 13n for a list of characteristic species.

12.5.2 Key natural processes:*Climate*

Harvest results are primarily affected by climatic variations with drought, precipitation and temperature. Proximity to Lake Vättern creates a special climate, with what is known as Vättern snow and fog. The climate may also vary significantly from year to year, with occasional late springs depending on the occurrence of fog and whether or not ice forms on Lake Vättern.

Encroaching vegetation

Encroaching vegetation has substantial negative consequences for landscape assets and ecosystem services particularly in the small-scale agricultural landscape. Lack of pruning and care results in fruit trees losing their productive quality.

Other key natural processes

Grazing by roe deer and elk occurs to some extent in the East Vättern Scarp Landscape. Numbers of wild boar are steadily increasing in the proposed biosphere reserve, and their rooting is posing an increasing problem in agriculture.

12.5.3 Main human impacts:*Agricultural rationalisation*

While Sweden was largely self-sufficient in food in the 19th century (a barter economy), it is now dependent on food imports. Agriculture has undergone great changes in the post-war years with plant breeding, livestock breeding and mechanisation, which has increased production at the expense of biodiversity. Small units have been combined into larger ones and microhabitats have been rationalised out of existence, in particular perhaps the open ditches that have been replaced by underground drainage. However, less rationalisation has taken place in the East Vättern Scarp Landscape than in the country as a whole. Many small units are still farmed as part-time or spare-time operations with extensive grazing and smaller fields.

Production-improving measures

Commercial fertilisers, seed cleaning and chemical pesticides make agriculture and fruit and berry cultivation more efficient. The farmed landscape in highly rationalised agriculture becomes depleted of arable weeds, fungal flora, insects and consequently also birds, bats, other small mammals and frogs, lizards etc. The proportion of agriculture with organic cultivation is relatively high in some areas (for instance on Visingsö Island), and the trend is for a slight increase over time in the whole biosphere reserve.

Development and utilisation of land

Development alongside population centres often takes place on arable land. This is most noticeable close to the major conurbations.

Agricultural policies

Land partition reforms were pursued during the 18th and throughout the 19th centuries in order to increase reclamation. Burn-beating was frowned upon by the State from the 17th century onwards. In modern times, agriculture has also been influenced by regulations and various types of payments. EU agricultural policy and associated support and payments today largely dictate land use and are of crucial significance to farming economics, methods and crop choices.

Other main human impacts

Hunting is a very significant human impact on populations of cloven-hooved wildlife and small game that are present in the farmed landscape in particular. The introduction of alien species (e.g. giant hogweed (*Heraclium mantegazzianum*)) is a great problem locally, caused by human activities. Human influences at a more large-scale level include climate change and air pollution.

12.5.4 Relevant management practices:

Farming of agricultural land

The landscape is kept open by annual cultivation. This favours remaining cultural traces such as open ditches, clearance cairns, meadow barns, stone walls, prehistoric graves and settlements. Orchards are managed annually by pruning, regeneration and harvesting.

12.6 Sixth type of habitat/land cover: NATURAL GRASSLANDS

Before the days of feed imports and commercial fertilisers, the quantity of hay meadows and pollarded trees was of crucial significance to the number of cattle a farm could keep over the winter and therefore indirectly how much land could be manured. The acreage of hay meadows in Sweden at the beginning of the 19th century was 2 million hectares. Around 8,000 hectares remain today.

Natural pastureland, hay meadows and pollarded trees have long represented a significant land use in the East Vättern Scarp Landscape. The County of Jönköping is one of the regions of Sweden rich in these grasslands, and the proposed biosphere reserve has a particularly high density and spread with regard to valuable natural pastureland. Pastureland largely consists of former hay meadows, which also means that adaptation of traditional grassland management would often be preferable (see Chapter 12.6.4). Leaf harvesting has a long continuity in the proposed biosphere reserve, and the area is one of the biological value regions with regard to pollarded trees. A particular effort in relation to pollarded trees has been made in recent years, with several special activities such as population surveys, collation of local traditional knowledge, study circles, a study trip to Romania, courses etc. This initiative has been very successful, and there has been a substantial increase in the number of pollarded trees.

Conservation of natural grazing land is an important goal for the preservation of species-rich ecosystems in the East Vättern Scarp Landscape and in the country as a whole. The small-scale, mosaic-like agricultural landscape characteristic of the region has great cultural, social and biological value. There is also great consensus among all parties (farmers, residents, visitors, organisations and authorities) that these assets should be conserved.

Hay meadows (LOCAL)

Various types of dry meadows and wet meadows still remain to some extent in the East Vättern Scarp Landscape. The East Vättern Scarp Landscape is one of the country's richer regions in terms of dry calcareous meadows and flat rock dry meadows, and herb-rich dry meadows are also present to some extent. However, the greatest assets of the area are related to the relatively common, but often overgrown, wooded meadows. The proposed biosphere reserve has around 2,000 pollarded trees remaining from former times. Many younger trees have also been pollarded in recent years. There is strong interest in resuming this tradition, and agri-environmental payments make it economically advantageous. Pollarded trees grow both on infields and on steep terrain, which was previously regarded as 'useless' land, difficult to farm.

Natural grazing lands (REGIONAL)

Much of the natural grazing land of today was wooded meadows or smaller fields covered with shrubs and trees until the first half of the 20th century. Wooded pastureland is common, both next to large farms in the open agricultural landscape and in the more mosaic-like farmed landscape in the highlands. Cattle previously had to be kept on the poorer outfields during the grazing season, which in the East Vättern Scarp Landscape meant forest grazing. Today, forest grazing is a land use that has almost completely ceased in Sweden, but it still occurs sporadically in the proposed biosphere reserve. Shore grazing occurs in some places, for example on Visingsö Island and at Lake Landsjön in Skärstaddalen Valley. These are important bird sites both during the breeding season and for resting birds. Oak groves are found primarily at the large farms, and one of the finest oak groves in the county, the Vretaholm Nature Reserve, is located on the Gränna Plains. Solitary, sunlit trees harbour a large number of endangered organisms, particularly insects and lichen, and they are therefore the object of special measures, for example action programmes for endangered species.

12.6.1 Characteristic species:

The natural grasslands are some of the most species-rich habitats (land types), with many characteristic vascular plants such as various trees, grasses, legumes and flowers. Characteristic species such as common bent (*Agrostis capillaris*), sheep's fescue (*Festuca ovina*) and sweet vernal (*Anthoxanthum odoratum*) are present in all the natural grasslands. The species that have been favoured by human activity and/or adapted to current traditional grassland management, such as ash (*Fraxinus excelsior*), small-leaved lime (*Tilia cordata*), elm (*Ulmus glabra*), wild cherry (*Prunus avium*) and hazel (*Corylus avellana*), are also relatively common, as are viper's grass (*Scorzonera humilis*), devil's bit scabious (*Succisa pratensis*) and common milkwort (*Polygala vulgaris*). A very large number of insects and arachnids also occur, many of which have specific requirements for the presence of particular vascular plants. Many species in other species groups are also present. See Annex 13o for a list of characteristic species.

12.6.2 Key natural processes:*Encroaching vegetation*

In weak traditional grassland management, hay meadows and grazing lands quickly become overgrown, especially in damp and healthy land. Uncompetitive and light-demanding species have difficulty surviving. Reeds become dominant after a while on shore pastureland. Meadows on firm land and grazing pastures gradually turn to forest, and the fauna and flora change.

Storms

Trees on grassland and overgrown pollarded trees may be felled by storms. However, solitary trees usually withstand winds better than spruce in production forests, for example.

Other key natural processes

Wild boar are steadily increasing in number in the proposed biosphere reserve, and their rooting is posing an ever greater problem in agriculture.

12.6.3 Main human impacts:

Traditional grassland management

During the development of agriculture from the Late Iron Age onwards, a new land organisation emerged that led to the villages being divided into infields and outfields. The hay meadow was created as a new type of land for gathering feed for the winter when the livestock were housed. The pasturelands on outfields and in enclosures were managed increasingly intensively as the population grew. Trees were taxed on leaves on both infields and outfields. Natural grazing lands in a mosaic landscape with scarps and natural forest environments are a special feature that, among other things, have favoured species associated with shrubby forest-edge environments including insects and insect-eating birds.

Production-improving measures

Production-improving measures, in particular with manuring or leaving of brushwood, straw and support feed in grazing pastures affects grasslands, as do drainage and ditching. Dewormers affect the insect fauna in dunghills. Switching land use for example to forest production has an impact on the area and the landscape.

Airborne pollutants

General nitrogen fallout and ground-level ozone affect plants and grasslands to some extent, resulting in encroachment of vegetation and increased competition from species favoured by nitrogen.

Policy

The agri-environmental payments under the Rural Development Programme have resulted in many Swedish pasturelands being restored. These payments are strong policy instruments and crucial to the economy of many farmers. EU regulation, under which only a small number of trees are permitted on meadows and pastureland in the single-farm payment scheme, can have adverse effects on biodiversity on this land. There is a particular risk of woodland-edge environments between agricultural and forestry land becoming overgrown or being felled. Increased cooperation between various actors in the East Vättern Scarp Landscape on these issues is therefore something that will be introduced into the planned landscape strategy (Chapter 17.6.2). The trend in Sweden is to develop extensive grazing over larger acreages. There are fewer farmers today who have large herds of livestock that they also allow to graze on leased land. The average age of farmers is high. Younger farmers in particular have large secondary leases and invest in efficient loose housing units. In recent years a large number of younger farmers have also made large investments in efficient milk and meat production in larger units with secondary leases.

12.6.4 Relevant management practices:

Hay making and traditional grassland management

Extensive hay meadows were formerly common in the East Vättern Scarp Landscape. The number of meadowlands has now shrunk to a very low level. Remaining meadows are therefore particularly valuable and require careful and correctly adapted management including clearing, spring cleaning (raking), hay-making with tedding and removal of the material and after-grazing. Traditional management of natural pasturelands is relatively common in the proposed biosphere

reserve. The land may be grazed by livestock such as horses, cows and sheep, but mixed grazing by several types of livestock is often preferable. The number and types of livestock should be adapted to the availability of pasture, the nature of the pastureland and previous management. The restoration of pasturelands and annual care are largely dictated by the agri-environmental payments scheme. New knowledge on how valuable meadowland flora can be conserved through adaptation of grazing management has been obtained, according to which it may be suitable for some areas, for example, to have late turning out to summer pasture, years free of grazing and large enclosures, all with the aim of mimicking the disturbance regimes of older times.

12.7 Seventh type of habitat/land cover: THE BUILT-UP ENVIRONMENT

The proposed biosphere reserve contains two cities, other built-up areas and extensive rural settlement. South of Lake Vättern there is a point where many roads have historically met and that has been developed as a logistics centre in present-day society. A European motorway (E road), national and county roads, overhead power lines, a regional railway and some ports are located in the area.

Natural environments near population centres serve multiple functions. They result in local climate improvement and provide community/ecosystem services close to the pollution source, e.g. ponds, ditches and marshes; they deal with dirty stormwater and are a holding basin for high flow levels. Trees and shrubs bind dust, even out the temperature and reduce rain flows. The community's refuse tips have previously ended up in nature. Marshland has served as a dump for hundreds of years, most intensively in the 20th century. These days household and industrial waste are no longer landfilled. Refuse is pre-sorted, and combustible waste is used in the municipality's district heating plant for domestic heating. Gravel pits, rock quarries, stone quarries and mines go a long way back in history, and quarrying still takes place on a smaller scale in the proposed biosphere reserve.

The wealth of lakes and forests in the East Vättern Scarp Landscape, as well as its beautiful varied landscape, provide an attractive region to live in for year-round residence as well as summer homes and tourism. Lakes Ören and Bunn have many summer homes, as does Visingsö Island. Commuters, part-time workers and those with several or flexible jobs live in the countryside. The built-up areas in the proposed biosphere reserve have all emerged out of an agricultural community, and the two towns are located next to Lake Vättern. The region is characterised by a small business culture and a spirit of enterprise. The built-up areas are surrounded by municipally owned agricultural and forestry land to a varying degree. Open spaces are important to recreation and other social aspects and are significant for public health. As they have usually been excluded from forest production for a long time, they also accommodate high biological values linked to old trees and forests with long continuity. There are and exercise trails with electrical lighting close to most built-up areas.

Town centre and industrial sites (LOCAL)

Both Gränna and Huskvarna are towns with a clear town centre. Gränna was founded in 1652 and is a tourist town today. Huskvarna, on the other hand, is known for many large companies. Among other built-up areas, Tenhult stands out as a station community. Huskvarna and Tenhult have industrial districts. There are many asphalted surfaces in both town centres and on industrial land. There are often grass surfaces and individual parks between these. Trees are often planted between buildings and infrastructure. Taken together, these provide different conditions for biological life.

Quarrying (LOCAL)

Stone has been quarried at a large number of places along the Vättern scarp from Spexeryd in the south to Girabäcken in the north. There are non-renewable resources such as natural gravel in the northeast at Lekeryd and south of Tenhult. There are no major quarrying operations in the area today, only small sand quarries to meet the household needs of farms. These smaller sand pits have biological value as a place where insects and sand martins live. It is therefore desirable both for the local economy and from the point of view of nature conservation for small-scale quarrying of sand to continue.

Landfills (LOCAL)

Landfilling dates back to the mid-twentieth century. The marshes of the Huskvarnaån River in the town centre are largely filled with industrial and household waste, as well as construction and demolition rubble. Today, waste is pre-sorted. It is turned into biogas and used for material and energy recovery. The Municipality of Jönköping's landfill site is located in Hult south of Tenhult, and receives ash from the district heating plant, which takes most of the household refuse.

Residential areas and nearby nature (LOCAL)

Both Gränna and Huskvarna are described as garden towns and have a good microclimate in a favourable zone. Huskvarna is the garden town in the green valley, and Gränna is historically linked to pears, which were one of the town's early symbols. The town centres are surrounded by residential development largely consisting of single-family houses with gardens. Other built-up areas also have sparse residential development with many gardens and a few parks. Nearby nature is both intermingled with the built-up areas and adjacent to them. Gardens and parks often have high biodiversity, also fulfilling functions for the surrounding landscape.

Rural areas (REGIONAL)

The built environment is relatively evenly distributed with villages, individual farms and homes. Some areas, however, are clear of buildings, for example north-west of the Gränna-Tranås road, Kaxholmen-Skärstad-Ramsjön. The oldest villages have roots dating back to prehistoric times. In the 19th century, many villages were fragmented by land redistribution. In modern times, plots of land are divided up for individual homes. In addition to the land-based industries there are some small businesses with industrial sites and buildings.

Manors (LOCAL)

In the countryside there are also several manors with associated tree-lined avenues and large hardwood trees. This environment originates in the shire of Visingsborg. There are also several ruins from this period: Brahehus Castle north of Gränna and Visingsborg Castle and the ruins of Näs Castle on Visingsö Island. Manors, churches and rectories are usually located on the open agricultural landscape. The Vättern region was a military-strategic zone in the 16th century, marking the border with Denmark after the Kalmar Union.

Infrastructure (REGIONAL)

The Vättern region has always been of trade interest and a logistics centre where sea and land routes converge. There has been relatively extensive shipping between various places along Lake Vättern, and on shore ancient bridle paths linked rural communities together. Eriksgatan (the route that newly crowned kings travelled through the country visiting important provinces), old Riksettan highway and what is now the E4 European motorway have all run in a north-south direction east of Lake Vättern. Today the E4 European motorway cuts through the Vättern scarp from the county boundary via Gränna to Huskvarna. There are three marinas and a small airfield

on Visingsö Island. National Road 40 runs in an east-west direction to Nässjö, as do a few county roads to Tranås and Aneby. The regional railway from Nässjö to Skövde links Sweden's eastern and western main lines and follows the contours of the East Vättern Scarp Landscape. Specific habitats are formed at harbours, railway embankments, roadsides and overhead power lines and also create open corridors through the forest landscape that dominates the proposed biosphere reserve.

12.7.1 Characteristic species:

There are widely differing characteristic species for the many different built-up environments. It is common to most of the species encountered in built-up areas, industrial sites, quarries and infrastructure etc. that they are either good at adapting to new, often disturbed environments, or they have been actively introduced to the area. The characteristic species in gardens, parks, churchyards etc. are principally those that have been planted on the site. See Annex 13p for a list of characteristic species.

12.7.2 Key natural processes:

Landslides

Minor landslides occur for example when torrential rain falls on steep terrain, which is also found in built-up areas and alongside the infrastructure.

Flooding

Natural floods occur, for instance on the Lillån River in Huskvarna and the Huskvarnaån River in Lekeryd.

12.7.3 Main human impacts:

Development and utilisation of land

The Municipality of Jönköping has grown and undergone rapid development since the mid-1990s, when Jönköping University was built. The whole local region is affected, but this impact is clearest next to built-up areas and in commuter settlements. The steep terrain and dense development make it difficult to construct local stormwater management surfaces. The Municipality of Jönköping recently developed an expansion strategy that will enable the municipality to grow from its current population of 125,000 to 150,000.

Air pollution and noise

Nature close to built-up areas is subject to air pollution, stormwater and noise. Noise is a significant problem in the countryside along the whole length of the E4 motorway.

Barriers

Large roads, especially the E4 motorway, are an effective barrier in the landscape, for example for wildlife. Certain other roads also carry heavy traffic.

Alien species

Human activity spreads, and intentionally or unintentionally promotes, alien species. The towns close to the Vättern scarp have a favourable microclimate that enables southern species to survive more easily. Giant hogweed (*Heracleum mantegazzianum*) is controlled by the municipality and individual farmers.

Care of parks, gardens and natural environments near population centres

Natural environments near population centres are greatly used for recreation. Thinning and clearing are the most common action taken and also the one that is most in demand. Areas of long grass are mowed once a season, while fine parks in both Huskvarna and Gränna are intensively managed. The steep terrain also means that residents request that trees be felled to improve their view. Enquiries are regularly received to fell trees to let more sunshine into gardens or onto solar cells.

12.7.4 Relevant management practices:

A nature conservation plan for the Municipality of Jönköping was adopted in 2009, which indicates a large number of measures to preserve and develop biological and social values in the green spaces of the built-up areas. There are great natural values around the population centre of Huskvarna on municipally owned land. An inventory of these has been compiled and there is good knowledge of these assets. A forest and tree policy for the whole of the municipality's land holdings is being developed to further clarify the municipality's intentions for recreation and biodiversity.

13 CONSERVATION FUNCTION

13.1 Contribution to the conservation of landscape and ecosystem biodiversity

[Describe and give location of landscapes, ecosystems, habitats and/ or land cover types of particular significance for the conservation of biological diversity.]

The proposed biosphere reserve is characterised by mosaic-like nature in a landscape with the character of a fissure valley. The terrain is extremely rough and the area has many steep slopes, or scarps, all parallel to one another, the largest and most characteristic of which is a western-facing precipice down to Lake Vättern. Big and impressive, this scarp is important for forest biodiversity. The climate closest to Lake Vättern is very mild, while that of the plateau to the east of the scarp, called the South-Swedish Highlands, is much colder. The topography, differences in local microclimates and soils create a wide variety of forest types. Many small waterways cut through the north-south-running ridges, creating variation especially in the wooded scarp down to Lake Vättern. The proposed biosphere reserve contains several deep lakes. Of these, Lake Vättern is Sweden's largest cold-water lake, and the southernmost such lake in Scandinavia. The great diversity of lakes also leads to long shorelines with special natural values.

In this mosaic-like landscape, farmlands are small-scale clearings in a region that is otherwise dominated by forest. There are many forest-edge environments in this area where woodlands stand shoulder to shoulder with farmland, and there are many microhabitats and obstacles to cultivation embedded in this heritage landscape. Human beings have shaped the countryside for millennia, and they continue to do so. Centuries of hay making, grazing and pollarding have created a special grazing landscape with a wide variety of species linked to grasslands, bushes and trees. In the open agricultural landscapes in the valleys are main parish towns, churches, large farms and manors and urban areas. The two cities in the proposed biosphere reserve are located on the plains below the Vättern scarp and have a favourable west-facing position next to the lake.

The proposed biosphere reserve has 16 existing nature reserves and 14 more in the process of being established; 23 habitat protection areas, 22 nature conservation agreements and 28 Natura 2000 sites.

The following terrestrial habitats are of particular importance to biodiversity and conservation of a large number of ecosystem services in the area:

- Forest-edge environments
- Trees worth protecting
- Scarp and ravine forests
- Natural environments near population centres

13.1.1 Forest-edge environments

Where the forest meets the agricultural landscape are unique forest-edge environments rich in blooming trees and bushes. The forest regions of the East Vättern Scarp Landscape are home to many small farms and cultivated fields, resulting in many forest-edge environments. In a forestry context, these environments are often referred to as the vestibule of the forest – but perhaps the veranda of the open landscape, capturing the sun's rays, would be a better description. Sun-warmed places are important to many plants and animals. Various habitats with a variety of structures such as deadwood in the forest, herbs rich in fruits, seeds and nectar, and trees and bushes in the agricultural landscape are crucial to biodiversity and a functioning ecosystem.

Many animal species require two or more habitats to complete their annual life cycle from egg to reproductive adult. Suitable habitats for feeding may differ from those where reproduction occurs. Places for sleeping, taking shelter from summer droughts or winter hibernation can be habitat-specific. In this context, a nearby mosaic countryside is a great advantage. Barriers created by modern society, such as large roads, railways and other installations are often a threat to various species' migration; however, infrastructure also creates open curtains of light in a forest landscape, especially overhead power lines, but also roads and railways to some degree. These corridors can create an environment in which plants, birds and other species that require a more open landscape can find suitable living environments for all or part of their life cycle.

13.1.2 Trees worth protecting in the agricultural landscape

The East Vättern Scarp Landscape is a mosaic of different habitats. This variation allows for great biodiversity in the area. Much of the biodiversity in the East Vättern Scarp Landscape is linked to trees that are worthy of protection. Oak pastures, wooded meadows, pollarded trees on mountain slopes and in cultivated lands, trees on manor estates, trees in churchyards and a large number of tree-lined avenues large and small are a few examples of places where we can find trees worthy of protection. These are trees that are old, large, pollarded, hollow or dead/dying.

Such trees present a range of living environments, such as deep cracks in the bark and hollows where many species of insects, birds, bats and lichen may live. In addition to the biological values linked to the trees, their advanced age indicates that they have a long, interesting history. Conservation measures are very important in order to preserve the natural and cultural values linked to the trees. To ensure that the species on and in the trees can live on and multiply, we must secure the existence of future giant trees, clear out the areas around choked trees, renew pollarding on trees that show traces of historical pollarding, begin pollarding new trees and prevent the cutting down of trees that are worthy of protection. The trees at greatest risk of being cut down are primarily found in country estates, urban areas and tree-lined avenues. An alternative to cutting down is to prune the crowns or to link together the trunks in a tree crown. Such measures have and will be carried out at many manors in the East Vättern Scarp Landscape.

In recent years, trees that are worthy of protection have been surveyed in various parts of the East Vättern Scarp Landscape, to give a better idea of where these trees are. The East Vättern Scarp Landscape is divided into two sub-landscapes with the greatest concentration of giant trees and four sub-landscapes with the greatest concentration of pollarded trees. The East Vättern

Scarp Landscape is one of the areas in Sweden with the very highest number of pollarded trees. The existence and history of these trees makes it important to manage them correctly and preserve the tradition of pollarding. Knowing where the trees are and what measures they require is a big step forward for conservation. The Swedish Forest Agency and the County Administrative Board have a common goal to work with interested landowners to re-establish pollarding and clear out other trees around those that are worthy of protection. Other efforts to collect and disseminate information and knowledge have been pursued in the pollarding project (see Chapter 15.3).

13.1.3 Scarp and ravine forests

Broadleaf deciduous forests cover large portions of the fault scarps along Lake Vättern. The mild climate favours heat-loving hardwood trees such as small-leaved lime (*Tilia cordata*), Scots elm (*Ulmus glabra*), Norway Maple (*Acer platanoides*), European ash (*Fraxinus excelsior*), wild cherry (*Prunus avium*) and European wild apple (*Malus sylvestris*). The broadleaf forests on the scarps are the most species-rich environments in the area and have the highest priority in conservation measures. Their shady, calcareous, damp, untouched environments are home to many threatened land snails, among other things. The bulin snail (*Ena montana*) is one species that only occurs in Scandinavia in the East Vättern Scarp Landscape. The threatened pea vetch (*Vicia pisiformis*) thrives in mountainous broadleaf environments. The richest broadleaf forests grow in the lower portion of the scarps, usually along ravines. For example, the Narbäcken Stream, the Girabäcken and Västanå Nature Reserves and the Strands Ravine in the Huskvarna Mountains all contained broadleaf forests with very high natural values.

The nutrient content of the bedrock leads to a varying blend of trees along the scarps. Hardwood trees thrive in high-nutrient environments, while trees such as aspen (*Populus tremula*), rowan (*Sorbus aucuparia*), goat willow (*Salix caprea*) and birch (*Betula pendula/pubescens*) prefer more nutrient-poor soil. The direction the slopes face also affects species composition. The scarps facing north and northeast have valuable forests of species such as aspen and some coniferous trees. In the east at Rävlinge and Hultsjön are many such shady untouched scarps with scree, boulders and plenty of deadwood.

The west-facing scarp towards Vättern contains patches of oak and pine forest in rocky soil. Driving along the E4 European motorway, it is easy to see this landscape as a typical characteristic of the Vättern scarps. Oak and pine forests generally have long continuity as they have been excluded from forestry because their productivity is low and they are difficult to cultivate ('technical impediment'). This means that these environments have good access to deadwood and trees worth protecting. Combined with a sunny environment, this leads to a species-rich fauna of beetles that require a warmer climate, such as the timberman beetle (*Acanthocinus aedilis*) and the musk beetle (*Aromia moschata*).

Scarp environments rich in hardwood, rocky oak and pine forests and scarp forests with varying coniferous trees and few hardwoods are typical environments within the proposed biosphere reserve, which are unusual in other parts of Sweden. This makes them areas of responsibility and thus extra important priorities in conservation work. The scarp environments also contain many of the pollarded trees in the area. These trees are also a high-priority area of responsibility in the East Vättern Scarp Landscape.

13.1.4 Natural environments near population centres

The urban areas in the East Vättern Scarp Landscape developed out of an agricultural landscape in which woodland areas were located close to the communities. Trees worthy of protection and

lakes and waterways with natural values on a regional or national scale are other common denominators of most urban areas in the proposed biosphere reserve.

The topography of the Lake Vättern graben, with the terrain rising sharply from the water level to the heights of the South-Swedish Highlands, create specific conditions for the countryside and the expansion of communities. The towns of Gränna and Huskvarna alongside Lake Vättern developed in a landscape that was once species-rich, which is evidenced by old herbaria and species surveys. More interesting than museum collections are the natural areas that have been integrated into built-up communities. Large trees became the backbone of parks, were allowed to remain in courtyards, churchyards and greenfields in urban areas. Along the sides of roads and railways, in gravel pits, along park walkways and on ski slopes, unusual plants and insects still thrive. Ruins from ancient times – such as Näs and Brahehus Castles – provide a specific calcareous breeding ground for several species of lichen and moss. A wooded meadow or pasture rich in flowers became a city park because that was where people went to enjoy the sunset over Lake Vättern in the company of good friends.

Land that is difficult to build on, such as scarps and slopes and the shores of waterways and lakes, were left primarily undeveloped until the expansion of the urban areas in the 20th century. Today they make up a part of the urban greenfields. One clear example is the city of Huskvarna, which expanded greatly from the late 19th century throughout the 20th. The Vättern scarp and two waterways pass through the city like green ribbons. One key habitat after another lines the scarp, and some of them have natural values of national interest. The same is true of waterways; the Huskvarnaån River tributary Lillån is of national interest due to its fish populations and is of regional interest from a nature conservation perspective. Solitary oaks and other hardwood trees have a long continuity on the scarp and along the waterways. In the past, the rich soils in stream ravines were used for wooded meadows and later for grazing lands, but a forest succession is under way there now. With all the natural areas, well-tended parks and the Esplanade in central Huskvarna, all residents there have less than 200 m to a greenfield. One stretch of greenfield through Huskvarna is of both national and regional interest: The Huskvarnaån River crosses the scarp in southern Sweden's largest waterfall. The natural values are high here, but still much lower than if the fall had been intact or had more rapidly running water. Today the majority of the running water goes to electricity generation.

In Gränna, the nearest outdoor recreation area is above the scarp and accessible by steps, roads and paths. There is cultivated land here, but most of the area consists of pine forest. It was once a forest grazing land and has also been affected by a forest fire. Three of the four sub-landscapes in the East Vättern Scarp Landscape are linked to Gränna Mountain – giant trees, hardwood woodlands and coniferous forest. The countryside is typical of the East Vättern Scarp Landscape, with rolling agricultural lands surrounded by coniferous forest. This combined with the proximity of Lake Vättern and the open agricultural landscape on the Gränna-slätten Plains means that Gränna is surrounded by all four landscape types in the proposed biosphere reserve.

13.2 Conservation of species biodiversity

[Identify main species (with scientific names) or groups of species of particular interest for the conservation of biological diversity, in particular if they are rare or threatened with extinction; use additional sheets if need be.]

13.2.1 Umbrella species, symbolic species and species of responsibility

Within the East Vättern Scarp Landscape, a range of species have been selected to facilitate conservation and teaching about it. Umbrella species are sensitive species whose conservation confirms protection of a larger number of coexisting species. The following umbrella species have been designated for forest landscapes and scarp environments in the area: lesser spotted

woodpecker (*Dendrocopus minor*), lung lichen (*Lobaria pulmonaria*), the grass *Poa remota*, and the bulin snail (*Ena montana*). For the agricultural landscape and its environments we have selected the umbrella species European wryneck (*Jynx torquilla*), the *Lecanographa amylacea* and *Gyalecta ulmi* lichen and spike speedwell (*Veronica spicata*). Symbolic species are often charismatic species that are used to demonstrate to the public that there is a threat to the conservation of biodiversity. The species in itself may not have any indicator value, but it should attract the interest of the general public and landowners. The symbolic species for hardwood ravines is the bulin snail (*Ena montana*) and for larger forested landscapes the western capercaillie (*Tetrao urogallus*).

For the agricultural landscapes in the East Vättern Scarp Landscape, the following species are valuable symbols: the hazel dormouse (*Muscardinus avellanarius*) in brushy forest-edge environments, mountain arnica (*Arnica montana*) for traditionally managed hay meadows and the great crested newt (*Triturus cristatus*) for small waters. The Eurasian curlew (*Numenius arquata*) represents an open agricultural landscape with open ditches, fields and natural grazing lands, making it a suitable symbolic species for Visingsö Island.

For Lake Vättern, the large salmonid species Vättern char (*Salvelinus umbla*) is a symbolic species and the European otter (*Lutra lutra*) represents smaller lakes and waterways with nearby forest vegetation. Finally, the peregrine falcon (*Falco peregrinus*) is the symbolic species for a landscape with no environmental toxins. Several of the above umbrella species also serve as symbolic species.

Species of responsibility are threatened species with few or no occurrences outside the area – not in the country or in the rest of the world. The East Vättern Scarp Landscape is home to the following species of responsibility: downy veilwort (*Apometzgeria pubescens*), soot lichen (*Cyphelium notarisii*), Visingsö lichen (*Caloplaca biatorina*), the *Elaphomyces striatosporus* fungus and the bulin snail (*Ena montana*).

The ongoing biological gap analysis will study the relevance, habitat requirements and need for conservation measures of these species and propose species for other habitats. The species will play a key role in the implementation of the landscape strategy, both as measures of environmental status and as educational tools for communication to various stakeholders.

13.2.2 Globally and nationally red-listed species, and a selection of EU-listed species

The proposed biosphere reserve has 304 nationally red-listed species and six globally red-listed species registered, as well as 41 species listed in the Birds Directive Annex 1 and the Habitats Directive Annex 2. Of the nationally red-listed species, two are critically endangered (CR), 17 are endangered (EN), 77 are vulnerable (VU), four fall into the category data deficient (DD) and the remaining 205 are near threatened (NT). The proposed biosphere reserve is well documented in most respects, and the highest natural values are linked to the arboreal environments of the forest and agricultural landscapes. A complete list of all nationally and globally red-listed species, as well as EU-listed species, located in the area is provided in Annex 13.

Most of the red-listed and EU-listed species in the proposed biosphere reserve are both directly and indirectly important for biodiversity, either through specific interaction with other species or because the red-listed species signals high natural values as a result of specific requirements from its surroundings. There also red-listed and EU-listed species that do not affect biodiversity to the same degree, but are important to preserve primarily because they are, or risk becoming, extremely uncommon nationally or internationally. The following summary describes the global and nationally red-listed species and EU-listed species that have been found in the proposed biosphere reserve based on various plant and animal groups.

13.2.3 Mammals

Two globally red-listed mammal species found in the proposed biosphere reserve are the Barbastelle bat (*Barbastella barbastellus*) and the European otter (*Lutra lutra*). The Barbastelle bat has been known in Sweden since 1800 and has its national core area in the north of the province of Småland and the south of the province of Östergötland. The species is found primarily in or near villages with environments that are typical of older genuine farming communities, usually with a rich occurrence of old, thick, pollarded trees and other old broadleaf trees. On the national red list, the Barbastelle is in the endangered category (EN), while the otter is listed as vulnerable (VU). Since its drastic decline in the 1950s, the otter has once again shown signs of recovery both in number and in distribution, and can now be found throughout most of the East Vättern Scarp Landscape. Both the otter and the Barbastelle are listed in the EU's Habitats Directive, Annex 2. Another nationally red-listed species in the area is the Eurasian lynx (*Lynx lynx*), which is in the near-threatened category (NT). The lynx population has seen successful regeneration in recent years and cubs have been fitted with radio transmitters so their movements can be studied.

13.2.4 Birds

The proposed biosphere reserve has a regular occurrence of three globally red-listed bird species: Corn crane (*Crex crex*), great snipe (*Gallinago media*) and Eurasian curlew (*Numenius arquata*). Of the species listed in the EU Birds Directive, 29 regularly breed or rest in the area; and from the national red list there are 40 bird species in the area.

Birds linked to lakes, waterways and wetlands

Several species are more or less linked to the wetlands and waterways in the proposed biosphere reserve. Garganey (*Anas querquedula*) and blue-headed wagtail (*Motacilla flava flava*) have been observed in the shore grasslands that have traditionally been used for hay making and grazing in the area, while river warblers (*Locustella fluviatilis*) can occasionally be found in dense brush or wooded areas near the water. The many fish-rich lakes and rivers in the area make it a popular place for osprey (*Pandion haliaetus*), black-throated loon (*Gavia arctica*) and common kingfisher (*Alcedo atthis*). In addition, the occurrence of waters without fish make it possible for the rare horned grebe (*Podiceps auritus*) to breed here. Some species linked to extensive aquatic vegetation have also been observed in the proposed biosphere reserve, such as spotted crake (*Porzana porzana*) and Eurasian bittern (*Botaurus stellaris*). These species came about in connection with wetlands. Most likely one of them bred here and the other attempted to breed at one point and vice versa at another, and both have occasionally been seen at other times. Black-necked grebes (*Podiceps nigricollis*) have attempted to breed on Visingsö and the European penduline tit (*Remiz pendulinus*) has likely bred in Lake Landsjön.

Birds linked to forest environments

Large birds of prey such as the peregrine falcon (*Falco peregrinus*) and the Eurasian eagle-owl (*Bubo bubo*) breed in the scree slopes in the area, while three of Sweden's five game birds, western capercaillie (*Tetrao urogallus*), black grouse (*Tetrao tetrix*) and hazel grouse (*Bonasa bonasia*), live in the coniferous forests, although the two larger species are in decline. In the vulnerable category (VU) we have not only the above-mentioned peregrine falcon but also the European honey buzzard (*Pernis apivorus*). The proposed biosphere reserve is also home to the lesser spotted woodpecker (*Dendrocopos minor*), which is particularly linked to older broadleaf trees and standing broadleaf deadwood. Red-breasted flycatcher (*Ficedula parva*) is another species in the near-threatened category (NT) and breeds annually in the area in the older mixed woodlands with good access to deadwood, as they build their nests in standing deadwood.

Birds linked to agricultural lands

Several bird species linked to rich meadow lands are found in the East Vättern Scarp Landscape, such as corn crake (*Crex crex*), common quail (*Coturnix coturnix*) and grey partridge (*Perdix perdix*). On Visingsö Island, the globally red-listed Eurasian curlew (*Numenius arquata*) is also common. In the more brushy, forest-edge parts of the agricultural landscape, we find breeding species such as common rosefinch (*Carpodacus erythrinus*), red-backed shrike (*Lanius collurio*), European wryneck (*Jynx torquilla*) and linnet (*Carduelis cannabina*). In recent years, the European serin (*Serinus serinus*) has spread on the outskirts of Gränna and is occasionally found in other parts of the agricultural landscape within the area. The ortolan bunting (*Emberiza hortulana*) has been observed in the proposed biosphere reserve, but has not bred here in recent decades.

13.2.5 Reptiles and amphibians

There is one species of amphibian in the proposed biosphere reserve that is listed under the EU's Habitats Directive, Annex 2: great crested newt (*Triturus cristatus*). Like other amphibians, great crested newts are dependent on moist, warm environments to complete their life cycle. Because their larval stage is relatively long, this species is particularly sensitive to drying in the aquatic environment. Because the great crested newt spends much of its adult life on land, it is also important that the terrestrial environment around its breeding waters is suitable, with plenty of deadwood, piles of stones and stumps where the newt can seek protection and hibernate over the winter. The excellent terrestrial environments, good access to ponds with no fish and relatively warm climate of the East Vättern Scarp Landscape have created a large population of great crested newt in the area. For this reason, the East Vättern Scarp Landscape has been designated a national core area of the species. One nationally red-listed reptile species has been observed in the area: The smooth snake (*Coronella austriaca*) thrives in sunny scree slopes in climatically favourable locations. The majority of the scree slopes facing Lake Vättern that are rich in hardwood trees offer favourable habitats for the species and it has been found in many places outside the county in Ödeshög. Within the proposed biosphere reserve, it has only been seen at the Vista Kulle Nature Reserve.

13.2.6 Fish

Two fish species that are listed in the EU Habitats Directive, Annex 2, are reported in the proposed biosphere reserve: European bullhead (*Cottus gobio*) and spined loach (*Cobitis taenia*). Both species thrive in the clear, cold, high-oxygen waters of Lake Vättern. A nationally red-listed species is the large Vättern char (*Salvelinus umbla*), which is listed as critically endangered (CR) and is found in Lakes Ören and Vättern. The species is dependent on deep, cold, oligotrophic lakes with good oxygenation and few, but suitable, fish species at greater depths. Lake Vättern also has Sweden's southernmost population of grayling (*Thymallus thymallus*). Burbot (*Lota lota*) attracts fishermen out onto the ice of Lake Vättern on cold winter days. It is on the global red list as of 2010 (NT). Lake Ören is also a spawning ground for common whitefish, which is a globally red-listed fish species, listed as critically endangered (CR). Spawning whitefish have not been seen in the past decade, despite careful searching.

13.2.7 Insects

80 nationally red-listed insect species have been observed in the area, of which one is listed as endangered (EN), ten are vulnerable (VU) and 68 are listed in the near-threatened (NT) category. Eighteen of the red-listed species are butterflies, one is a dragonfly and one is a fly. One globally red-listed and one EU-listed species have been observed in the area: The hermit beetle (*Osmoderma eremita*) has been observed in a location where droppings and shell remnants have been found in hollow giant oak trees. Near this location, somewhat outside the proposed biosphere reserve, fully developed individuals have also been observed in recent years.

Insects linked to wetlands and waterways

One nationally red-listed species of mayfly has been observed in the proposed biosphere reserve, the March brown (*Rhithrogena germanica*). This species' distribution in Sweden is limited to a number of waterways in the southern third of the country, which are characterised by rapidly running water and a bed of loose-lying stones under which its larvae can live. The species is listed as near threatened (NT) in the national red list.

Insects linked to forest environments

The majority of the insect species observed in the proposed biosphere reserve are linked to broadleaf or hardwood forests, either generally or more specifically to individual types of trees. The longhorn beetle *Leptura revestita* is a very rare and extremely local species that is listed as endangered (EN) on the national red list. This species often lives in small populations, and in Sweden it is primarily found in the stumps of large broken branches and damaged trunks on living elm trees. In the vulnerable (VU) category on the national red list, seven insect species linked to woodlands have been observed in the proposed biosphere reserve: *Anisoxya fuscula*, *Xyletinus ater*, *Xyletinus longitarsis*, *Abraeus granulum*, *Euryusa sinuata* and *Pseudeuglenes pentatomus*. While the first three of these are generally linked to wood with white rot, primarily oak, *Abraeus granulum* prefers damp, decayed hollow beech trees and *Pseudeuglenes pentatomus* specifically prefers bark on fallen dead aspen. *Euryusa sinuata* is linked to old pasture land trees. Among insect species linked to woodland environments, two nationally red-listed butterflies have been observed in the area: balsam carpet (*Xanthorhoe biriviata*) and netted carpet (*Eustroma reticulata*). The habitats of these species are linked to areas where the host plant, touch-me-not balsam (*Impatiens noli-tangere*), commonly occurs, which are primarily broadleaf-forested, steep ravines of deeply eroded rivers with clayey or sandy soils.

Insects linked to agricultural landscapes

Dinothenarus pubescens is listed as vulnerable (VU) on the national red list. In recent decades this species has declined dramatically, probably due to a decline in grazing on poor, dry outfields. The small blue butterfly (*Cupido minimus*) is considered to be near threatened (NT) on the national red list. This species has been found in the area and thanks to its wide distribution and great dependence on a host species that requires dry, calcareous soils, kidney vetch (*Anthyllis vulneraria*), it is a good signal species for valuable dry-meadow environments with a favourable local climate for several red-listed butterfly species. Several beetles that live in wooded pasture lands were covered in the previous paragraph.

13.2.8 Molluscs

Four nationally red-listed mollusc species have been observed in the proposed biosphere reserve: the bulin snail (*Ena montana*), the grey door snail (*Bulgarica cana*), the ventricose door snail (*Macrogastrea ventricosa*) and the large-mouthed valve snail (*Valvata macrostoma*). The bulin snail is particularly linked to the area because its occurrence in Scandinavia is limited to the scarp environments nearest Lake Vättern between Jönköping and Ödeshög. Observed occurrences are divided up into several small localities with varying population densities. The species is linked to hardwood forests and thrives in damp ravines or wet meadows where the groundwater reaches the surface and shade is sufficient. Known localities of the species are currently protected in nature reserves, including the Narbäck Stream and the Västana and Girabäcken Nature Reserves. The grey door snail (*Bulgarica cana*) exists in only a few known places in Sweden. The find in the East Vättern Scarp Landscape is recent and lies in the Strands Ravine near Huskvarna.

13.2.9 Vascular plants

There are 40 nationally red-listed vascular plants in the proposed biosphere reserve: Five are listed as endangered (EN), 12 are vulnerable (VU) and the remaining 23 are listed in the near-threatened (NT) category.

Vascular plants linked till wetlands and waterways

Two vascular plants linked till wetlands and waterways that have been observed in the proposed biosphere reserve are in the near threatened (NT) category: water mudwort (*Limosella aquatica*) and spatulaleaf loosestrife (*Lythrum portula*). Flea sedge (*Carex pulicaris*), which grows in rich fens, is listed as a vulnerable species (VU) on the international red list.

Vascular plants linked to forest environments

Pea vetch (*Vicia pisiformis*) is one of Sweden's rarest hardwood forest plants and is listed as endangered (EN) on the national red list. The species grows in rocky, brushy terrain with moderate light levels and a tree layer consisting of hardwood trees such as oak (*Quercus robur/petraea*) and lime (*Tilia cordata*). Its habitats often lie in south/west-facing scree slopes on relatively dry, humus-rich soils with rich herbal flora. In the vulnerable (VU) category on the national red list we find the herb greater chickweed (*Stellaria neglecta*), a species that is favoured in the humus-rich hardwood forests of the East Vättern Scarp Landscape with their moist, nutrient-rich, shady soils. Greater chickweed grows primarily on soils with little competition from other plants, so it is favoured by grazing, in which other vegetation is inhibited by trampling hooves. The accelerating spread of fungal diseases such as Dutch elm disease and ash dieback have led to drastic drops in the ash (*Fraxinus excelsior*) and elm (*Ulmus glabra*) populations, which has led to ash being listed as vulnerable (VU) on the national red list. The near-threatened (NT) category includes the grass *Poa remota*, which is found in freshwater swamp forests with moving groundwater.

Vascular plants linked to agricultural landscapes

Once a widespread weed in much of the Nordic region, late-flowering yellow rattle (*Rhinanthus serotinus ssp. apterus*) has now disappeared from the whole area. The decline is thought to be the result of more efficient seed cleaning in the first half of the 20th century and the use of herbicides in the latter half. In combination with a low number of reproductive individuals, the dramatic decline has led this species to be listed as extinct (EX) on the national red list. In the endangered (EN) category we have eyebright (*Euphrasia rostkoviana ssp. Fennica*), for which the proposed biosphere reserve is a part of its central distribution areas in Sweden. Eyebright grows on moderately dry to fresh till and is quickly stifled by fertilisation or the cessation of traditional grassland management. Because eyebright does not have a vegetative distribution or a sustainable seed bank, the species is extremely sensitive to neglect and is unable to re-establish itself naturally once it has disappeared from a location. Another species in the endangered (EN) category on the national red list is field gentian (*Gentianella campestris*). The species pale madwort (*Abyssum alyssoides*), littlepod false flax (*Camelina microcarpa*), tuberous pea (*Lathyrus tuberosus*), motherwort (*Leonurus cardiaca*), Hartman's sedge (*Carex hartmanii*), common pasqueflower (*Pulsatilla vulgaris*) and hairy vetch (*Vicia villosa*) are listed as vulnerable (VU) on the national red list. Sandy slopes alongside agricultural lands at the ruins of Näs Castle and Brahehus Castle are the habitat of the endangered (EN) European stickseed (*Lappula squarrosa*). It is an annual plant and requires disturbed soil for its seeds to take root each year.

13.2.10 Mosses

Three mosses in the proposed biosphere reserve are listed under the EU's Habitats Directive, Annex 2: dicranum moss (*Dicranum viride*), herzodiella moss (*Herzogiella turfacea*) and green shield moss (*Buxbaumia viridis*). Dicranum moss is also listed as endangered (EN) on the national red

list, as are the species downy veilwort (*Apometzgeria pubescens*) and wavy beard moss (*Didymodon sinuosus*). Dicranum moss is favoured by the big, old trunks of in particular lime (*Tilia cordata*), ash (*Fraxinus excelsior*) and oak trees (*Quercus robur*) in the proposed biosphere reserve. The species thrives best in closed forests and prefers trees with a relatively high bark pH. No globally red-listed species have been observed in the area, but in addition to the mosses named above, another 11 nationally red-listed species grow in the area. Four of them are listed as vulnerable (VU) on the national red list: the liverwort *Calypogeia suecica*, brown beard moss (*Didymodon spadiceus*), the liverwort *Lophozia ascendens* and lesser striated feather-moss (*Plasteurbynchium striatulum*).

13.2.11 Fungi

A large number of nationally red-listed fungi have been observed in the proposed biosphere reserve, but none are globally red-listed or EU-listed. Of the 73 nationally red-listed fungi species, one is listed as endangered (EN), 23 are vulnerable (VU) and 48 are listed in the near-threatened (NT) category. The *Elaphomyces striatosporus* fungus is classified as endangered (EN) because the total population in the country has declined, primarily due to loss of suitable living environments as a result of felling, encroaching vegetation and broken continuity of hazel trees. The distribution of the species in the country is considered to be heavily fragmented and many of the finds are around the southern part of Lake Vättern. The species is not found outside of Scandinavia.

13.2.12 Lichen

No globally red-listed or EU-listed lichen occur in the proposed biosphere reserve. However, 44 nationally red-listed species have been observed in the area, of which one is listed as critically endangered (EN), four are listed as endangered (EN), 13 are vulnerable (VU) and the remaining 26 are listed in the near-threatened (NT) category. Soot lichen (*Cyphelium notarisi*) is critically endangered because it occurs almost exclusively on old, untreated wood from old rural structures, a substrate that is becoming increasingly unusual in forestry and agriculture. The four species that are considered to be endangered (EN) are Visingsö lichen (*Caloplaca biatorina*), a species of needle lichen (*Chaenotheca cinerea*), the *Pyrenula nitidella* lichen and sphinctrina lichen (*Sphinctrina leucopoda*). Visingsö lichen has its only habitat in Sweden at the ruins of Näs Castle, which consist of sandstone from the Visingsö formation. The three other EN species are linked to hardwood populations or hardwood trees in the agricultural landscape. Of the 13 VU species, 10 mainly occur in hardwood populations or on older hardwood trees in the agricultural landscape.

13.3 Conservation of genetic biodiversity

[Indicate species or varieties of traditional or economic importance and their uses, e.g. for medicine, food production etc.]

Genetic biodiversity is often associated with domestic species, and often a sharp line is drawn between wild and domestic creatures. But humans have traditionally also used wild biodiversity in various ways for survival, and have therefore affected wild species. The boundary between wild and domestic is thus unclear. Habitats, organisms and so on that have been created or favoured by man's use of the landscape and whose survival requires continued farming and management are described as our bio-cultural heritage. This living heritage is worth preserving for both biological and cultural historical reasons.

Preserving genetic biodiversity does not simply mean preserving species, varieties or breeds, but also being aware of how our bio-cultural heritage has been and can be utilised. It is also largely about conducting research to fill in the gaps in our knowledge of the field. The development of new technology is also extremely important to create profitability and entrepreneurship related to bio-cultural heritage.

Things that were of economic importance 50 or 100 years ago may not be important today. However, the bio-cultural heritage can become of interest again in the future and can contribute to the development of the region's ecosystem services. If this happens, we must be aware of how biodiversity looked and was utilised back in time. The task of documenting and developing the East Vättern Scarp Landscape's ecosystem services is just beginning, but will likely be of great importance in future operations – see more in Chapter 14.3.

Our knowledge is currently lacking and needs to be expanded regarding specific traits of the region in the past as regards varieties and breeds that were grown and used. In addition, there is no documented knowledge of how people in general used the agricultural landscape and wild species for their survival. We should also learn more about how we can utilise the resources created by the bio-cultural heritage in the future with financial gain while preserving its values. Currently there is competence in this field at the Grenna Museum, and discussions are also under way with the Swedish Biodiversity Centre (CBM) regarding efforts to document the bio-cultural heritage.

13.3.1 Fishing

There are 31 fish species in Lake Vättern. Whitefish (*Coregonus lavaretus*) and Vättern char (*Salvelinus umbla*) are the species that have had, and to some degree still have the greatest economic importance. However, other species such as brown trout (*Salmo trutta*), smelt (*Osmerus eperlanus*), grayling (*Thymallus thymallus*), vendace (*Coregonus albula*), perch (*Perca fluviatilis*), northern pike (*Esox lucius*) and burbot (*Lota lota*) have also been used. The grayling population is the southernmost natural occurrence in the country. In addition to the naturally preserved species, it is documented that 18 fish species have been introduced to the lake since the Middle Ages. Among these are salmon (*Salmo salar*), which is still planted in the lake from salmon farms.

The number of professional fishermen – i.e., fishermen whose primary source of income is fishing – in Vättern has decreased from perhaps 400 in the 1940s to about 20 today, of whom only a few are active in the area. Fishing is currently pursued as a leisure activity for personal use, with a small amount caught for sale to homes, restaurants and smoke houses.

However, in the 21st century both professional fishing and leisure fishing for signal crayfish have increased dramatically and are of growing importance. These days only signal crayfish (*Pacifastacus leniusculus*) live in the lake. They were gradually implanted from the late 1960s after the crayfish plague eliminated the naturally occurring noble crayfish (*Astacus astacus*). Today, crayfish are definitely the most important species for professional fishermen. See more under Chapters 9.3, 12.1 and 12.2.

13.3.2 Forest

Sweden has roughly 2 coniferous trees, 8 hardwood trees and about 10 other broadleaf trees naturally occurring that are of use to forestry. In the older farming society, they had different uses than today and were used based on a multi-faceted landscape use. On Visingsö Island, an oak plantation was established in the 1830s. The plant material was not local, but was shipped to the island from Stockholm. Intense management of the oak woodland has led to its becoming Sweden's largest cohesive field plantation and a normative example for the establishment and care of broadleaf deciduous forests. Individual oaks have been sold as special timber for shipbuilding and manufacturing of wooden barrels for water and whisky.

During the development of productive forestry, and due to growing deer populations, the types of trees grown actively have dramatically decreased. Spruce (*Picea abies*) and pine (*Pinus sylvestris*) are cut down as timber, while birch (*Betula pendula/pubescens*) and to some degree other broadleaf

trees are used for pulpwood and firewood. Aspen (*Populus tremula*) has traditionally been sold to Jönköping for the match industry, but is currently cultivated as a fast-growing source of bioenergy. Hardwood trees such as oak (*Quercus robur*) are sometimes sold for the production of veneer, but also locally for the manufacture of items such as fence posts. A project to expand our knowledge of cultivation and small-scale refinement of hardwood forests is planned within the proposed biosphere reserve.

Hunting of elk (*Alces alces*) and roe deer (*Capreolus capreolus*) is a very important activity locally and for household needs, which has arisen over the past 50 years due to growing populations. Various forms of limited hunting leases for outsiders are also increasing. Over the past decade the population of wild boar (*Sus scrofa*) has exploded, and locally fallow deer (*Dama dama*) have also become numerous. In coming years, wild boar will likely become the most valuable game animal. Up until 1960, hunting was not as strictly regulated as it is today and the use and financial significance of game was greater then. Forest birds such as black grouse (*Lyrurus tetrix*) and western capercaillie (*Tetrao urugallus*), and mountain hare (*Lepus timidus*) as well, were hunted for meat. Red fox (*Vulpes vulpes*), European pine marten (*Martes martes*) and Eurasian red squirrel (*Sciurus vulgaris*) were hunted for their valuable fur. Other animals that were hunted here in the past were hooded crow (*Corvus cornix*), common raven (*Corvus corax*) and jackdaw (*Corvus monedula*), because there was a bounty on these birds until 1960. Crows were previously sold as a delicacy at one restaurant in Jönköping. This shows that there can be a possible yield for unusual animals in the future as well.

Forest plants have been used in all eras as a supplement to cultivated foodstuffs. Food gathering was more significant during famine years and up until the 19th century wild plants were mainly used for local household use. Lingonberries (*Vaccinium vitis-idaea*) and cloudberries (*Rubus chamaemorus*) have traditionally been used more than other berries, which may be because they contain benzoates, a natural preservative. The berries were probably boiled into a sour jam. Aside from making jam, by far the most common preservation method was drying. Not until the 19th century did it become more common to make jam with sugar. This was also when it became more interesting to pick berries and other foods for a growing city population. Roads became better and transports on Lake Vättern also expanded. This allowed berries and other products to be picked for sale in the cities, both fresh and dried, and probably gave a financial boost to households in the more small-scale parts of the area with access to forests. In the early 20th century, city authorities encouraged the use of berries from the forest. Lingonberries (*Vaccinium vitis-idaea*), bilberries (*Vaccinium myrtillus*), cloudberries (*Rubus chamaemorus*), cranberries (*Vaccinium oxycoccos*), wild cherries (*Prunus avium*), damson plums (*Prunus domestica ssp. insititia*), blackthorn (*Prunus spinosa*), red raspberry (*Rubus idaeus*), dewberries (*Rubus caesius*) and brambles (*Rubus nessesis ssp. nessesis*) are berries in the area.

Today, berry picking in forests and other natural lands, like hunting, is primarily a social activity with some financial importance for local households. There are some market-square sales of local berries, but it is more common that these berries come from more berry-rich areas; the tradition of picking in the region is fading. Picking for personal use takes time, and it is easy and inexpensive to buy the berries you want. Berry-picking and processing for sale has low profitability, although it is increasing somewhat with the growing interest in locally produced food.

Mushroom picking is mainly a recent phenomenon that has increased in recent decades into something of a popular movement. Picking probably occurred earlier – and mushrooms were used in some small scale by the upper class – but the basic attitude of the general public was that fungi were not fit for human consumption. However, mushrooms were picked in the countryside

for sale in Jönköping. Among the most popular species are funnel chanterelles (*Cantharellus tubaeformis*), golden chanterelles (*Cantharellus cibarius*), porcini (*Boletus edulis*) and yellow-foot chanterelles (*Cantharellus lutescens*).

Berries are not the only things that were traditionally picked; lichen, bark, seeds and green leaves have also been collected. This was more common in areas where agricultural production was not very extensive, and was more common among the poorer elements of the population. Women and children did most of the gathering. Making use of the leaves and seeds of various wild plants was probably common, but has practically been forgotten in the 20th century. In contrast to hunting and cultivation, which were often documented, knowledge of gathering was passed down orally. This may be one reason that our knowledge of what wild plants were used for in practice is lacking. Today the use of wild plants is having a renaissance; they are used at fancy restaurants or in contexts where people want to live close to nature. Examples of plants that can be used, and almost certainly have been used, are the leaves of wild garlic (*Allium ursinum*), wood sorrel (*Oxalis acetosella*), ground elder (*Aegopodium podagraria*), nettles (*Urtica*) and meadow salsify (*Tragopogon pratensis*) as well as hazelnuts, elm seeds, alpine bistort seeds, shoots from rosebay willowherb (*Epilobium angustifolium*) and common hop (*Humulus lupulus*). Wild plants have also been gathered and used in combination with cultivated plants in folk medicine and as spices. Examples of this include greater plantain (*Plantago major*), St. John's wort (*Hypericum perforatum/maculatum*), meadowsweet (*Filipendula ulmaria*), wormwood (*Artemisia absinthium*), various types of mint (*Mentha*), caraway (*Carum carvi*) etc.

13.3.3 Grasslands

In the historical agricultural landscape, essentially all land that farmers had access to was used. The best soils became fields or hay meadows, while the poorer outfields were used as grazing lands where the animals could roam freely and eat all accessible vegetation. Infields that were difficult to farm were also used as grazing land. However, the relationship between grazing lands, meadows and fields has not been static; sometimes larger areas have been fields, and later returned to being meadows and grazing lands. Since the late 19th century, much of this has changed. In many cases, outland grazing lands were allowed to become forest lands, while grazing moved into the infields, on former fields and former hay meadows. The more easily farmed hay meadows have also been converted into fields as fertiliser became more accessible, while others have become overgrown.

Visingsö Island has long been heavily cultivated; there was no space here for grazing animals in the summer. Above all, Hökensås on the south shore of Vättern was used as a summer pasture and for gathering winter fodder, as were parts of the scarp toes in the East Vättern Scarp Landscape.

Meadows were the source of winter fodder for livestock. In time, the soil became depleted and developed a special flora with extensive species variation. Many meadow species have difficulty competing with other species and have developed various strategies for surviving hay making. For example, some species developed early blooming as an adaptation to the time when grass was harvested. A good example of this is early field gentian (*Gentianella campestris*), which blooms from mid-June to mid-July, in contrast with late field gentian, which blooms in later months. The earliest evidence of early field gentian in the province of Småland comes from Huskvarna in 1846. The amount of space dedicated to meadows is decreasing and major efforts are required to preserve the unique flora and fauna linked to this land type. There are many unique wooded meadows left in the area, which require regular maintenance; however, other measures are also required, such as letting the cows into natural grazing lands with meadow-type flora a bit later in the spring. Even places with more post-modern land use – such as golf courses and ski slopes –

can be managed in a way that preserves typical hay-meadow flora. One interesting example is eyebright (*Euphrasia rostkoviana ssp fennica*), which is adapted to unfertilised grasslands, but grows today on the ski slope in Huskvarna, one of the few places left where it still grows. The sides of roads and corridors for overhead power lines often contain unusual flora and insect fauna that are favoured by traditional grassland management. Roadsides are a common place for people to pick and simply enjoy wildflowers. Developing and testing new methods for conserving typical hay-meadow flora is a top priority. The Swedish Biodiversity Centre (CBM) has pursued targeted research on these issues for several years. A good knowledge base on modern methods for traditional lands has been established and it is time to put it into practise. The biological gap analysis will study the importance of post-modern environments and propose management methods. See Chapter 15.1.1.

The trees on the grazing lands and in the meadows were used to produce fodder and were cut back in a way that maximised leaf production, called pollarding. Pollarding was common in the area and there are still many trees that bear its traces. The East Vättern Scarp Landscape is one of Sweden's core areas for pollarding, with over 2,000 pollarded or previously pollarded trees. Above all lime, (*Tilia cordata*), ash (*Fraxinus excelsior*) and elm (*Ulmus glabra*) were pollarded in infields, while leaves from 'soft' broadleaf trees such as birch (*Betula pendula*) and aspen (*Populus tremula*) were used in the outfields. A pollarded tree is one of the very best examples of bio-cultural heritage. They often become very old and stand in sunny locations, where they develop into hollow trees. This makes them a unique home for a large number of insects, birds, mosses and lichen. New pollarding, restoration and current pollarding have increased significantly in the area. In addition, new technology has been tested – accumulation units for harvester, which can manage multiple small trunks at once – to see how the production of bioenergy from pollarded trees can be made more economical.

Fruit trees in grazing lands and meadows have also been used. This has applied mainly to stone fruit trees such as wild cherry (*Prunus avium*). Over time, the better trees have been conserved and a kind of refinement occurred. Today there are many fruit trees left in forest-edge environments, on roadsides and grazing lands. The wealth of hardwood trees and hazel (*Corylus avellana*) indicates that these grazing lands and meadows were used and saved.

13.3.4 Livestock

Older native breeds have seen a renaissance in recent years in both interest and use. There are national associations for several breeds, and we can assume that the distribution of these breeds in the proposed biosphere reserve has increased. There is no definitive list of breeds in the area, but Rödkulla cows, Göinge goats, Rya sheep, Värmland sheep and Linderöd pigs are found here. Among native breeds of horses, the North Swedish horse and Gotland pony are represented in relatively large numbers. Cattle probably consisted of smaller breeds like Ringemåla cattle and the little Småland cattle (extinct in the 19th century). These smaller, low-producing (in both milk and meat) breeds are adapted to grazing lands with difficult terrain and meagre grass. Their grazing patterns (choice of fodder and ways of moving and tramping) differ from the heavier beef and dairy breeds of today. The qualities of modern breeds combined with the earlier letting-out to graze on lands that were previously hay meadows can have a significant negative impact on flora and fauna in grazing lands.

In sheep and poultry above all, the older native breeds are also of key economic importance for individual farms in terms of landscape management, meat and egg production. Cattle are kept for beef and dairy production, while horses and sheep – the same breeds as elsewhere in the country – are kept for recreation and landscape management. Chickens, pigs and goats are also kept in many places in the area, but are of lesser economic importance.

Horses are used on a small scale in agriculture and forestry, as well as for recreation on some farms. There is an association for the North Swedish breed in the area. Interest in horses as domestic animals has increased significantly in recent decades. The area is home to three fairly large riding schools, several breeders of trotting and riding horses and several farms that offer horseback riding for tourists. Equestrian sports are a growing industry in rural areas, both in the form of dedicated equestrian companies and as a sideline alongside the traditional land-based industries. This has also given a boost to employment in agriculture through the production and sale of fodder, straw and so on. At a rough estimate there are around 1,000 horses in the East Vättern Scarp Landscape. This means that many grazing lands are kept open today through horse grazing.

Honeybee keeping is an important activity for individual practitioners and occurs here and there throughout the area. This activity is crucial to pollination and by extension for revenues for agriculture and fruit and berry growers. Beekeeping was once very widespread in the area, but has decreased in recent decades. Before the import of cane sugar and the cultivation of sugar beets (which began around the mid-19th century), probably all farms had their own honey production. The connection between beekeeping and pollarding is interesting, because lime trees produce large quantities of nectar while their leaves provide winter fodder and the bark fibre, bast, was used to make rope. The latter ceased in the late 19th and early 20th century, when industrial hemp replaced bast. However, lime bast was used until the late 20th century in orchards when grafting. These days, honey production faces several problems: a high average age among beekeepers, few practitioners and many problems with diseases among the bees, of which Varroa mites are the most serious threat. Winter mortality of bees in southern Sweden has been very high in recent years (nearly 40%). On Visingsö Island, the ligustica breed was introduced three years ago with the aim of creating strong, vital bee colonies.

13.3.5 Cultivated diversity

Agricultural plants

Geographically, the area is located in the border zone between the provinces of Småland and Östergötland and therefore has a mixed tradition of cultivation. Pollen analyses from the vicinity south of the proposed biosphere reserve show that wheat and barley were the earliest proven cultivated crops, dating back to about 600 BC. During the agrarian expansion of the Middle Ages, these crops continued to be grown, but were joined by rye and hemp. The cultivation of hemp probably ceased in the late 18th century when oats were introduced. Three-field rotation was common in the area, which means that winter rye was cultivated here more than in the rest of Sweden. Today the species and varieties grown in the area are the conventional ones grown in Sweden: cereals, oil-yielding plants, legumes and potatoes. However, interest in unusual niche crops is growing.

Older varieties of agricultural plants are currently preserved in the Nordic Genetic Resource Centre's plant gene bank in Alnarp. The number of cereal varieties that were gathered prior to the 20th century, when varieties were more local, is limited and most were abandoned in active cultivation early in the 20th century. Thus, specific varieties for the region have not been preserved. Regarding legumes, the situation is similar but there are more preserved varieties from Östergötland, for example Östgöta yellow pea, which could be similar to varieties found elsewhere in the area. Various potato varieties may still exist at individual growers and there are also individual varieties in the gene bank.

Fruit and berries

The Gränna-Visingsö area has a very special bio-cultural heritage that is clearly linked to its favourable local climate and its unique history from the 17th century on. Plant breeding and unique cultivation were pursued in Visingsborg Shire. In the 17th century, attempts were made to cultivate mulberry trees for silk production; the trees remain, but the butterflies did not have a good survival rate. A type of red pear was imported by Count Per Brahe the Younger and cultivated into the 18th century in Gränna. The people of Gränna set up nurseries to propagate pear trees and sold plants nationwide. As the plants came from Gränna they were often called Gränna pears, and Gränna came to be called Pear City. Tobacco plantations were another specialty of the tracts around Gränna, from the 1720s on.

The previous fruit plantations (except for those at the really big manors) were primarily established in grazing lands and meadows (see above). In the late 19th and early 20th century fruit plantations were established more rationally on fields or on a smaller scale near homes as small orchards. Many varieties were imported from other parts of the country or from other countries, but completely local varieties were also cultivated. Fruit was even grown in gardens in the town proper. There are still old-style fruit plantations, but several are falling into decay. To preserve and develop these historical plantations, they must continuously be managed and renewed, which has not occurred in recent years.

Today commercially grown berries and fruit create a distinctive character in parts of the proposed biosphere reserve. They are grown in the locations with the best climate, as in the Skärstaddalen Valley north of Huskvarna and on the scarp toes near Gränna. The fruit plantations in the southern Lake Vättern region are Sweden's second-largest fruit-growing district and are growing strongly. For example, five growers have joined forces under the brand 'Vätterfrukt'. Another great success is the sale of fruit crates including locally grown fruit. Commercial growing consists mainly of apple trees. More large-scale plantations of currants and strawberries exist and have existed here. These were most important from the 1950s to the 1970s. A few nurseries in Gränna grow fruit trees from seed.

The older varieties of apple and pear are preserved in clonal archives throughout the country. One of these is in Brunstorp north of Huskvarna. The clonal archive will be a part of the national gene bank for vegetatively propagated plants that is under development. The archive in Brunstorp preserves both the varieties that will be included in this gene bank and other local cultivars. The Brunstorp clonal archive was founded in 1979, and old local varieties from Småland, eastern Västergötland and Östergötland were obtained through appeals on the radio and in newspapers. Today it has about 130 varieties of apples, such as 'Count Pehr's Dinner apples' and 'Hornsberg'; 30 varieties of pears, such as 'Blood Pears' and 'Gränna Pears'; and 20 or so varieties of cherries with names like 'Big Amarells' and 'General Yellowish Whiteheart'. Local, documented unique varieties can still be found at Brunstorp. There are also perennial plantations and a lovely herb garden there. Older varieties of berries are preserved in other ways.

Vegetables, herbs and medicinal plants

Count Per Brahe the Elder wrote in his *Oeconomia, or the Household Book for Young Nobles* that a manor's grounds should contain a hop garden, an orchard, a herb garden, a cabbage garden, a turnip garden, a flax and hemp garden, peas and beans, fields, forest and grazing lands. The orchard would consist of fruit trees and the cabbage garden would contain leafy greens and root vegetables. This latter is where the modern term garden comes from. We also have documentation of what was grown on Visingsö during this period. The Visingsborg Castle herb garden is one of the nation's biggest, most elegant baroque gardens with some 800 types of plants and a popular tourist attraction with very high historical value.

Plantations at other manors may also be documented, while the vegetable gardens of the peasants are less well known. At manors, servants managed the vegetable gardens. Plants and seeds were mainly imported, although some were domestic. The selection of plants was probably very large for those who could afford them. Among the peasantry, tending the vegetables was women's work. Before the land reforms of the 19th century, farm environments were not very big, so there was no space for a vegetable garden for home use. The varieties were local to a great degree, and people used farm-saved seed to a greater degree than today. This limited the selection. It is conceivable that they grew turnips, parsnips, carrots, onions and peas. They probably also had a garden of medicinal herbs, but most of the herbs that were used at the time probably came from the meadows, roadsides or forest.

Not until after the land reforms of the 19th century did vegetable gardens develop into larger units even among peasants. This was also a period when city authorities became more interested in having the public produce good foods and eat well. County agricultural societies were founded and there were even school gardens where children learned to grow vegetables. Herbs were also grown to a greater extent, and people began to refer to them as spice plants in this era. Before and during the Second World War, people were encouraged to gather and sell plants to the pharmacies. Some of the plants used this way include bogbean, (*Menyanthes trifoliata*), mountain arnica (*Arnica montana*), alder buckthorn (*Frangula alnus*), German chamomile (*Matricaria recutita*) and caraway (*Carum carvi*).

From as early as the 15th century until 1860, farmers were required by law to grow hop, so that crop had a nationwide distribution. Often the hop you find growing outside properties of homes is from a bygone era. A survey is under way using old maps to determine if hop still grows in the same locations. Several sites have already been surveyed and hop has been found, although it is not yet known if the plants are old varieties.

The cities grew and Huskvarna was built with many gardens. Those who did not have a garden of their own could rent an allotment. Around Gränna and in the Skärstaddalen Valley, several garden centres and plant nurseries cropped up in the 20th century that offered berries, vegetables and ornamental plants. They also had some greenhouse plants. The more large-scale growing of vegetables for personal use kept increasing until the 1960s, then began to fade at an increasing pace. The reason was that imported plants became cheaper and it became easier to obtain vegetables year round. However, interest in gardening is tending to grow again, and interest in unusual and older domestic varieties is increasing.

In 2002 the Programme for Cultivated Diversity (POM) conducted a survey of older varieties of seed plants in Sweden. There are still several older varieties being grown in Småland, particularly of peas and beans. Beyond this it is difficult to say if any local varieties remain for the area. However, older gardens may still have traces of older varieties of perennial vegetables such as asparagus, rhubarb and lovage.

Older varieties of vegetables are kept frozen at the Nordic Genetic Resource Centre in Alnarp. Small amounts of seeds from older varieties can be ordered from here. Members in the non-profit Sesam Association can also obtain small amounts from other members who are willing to share. Previously it was difficult to obtain older or unusual varieties in any other way. However, the regulations for plant seeds are changing, which will allow commercial growing of such varieties. This may be a development opportunity for the parts of the area that have an ideal climate.

Ornamental plants

Just as with vegetables, ornamental plants were primarily grown at manors prior to the 19th century. After this, commoners began growing ornamental plants as well. Several species were grown in the late 19th and early 20th century that are called ‘old-fashioned plants’ today. Typical examples are columbine, soapwort, phlox, aconite and snowdrop anemones. Bulb plants like crown imperial, tiger lily, daylily and daffodils are other examples. There are also many old rose varieties from the area preserved in Jönköping’s Rosarium.

The nationwide survey conducted by POM lists old ornamental plants among other things. The main focus is on hardy plants with a history. Several interesting finds have also been made in northern Småland. Some of this will be included in the national gene bank for vegetatively propagated plants. Among the varieties found include several that could be used to restore gardens to a more original condition. Some varieties are also worthy of getting back out on the market; work is under way to achieve this.

14 DEVELOPMENT FUNCTION

14.1 Potential for fostering economic and human development which is socio-culturally and ecologically sustainable

[Describe how the area has potential to serve as a pilot site for promoting the sustainable development of its region or ‘eco-region’]

14.1.1 Projects for sustainable development

A working forum for problem solving

The initiative for the East Vättern Scarp Landscape project, which began in 1998, came from local special interest groups and authorities that are active in the area: the Federation of Swedish Farmers (LRF), the forest landowners’ association Södra Skogsägarna, the local Gränna Skogsgrupp forest conservation association, the World Wildlife Fund (WWF), the Municipality of Jönköping, the Swedish Forest Agency and the County Administrative Board of Jönköping. The success of the East Vättern Scarp Landscape project at the tricky balancing act of creating active collaboration between conflicting interests is extra interesting considering the huge conflicts regarding surveying and protecting natural areas – this was in fact the catalyst that started the whole project.

One vital precondition for turning this infected debate into a constructive dialogue was the creation of a forum in which representatives of the involved organisations could get together. During the ten-year project, this forum expanded to embrace more and more aspects of sustainable landscape use. All measures that have been implemented have been in line with the overall intentions of the European Landscape Convention; for example:

- enhancing awareness of the value and importance of the landscape in the community, in private organisations, among companies and for public authorities
- promoting public participation in decisions and processes regarding the landscape locally and regionally
- developing a holistic view of the values of the landscape and how to manage them sustainably.

In the work with the biosphere reserve candidacy, this forum has created an arena for problem solving and networking, which has been accentuated over the years. The following functions have been emphasised during this period:

- Bolster the local spirit of collaboration that has developed in the area
- Improve opportunities for users, businesspeople and landowners to develop a financially, ecologically and socially sustainable business ownership
- Inspire innovation, entrepreneurship and new knowledge and technology
- Highlight all the values of the landscape to build up the local identity and enhance the attractiveness of the area
- Give residents and visitors greater opportunities for natural and cultural experiences
- Develop the East Vättern Scarp Landscape into a test landscape to build up the interaction between conservation and development, city and country, and between nature conservation and cultural heritage preservation
- Create international awareness of the large and small-scale values of the area
- Attract relevant, interdisciplinary research resources and create a knowledge centre for collaboration between traditional and scientific knowledge, as well as between theory and practice
- Contribute to meeting regional environmental goals by promoting positive examples that create interest and dedication
- Develop a scientific method for biological gap analyses that will form the basis of a landscape strategy based on measurable goals and with all players involved in the implementation
- Develop efforts to establish conservation-adapted forestry around waters. Establish ponds in the agricultural landscape and wetlands in forest and grazing land
- Create a Biosphere Centre that will provide administration, information and sales of local, sustainably produced products as well as facilities for research and meetings. See also theme 6 below

14.1.2 New networks and arenas

The activities in the East Vättern Scarp Landscape have created many new contacts and networks related to sustainable development and landscape use. This is particularly true on the local and regional level between the seven organisations involved. These networks are often based on various geographical boundaries. A vertical network structure has been developed, creating many new collaborations with organisations and individuals on the national and international level. These networks often have more thematic delimiters.

Collaboration between different special interest groups at various administrative and geographical levels is crucial for creating long-term sustainable solutions to local and global social problems. One of the most important tasks of the proposed biosphere reserve in this context is to create an arena for discussion, problem solving and innovation. Above all, this meeting place is important in the borderland between policy and practice and between scientific and traditional knowledge.

Sweden has many institutions that work with and conduct research in sustainable use of natural resources, but few of them have any geographical ties to a real living landscape. At the same time there are many administrators, advisors, landowners and businesspeople who have good, concrete knowledge and experience, but often lack overall knowledge of comprehensive goals and the opportunity to influence policy. The proposed biosphere reserve helps increase understanding of one another's realities, which also creates new opportunities to establish a working demonstration area for economic development that is socioculturally and ecologically sustainable.

14.1.3 Theme issues – priorities within the biosphere reserve’s operations

To set priorities and bring together the three functions of a biosphere reserve, the work in the East Vättern Scarp Landscape has been divided into six theme issues and six theme landscapes. These divisions help clarify and communicate the operations within the biosphere reserve candidate. These theme issues and theme landscapes enrich the vision and goals for the area by giving them thematic and geographical limitations.

Selected themes reflect the priority that is currently most relevant, and thus must continuously change as new challenges arise. This is and will remain important for the biosphere reserve to be prepared and flexible enough to act when the opportunity presents itself. This is particularly important in collaboration with organisations, users and landowners who take the initiative and should be able to count on support from the biosphere reserve organisation. Within the framework of the overall priorities that direct the operations, there must be great freedom to revise short-term plans. Participation in meetings, production of information and concrete measures in the land-based industries are some examples.

The goal of all theme issues is to promote conservation and development work, and in the long run also develop research, educational and demonstration projects through local collaboration. The three functions of a biosphere reserve permeate all efforts, and usually each of the individual projects. The priority challenges according to the Madrid Action Plan – climate change, ecosystem services, and urbanisation – are included with varying relevance in all themes defined below.

Theme landscapes:

1. Grazing lands
2. Valuable trees in the agricultural landscape
3. Woodland and scarp environments
4. Water in the landscape
5. Natural environments near population centres
6. The shire and the smallholder farming landscape

Theme issues:

1. The East Vättern Scarp Landscape brand
2. Small-scale wood refinement and set-aside woodland
3. Tourism
4. Locally produced goods
5. Renewable energy
6. Landscape history and ecology

The theme issues are described in more detail below, with an emphasis on their ties to the development function.

14.1.4 The East Vättern Scarp Landscape brand

The ambition in the proposed biosphere reserve is to develop ‘the East Vättern Scarp Landscape – grand and small-scale’ into a well-established brand for local ideas, products and services. Landowners and businesspeople in the area should be able to use the East Vättern Scarp Landscape brand in their own marketing, of which there are already good examples today. However, for a biosphere reserve designation to work, we must develop a quality control system

that complements and expands the existing systems in fields such as organic farming, sustainable tourism etc. Discussions regarding these matters have begun on the local and national levels.

14.1.5 Small-scale wood refinement and set-aside woodland

The East Vättern Scarp Landscape is home to several entrepreneurial and special-interest organisations that work with forest and wood issues, such as the forest landowners' association Södra Skogsägarna, the Federation of Swedish Farmers (LRF) and Svenska lövträdföreningen [the Swedish Broadleaf Tree Association]. The aim of these organisations is to contribute to the development of businesses and businesspeople who work with agriculture, forests, gardens and rural environments, for example by holding courses and marketing refined forest products. Landowners and businesspeople who want to invest in small-scale wood refinement and setting aside woodland need knowledge, entrepreneurship and networks. The collective skills in the proposed biosphere reserve have great potential to promote sustainable community expansion and sustainable forestry based on the unique conditions of the landscape and each property.

14.1.6 Tourism

Within the proposed biosphere reserve, Gränna and Visingsö are among the nation's most famous tourist destinations. This area has a long tradition of tourism. The Swedish Tourist Association (STF) was founded in 1885; fourteen years later came the Grenna Tourist Association, which aimed to spread awareness of the unique natural and cultural heritage we are here to preserve. As a part of these efforts, STF began producing brochures about different parts of the country. One of the first areas presented was the region surrounding Lake Vättern with all of its historical monuments from above all the Swedish Middle Ages and the Great Power Era. The unique natural surroundings were highlighted, and the articles ended with the words: "You simply must see this, and that's final!" This was the humble beginning of over 100 years of tourism development in the area. The unique natural values of the landscape include its many lakes, its enchanting ancient-looking forest environments and above all the grand views and small-scale rolling agricultural landscape linked to the area's bio-cultural heritage. To maintain and develop tourism, continuous maintenance is required, through grazing, hay-making and spreading information on why these activities are so important. For more information, see Chapter 14.2.

14.1.7 Locally produced goods

Interest in locally produced goods, above all local food products, has never been greater than it is now. Several farms in the East Vättern Scarp Landscape have opened farm shops, and many shops and restaurants in nearby city of Jönköping have begun carrying locally produced goods. There are successful entrepreneurs who sell crates of fruit or meat directly to consumers. In several places in Sweden, projects are under way to increase the proportion of locally produced goods through a focus on quality assurance and labelling, as well as continuing to boost the added-value feeling of local products.

Yet another dimension of locally produced food is locating raw materials that are indigenous to the region. Even if the same varieties or breeds no longer exist, older and newer cultivars of traditional crops can contribute to greater variation in the landscape and among the products. The vegetable gardens that vanished in the 1970s in the area might be worth re-establishing, as the added value can be quality-assured by using local products. In addition, berries and other wild plants, as well as fishing, are all local products that have a potential to attract both supermarkets and restaurant owners. The challenge in the East Vättern Scarp Landscape is the same as in the rest of the country. This theme issue has great potential for the proposed biosphere reserve to serve as a testing ground for concepts such as how to create meeting places, tools and support for greater consumption of locally produced goods. The Federation of Swedish Farmers (LRF)

has proposed an indoor farmers' market for selling such products and the proposal has been discussed in the East Vättern Scarp Landscape.

14.1.8 Renewable energy

Sweden has a clear ambition to boost production of renewable energy to cut the use of fossil fuels and their effects on global warming. The county's Climate and Energy Strategy also has ambitious regional goals and visions. This strategy includes the vision that the County of Jönköping will be a 'surplus energy county' by 2050, which means that it will have reduced need for energy and the use of renewable energy will have produced a surplus. The East Vättern Scarp Landscape has unique abilities to contribute to this vision. Hydropower has long been a valuable source of energy that has contributed to community expansion. The renewable energy sources that have the greatest future potential in the East Vättern Scarp Landscape include wind and bioenergy. The ability to produce fossil-free electricity and fuel through wind power and a greater use of bioenergy from agriculture and forestry is a good thing if it happens through local collaboration and in balance with other interests in the community. Energy production can also contribute significantly to employment and local entrepreneurship; for example, community district heating produced using local biofuels and managed by local businesspeople. Where and how these energy sources are obtained is important for economic, ecological and social/historical reasons. In the East Vättern Scarp Landscape, the biosphere reserve organisation can serve as a neutral forum for dialogue regarding sustainable development of wind and bioenergy. Information about renewable energy and energy savings will also be generated and distributed within the proposed biosphere reserve.

14.1.9 Landscape history and ecology

The historical traces of previous land use are clearly visible in the East Vättern Scarp Landscape, because they were not erased by the rationalisation and intensification of the industries to the same degree as elsewhere. The landscape is typical of a varying southern Swedish region, with long continuity and tradition, in which the land use has been cautious and carefully adapted to the natural conditions of the bedrock, soil and topography. This natural and cultural heritage is a great resource for the community, particularly for development related to tourism, recreation and health. In order to preserve and develop this unique landscape in the long term, a landscape strategy and biological gap analyses will be developed for the area.

14.1.10 The Biosphere Centre – the future hub for theme issues and the functions of the biosphere reserve

During the biosphere reserve candidacy, efforts began to establish a Biosphere Centre in collaboration between the organisations in the East Vättern Scarp Landscape. The basic idea of the centre is for it to be a regional hub for the priority theme issues (see above) and to embrace the three functions of a biosphere reserve: conservation, development and logistic support. This would be a completely new approach in Swedish efforts regarding sustainable development. There are many buildings around the country that contain one or at most two of these functions. The East Vättern Scarp Landscape centre will combine an exhibition centre, farmers' market, tourism and experiences with offices and meeting facilities. This is described in more detail below.

Natural and cultural exhibition

Many national parks and other interesting nature areas in Sweden have visitor centres with information and exhibits, called Naturum. These play an important part in educating visitors to the area and are often professionally done. In the East Vättern Scarp Landscape, local land use forms the basis of many of the values of the landscape. The traditions and cultural expressions in the area must therefore be included in a natural and cultural exhibition, which should also create opportunities for interactivity and participation.

Farmers' market with local products

The region has long had ideas of building an indoor farmers' market to sell local food, ingredients and crafts. The Federation of Swedish Farmers (LRF) has conducted a preliminary study that shows a great potential for this in the area. The farmers' market could also be an arena for local entrepreneurs who do not have the opportunity to sell their own products individually. If producers from other biosphere reserves in Sweden and abroad are given the opportunity to sell their products at the market, this would give a very concrete impression of the international MAB network.

Tourism/experience centre

The location of the East Vättern Scarp Landscape in the middle of southern Sweden, in easy travel distance of both Gothenburg and Stockholm, and with Sweden's largest motorway nearby, creates great potential to develop the proposed biosphere reserve into a major tourist attraction. To bring visitors in and get them to stay and find the gems in the area, the various tourism companies in the area must work together. A centre for these players – which will also be an attraction and an experience on its own – increases the opportunities to further profile the East Vättern Scarp Landscape.

Offices and meeting facilities

The proposed biosphere reserve will have an office for the organisations and individuals involved in its daily work, as well as for individuals who work temporarily in the East Vättern Scarp Landscape. Allowing various organizations to work together in the same building would create a very important interdisciplinary platform that would benefit a holistic view and problem solving. If researchers and students are able to use facilities when visiting the area, this would probably enhance their interest in conducting studies and field research in the area.

14.2 If tourism is a major activity

14.2.1 - How many visitors come to the proposed Biosphere Reserve each year?

In the Municipality of Jönköping the tourism industry brings in about SEK 1.5 billion each year, of which SEK 250 million are spent solely in the Gränna-Visingsö area, which is in the northern part of the East Vättern Scarp Landscape. Because many of the visitors do not stay the night, it is difficult to give precise figures for the total number of guests in the area. One indicator is the number of people who take the ferry to Visingsö each year, which was about 200,000 in 2009.

However, the number of people travelling through the East Vättern Scarp Landscape is significantly more, as 15,000 vehicles pass the E4 European motorway each day. The motorway is problematic from the perspective of sustainability and the ecosystem (e.g. regarding emissions and noise) but it also gives the proposed biosphere reserve a unique opportunity to spread information about MAB and the local efforts.

In recent decades, traditional private travel has been expanded with extensive business travel, as Jönköping is becoming a key business hub in the country. Elmia is a giant conference facility that works with Jönköping University and all the hotels in the area to offer capacity for extensive conferences and trade fairs. The conference facility, located just outside the proposed biosphere reserve, is Sweden's third largest exhibition centre and a meeting place for international exhibitors and trade fair visitors. Among other things, Elmia arranges an annual forestry trade fair, which is a leader in Scandinavia, and every few years it arranges the world's largest forestry trade fair, Elmia Wood.

14.2.2 - Is there a trend towards increasing numbers of visitors?

(Give some figures if possible)

Tourism in the area has increased for the past several years, albeit at a varying rate. There is every reason to believe that this trend will continue, as many of the products that future visitors will demand, particularly as regards nature tourism, are found here. It will become important to renew the tourism products in the area and develop new ones that are adapted to local conditions and travellers' wishes. The great challenge will be to get tourists to stay longer than a day in the area; most only stay a day or two.

14.2.3 Types of tourism

[Study of flora and fauna, recreation, camping, hiking, sailing, horseriding, fishing, hunting, skiing etc.]

In international tourism, modern travellers are divided into four categories: DINKs (Double Income, No Kids), WHOPs (Wealthy, Healthy Older People), Active Family, and Corporate Meetings. In the proposed biosphere reserve, category three, Active Family, is the leading group. This group's wishes and requirements naturally vary, but there is a clear trend to look for more activities, often related to wildlife experiences. Another clear trend is that tourists want 'genuine' experiences, activities based on tradition and a holistic perspective on humans and the environment.

We have great opportunities to develop new products in the area based on this category, which will also interest other target groups. The region has great potential for development in areas such as fishing tourism, guided tours, ecotourism, agricultural tourism etc. and already has excellent opportunities for horseback riding, walking, cycling, boating and canoeing. Over the past year, pilgrimages have become popular in Sweden; since 2009 a pilgrimage route called the Franciscus Trail has passed through the area between Jönköping and Vadstena. These walks can be very significant for physical and mental health in the local region as well as in a broader perspective.

Sports tourism, with such activities as orienteering, riding, skiing and triathlon, are very well-established in the proposed biosphere reserve, with practitioners in several of the priority target groups. In connection with the giant annual bicycle competition Vätternrundan, some 20,000 cyclists passed through the biosphere reserve, and the number of spectators is also very large. Therapeutic tourism for people with all sorts of ailments and disabilities is another area in which the East Vättern Scarp Landscape has a well-established tradition and great potential.

It is also important to point out the importance of the area for recreation for locals and city people. Using the landscape with its lakes, forests and grazing lands for activities such as picking berries and mushrooms, fishing and hunting and getting close to nature is a part of the Swedish heritage and a key element in creating health and well-being. There are several interesting places to go bird watching in the area, such as Lake Landsjön and the Erstad Kärr and Vista Kulle Nature Reserves.

14.2.4 Tourist facilities and description of where these are located and in which zone of the proposed biosphere reserve

Tourist facilities are located in all three zones, but with different distributions. Below is a rough overview of the facilities and where they are located.

In the core areas there are several facilities that promote active outdoor recreation, such as informational signs, campfire pits, tent pitches and wind shelters, swimming jetties and walking trails. There are often car parks and informational signs at or near the nature reserves. The

Huskvarnaberget Nature Reserve, which is described as a recreational reserve, has an extensive recreational facility called IKHP, which includes a ski slope, cross-country ski trail, running, cycling and riding trails.

The buffer zone has, in addition to the facilities already mentioned, commercial accommodation such as camp sites and youth hostels. There are also several marinas, fishing spots and bird watching towers in the buffer zone.

In the transition area there are similar facilities and a relatively large range of commercial accommodation. There are a total of three camp sites with over 500 pitches; 13 hotels with over 600 beds; 7 companies that rent out a total of 75 cottages; and 5 youth hostels with 355 beds. In addition, there are many private summer homes, primarily in the areas around lakes Bunn and Ören, many of which are rented out via travel agencies in Sweden and abroad. The Transition Area also has museums and tourist offices, local community museums, farm shops, conference facilities, golf courses, a retreat centre, many beautiful churches for sightseeing and for worship etc.

A system of roads for horseback riding and horse-drawn carriages is being developed, which will go through large parts of the proposed biosphere reserve and to all of its zones. The primary goal of this road network is to enhance opportunities for tourism and help people get close to nature, to benefit the rural areas and rural businesses, and to secure natural values while preventing conflicts. Shorter pilgrimage routes with special adaptations for the disabled are also being constructed in Hakarp. In the future, this trail can be developed and connected to the Franciscus Trail (see above).

Throughout the proposed biosphere reserve are large number of highly popular tourist attractions by Swedish standards. Many of these are linked to the interesting history of the region. The unique countryside is of course also an important ingredient in the marketing material used to attract visitors to the area. Particularly in the summer there is a wide range of events, from special guided tours in nature reserves to music events that draw national attention.

14.2.5 Indicate positive and/or negative impacts of tourism at present or foreseen

According to many studies, the service sector has the best prospects for expansion in the future. The experience industry, which includes tourism, is one of the sectors in these contexts that is seen as having greatest potential. The advantage of tourism is that by definition it is produced and consumed locally. You could never move the experience of a sunset over Lake Vättern to another place in the world – a sunset, by the way, that Mark Twain described as one of the most beautiful on earth. Therefore, increased tourism in the East Vättern Scarp Landscape means increased employment in existing and new fields of operation. It also has indirect effects on the local population. The number of community services increases – more shops, restaurants and cafés, for example, giving all residents access to a selection that would not normally be possible outside a metropolitan area. Good local services increase the attractiveness of moving to the area. This triggers a positive spiral in which various events are not only dependent on one another, but their combination spurs development.

Increased tourism can also have negative effects, if the increase is uncontrolled. Preserving sensitive cultural and natural environments must therefore go hand-in-hand with the goal of increasing the number of visitors to the area. Changes in roads, buildings and commercial facilities, as well as the development of new activities, must therefore occur in close dialogue with the local population and organisations, to prevent future conflicts. The working method that has

been pursued up to now in the proposed biosphere reserve ensures that this will occur in a constructive, successful way.

14.3 Benefits of economic activities to local people

[Indicate for the activities described above whether the local communities derive any income or benefit directly or indirectly from the site proposed as a Biosphere Reserve and through what mechanism]

14.3.1 Employment and development in land-based industries

Employment

In the past fifty years, the number of agricultural companies in the East Vättern Scarp Landscape has dropped dramatically. In 1975 there were 300 agricultural companies in Gränna, Ölmostad and Skärstad. That number has been halved in the last thirty years, which changes the conditions for rural development here. In the Municipality of Jönköping, green industries represent about 9% of the GDP. Active agriculture and forestry are the foundation of a living countryside, but other production is of growing importance. Many rural properties are managed part-time or on the owner's leisure time, which has limited the negative effects of reduced profitability. Heritage lands are managed traditionally with hay making and grazing, and forestry in the area has to some degree a different focus than just rational production of timber. Forest management, logging and forest protection, combined with general and/or enhanced consideration, are continuously developing. Similarly, agriculture is going through a restructuring and streamlining with the aim of boosting profits for local businesses.

Thanks to the EU's agri-environmental payments, many farms are financially dependent on taking good care of biological and cultural values. Production of goods alone rarely produces sufficient profitability, so farmers have become 'producers of landscapes and non-monetary values'. Many supporting activities are pursued these days based on farms, such as farming services, tourism, equestrian activities, contracting and small-scale food processing. The Federation of Swedish Farmers (LRF) works on the regional level dealing with business policy, business development etc. Its local divisions arrange various joint activities and study visits.

Development of new technology and new methods of collaboration

The collective skills in the proposed biosphere reserve offer excellent opportunities to be at the cutting edge of new technology that can contribute to preserving bio-cultural heritage, creating sustainable solutions to global problems etc. One example of many is the trial efforts to restore old pastures and pollarded trees using harvesters with accumulation units. By examining forest economy in the form of bioenergy yield and its effects on biodiversity, experts have been able to test and recommend new technology.

Management of policy and policy instruments

The proposed biosphere reserve offers many opportunities to influence national policy and regulations that affect local businesspeople in above all the land-based industries. The collaboration that has developed between private, public and non-profit organisations, as well as the (geographical and thematic) proximity to the Swedish Forest Agency and the Swedish Board of Agriculture, is a great advantage in this effort. Because a biosphere reserve is viewed as a landscape laboratory for sustainable development, such aspects as new economic policy instruments can be tested and discussed here between the local and national level. That way, policies can be adjusted and adapted to the needs of local companies.

Accessible and attractive

Some 126,000 people live in the municipality of Jönköping, of whom about 57,000 live in the actual city. Jönköping is the county town of the County of Jönköping and an administrative

centre in the region, home to national authorities such as the County Administrative Board, the Swedish Board of Agriculture, the Swedish Forest Agency and the National Courts Administration. Thanks to its strategic location, the Municipality of Jönköping has developed into a logistical centre for the Nordic region. The E4 European motorway, which stretches between Stockholm, Jönköping, Copenhagen and Hamburg, is one of the most important transport routes in northern Europe. Every day, an average of 15,000 vehicles pass through the East Vättern Scarp Landscape on the E4. This offers a great opportunity to spread information and develop tourism in the area, for example by setting up signs indicating the biosphere reserve. At the same time, the E4 has a negative environmental impact for the surrounding landscape and is a problem for nearby rural communities when the traffic is rerouted due to road work or traffic accidents. The old Riksettan highway, which runs parallel to the E4 and is marked with a brown tourist-route sign, has high historical value – it was a part of the ‘Eriksgatan’ route that newly crowned kings travelled through the country visiting important provinces – and aesthetic value, as it winds its way through the lovely natural and agricultural setting of the East Vättern Scarp Landscape. An increased focus on the tourist route would be an easy way to give travellers a quick view of what the proposed biosphere reserve has to offer.

City and country within easy reach

The location of the East Vättern Scarp Landscape in the middle of southern Sweden, right next to the city of Jönköping, creates special opportunities for housing and employment. The close interaction between the built-up areas (especially Jönköping) and the surrounding countryside is significant for the area. The geographical proximity of the city means that there is great demand for rural housing within an easy commute to the city, and that natural environments near the population centre are used frequently.

Having access to recreation nearby has proven to be very beneficial to public health. Natural environments near population centres serve a key purpose, as do planning and maintenance of the experience value of such areas. There is great growth potential in the East Vättern Scarp Landscape, particularly in terms of improved accessibility and information, as well as the development of various types of agreements with private landowners who own such environments. There are also good opportunities for entrepreneurs to develop businesses in which students, care service users, people suffering from burnout, elderly people etc. can gain access to learning, habitation therapy and recreational natural and farm environments.

The proximity to a major population centre is also a key reason that the area has been relatively spared from many problems that are otherwise common in the Swedish countryside (such as unemployment and depopulation). The extensive amount of commuting and relatively short distance from the rural to urban areas is crucial here. Many small farms have been able to survive as part-time occupations for people who work in industries in the urban areas. In the long term, there are good opportunities to sell local products in the area. This will mean that smaller rural businesses can be kept running and that small farms can be traditionally managed. However, it may also mean that the incentive to develop new businesses in the East Vättern Scarp Landscape may be lower than in more peripheral areas.

According to the latest assessment for taxes on real property, there are just over 3,300 summer homes in the Gränna-Visingsö area alone. The province of Småland, which is the region to which the East Vättern Scarp Landscape belongs, is a known brand in countries such as Denmark and Germany. Thus, many summer homes are owned by people from those countries. A large number of old crofts and country properties are occupied in the summer, which contributes to local development and the local economy.

14.3.2 Ecosystem services

Within the proposed biosphere reserve, ecosystem services will be generated that will contribute to maintaining important functions of society and people's well-being. Many of the area's ecosystem services also form a foundation for entrepreneurship. Increasing awareness and use of the tool and concept of ecosystem services is a priority on the global, national and local levels. One goal of the Swedish MAB committee is to "stimulate research that enhances the role of the biosphere reserve in teaching about sustainable use of ecosystem services". A new Swedish research project called Multifunctional Agriculture: Harnessing Biodiversity for Sustaining Agricultural Production and Ecosystem Services uses the East Vättern Scarp Landscape as a case study area for investigating agriculture, its policy instruments and administration, and the consequences for biodiversity and ecosystem services. Examples of the ecosystem services we work with in the proposed biosphere reserve are briefly described below for their various categories:

Supporting services

Supporting ecosystem services are a basis for other ecosystem services to work properly. Examples of this are water and nutrient cycles. Cross-sector work based on the landscape or the drainage basin enhances opportunities to preserve and develop the major processes and cycles in the ecosystems. Because the East Vättern Scarp Landscape works with the Water Conservation Association (Vattenvårdsförbundet) and its Water Council for Lake Vättern within the framework of the EU Water Framework Directive, the East Vättern Scarp Landscape contributes indirectly to maintaining this service.

Regulating services

The regulating services are somewhat more specific and cover such things as air and water purification and pollination. Instituting wetlands and nutrient traps in both agriculture and forestry in the East Vättern Scarp Landscape will benefit water purification in the area. The water project that started during the biosphere reserve candidacy aims to enhance biodiversity and water purification. Pollination is an extremely vital and sensitive ecosystem service for the local population, not least for the fruit and berry growers in the region. The area's beekeepers are vital people in the region and should be encouraged in the future through the biosphere reserve efforts. On Visingsö Island, the ligustica breed of bees is being systematically bred with the aim of creating strong, vital bee colonies. In addition to this, the work with the East Vättern Scarp Landscape has contributed to improved pollination through strenuous efforts to ensure the preservation of key species and key structures of pollinating insects. One specific example is goat willow (*Salix caprea*), as well as other blooming trees and bushes, and hollow trees such as pollarded trees in which hornets (*Vespa crabro*) are often found.

Productive services

The ecosystems produce many raw materials that can be used for food, medicine, construction material, fuel, fodder etc. Some ecosystems and species are more important than others depending on the industry, but we cannot know which parts of biodiversity will be important in a future, changing society. The East Vättern Scarp Landscape has always focused on traditional land use and utilization of natural resources. This is in part because the agrarian society of the past had a very detailed local knowledge of the biological resources available and what species could be used for what. This knowledge may be invaluable in the future, for example, in order to adapt to a warmer climate or to cure new diseases. In this context, the oak plantations established on Visingsö Island in the 19th century are very interesting. Chapter 13.3 describes some of the species and varieties that are of cultural or economic importance.

Cultural services

The designation cultural services includes everything we use for more emotional well-being – such as beautiful views and relaxing forest paths. It also includes the historical, spiritual and scientific information in the landscape. Since the historical traces of multiple eras in time are clearly visible in the East Vättern Scarp Landscape, the cultural services are very important to the region. The economic value of this particular aspect has been calculated for certain individual environments. The Swedish Board of Agriculture asked Jönköping University to analyse properties that have been sold in the municipality in the past 30 years and study how far they are from meadow and grazing lands. The study showed that properties located near a meadow or grazing lands (closer than 500 m) cost about SEK 30,000-40,000 more than properties that have a greater distance to grasslands. This means that all the efforts to restore and maintain areas such as natural wooded grazing lands in the proposed biosphere reserve do benefit individual landowners. In addition, these measures likely have a great effect on the health of locals and visitors. Projects have been conceived about enhancing both knowledge about and use of health-promoting effects of the countryside in the proposed biosphere reserve.

15 LOGISTIC SUPPORT FUNCTION

15.1 Research and monitoring

15.1.1 To what extent has the past and planned research and monitoring programme been designed to address specific management questions in the potential biosphere reserve?

(For example, to identify areas needing strict protection as core areas, or to determine causes of and means to halt soil erosion, etc.)

The East Vättern Scarp Landscape is a well-documented area, where specific species and habitat surveys have been conducted since the 1980s. This knowledge has been valuable for creating a common basis for planning, for example for area protection. The most important document for this task is a countywide strategy for formal protection of forests, which was created in collaboration between various special-interest organisations and delineates clear priorities among valuable forest areas. See also Chapter 17.4.

Compared with other parts of the county, and the country at large, both formal and voluntary protection measures in the East Vättern Scarp Landscape have come a long way. However, it is uncertain how far these areas go towards preserving the biodiversity we have in the region. That is why an extensive biological gap analysis has begun, to investigate the functionality of the entire landscape based on the quality and quantity of the protected areas and their surrounding lands (or in other words, the core areas, buffer zone and transition area). By analysing the habitat requirements and extinction thresholds of existing species we will be able to formulate concrete needs and measures with biological relevance and communicate them to various players. In simple terms, the task can be described as: “how much of what is needed where?” Some examples of needs can be a wider surface area of certain habitats or greater access to substrates such as deadwood, sunny shrubby environments or large, hollow trees. This analysis will be pioneering in Sweden and is being conducted in collaboration with the Lake Vänern Archipelago and Mount Kinnekulle biosphere reserve.

The biological gap analysis will be a scientific cornerstone of the overall ‘landscape strategy’, which will expand the analysis with cultural, historical and economic aspects as well. In this later phase the proposed biosphere reserve plays a key role in coordinating and conveying research results. In dialogue with the various players in the landscape, we can then conduct cost-effective and scientifically well-grounded measures. This methods development is funded by the Swedish

Environmental Protection Agency, which expects to be able to conduct gap analyses in more biological value regions in Sweden. A research strategy will also be developed at the same time as this landscape strategy (See Chapter 15.1.4).

The core areas in the East Vättern Scarp Landscape are a part of the monitoring or survey programme in accordance with applicable guidelines. Carefully developed management and conservation plans have been established for these areas under legal protection. The County Administrative Board and the Swedish Forest Agency monitor the areas and ensure that suitable measures are taken as necessary so that the protected natural values are not disfavoured.

For many of the valuable lands in the buffer and transition areas, for example wooded grazing lands, the Swedish Rural Development Programme has a specially developed monitoring procedure. To examine the effects of agri-environmental payments on biodiversity, a study of changes in valuable wooded pastureland has been initiated through the East Vättern Scarp Landscape.

Much of the care of forested lands in the area is regulated by forestry plans and some form of forest certification (PEFC and/or FSC). To develop these plans, which are specific to a given property, the East Vättern Scarp Landscape has developed a concept of sub-landscapes, in which the plan can be logically linked to values in the landscape. In addition, the East Vättern Scarp Landscape has a unique planning product called a Combo Plan, which includes planning for both agricultural and forestry values. This will minimise any gaps in care between the different types of land use.

Many of the declining species and substrates in the landscape are not directly linked to formally protected areas. For this reason, the Swedish Environmental Protection Agency with the assistance of the County Administrative Board is implementing action plans for threatened species. For several of these action plans (e.g. for trees worthy of protection in the agricultural landscape), the East Vättern Scarp Landscape has conducted surveys and developed a specific basis for decision linking together various stakeholders in order to conduct practical stewardship measures. The foundation of the action plan for trees worthy of protection was laid back in 2000 when the entire population of large, biologically valuable trees in the East Vättern Scarp Landscape was mapped out. In 2007 an additional survey of trees used for pollarding was conducted.

For stewardship measures linked primarily to water in the landscape and Lake Vättern, the Water Conservation Association (Vattenvårdsförbundet) has long had advanced research and monitoring programmes, including monitoring water quality and fish reproduction. The East Vättern Scarp Landscape works with the Water Conservation Association, which has extensive expertise in the area. In the current water project, the East Vättern Scarp Landscape contributes knowledge and gives the Association access to the already established network of users and practitioners.

The efforts to establish a water theme began with concrete measures such as developing demonstration farms for testing and showcasing a new 'blue' goal classification (which addresses the values of water on the property), reviewing the status of water in protected areas and compiling existing knowledge about various organisations. One of Sweden's leading researchers with a focus on forest limnic environments is involved in this project.

The East Vättern Scarp Landscape aims to get more stakeholders involved in creating stewardship plans and methods in the core areas, buffer zone and transition area. Our ambition is

that the proposed biosphere reserve will develop the East Vättern Scarp Landscape into an internationally leading example of how to weave together many different special interest groups with diverse knowledge when developing a plan for landscape care. This work will result in a landscape and research strategy (see Chapter 15.1.4).

15.1.2 Brief description of past research and/or monitoring activities

[Indicate the dates of these activities and extent to which the research and monitoring programmes are of local/ national importance and/ or of international importance.]

Abiotic research and monitoring

[climatology, hydrology, geomorphology etc.]

Abiotic research has been conducted for a long time in the proposed biosphere reserve, linked to the interesting geological and glacial history of the area as well as to Lake Vättern. This research and environmental monitoring is of international importance and scientific articles have been published as far back as the 1980s. See the list of activities in Annex 15.

Extensive, internationally important, abiotic environmental monitoring of Lake Vättern in particular has been conducted for a long time. The Committee for Water Conservation in Lake Vättern was founded in 1957 with the goal of preserving the unique characteristics of the Lake and coordinating measures, monitoring programmes and research in and around Lake Vättern. In 1989 the organisation restructured under the name Water Conservation Association (Vattenvårdsförbundet). Since then it has continued the monitoring programme and monitors various interests in and around Lake Vättern. The County Administrative Board and the Swedish Forest Agency have long had the nationally important task of coordinating abiotic environmental monitoring linked to the agricultural and forest landscapes.

Biotic research and monitoring

[flora, fauna etc.]

Biotic research in the proposed biosphere reserve has increased dramatically in the past decade. Student papers and the research conducted in the area are primarily of local/national importance.

Biotic monitoring has been extensive in the county and in the proposed biosphere reserve and is clearly of national importance (see next chapter). Many activities have been conducted since the 1980s. See the list of activities in Annex 15.

Socio-economic research and monitoring

[demographics, economics, traditional knowledge etc.]

Socio-economic research has been conducted in the area for a long time, related to the great historical and cultural values of the area – especially Visingsö Island. This research is of national and international importance. In addition, significant research about land history and land use has been conducted since the 1990s. Students have conducted research projects in recent years about social interaction and environmental communication in the East Vättern Scarp Landscape.

The local municipalities have conducted extensive monitoring of changes in the local economy, employment and demographics, for a very long time. Since 1969 the Municipality of Jönköping has published annual statistics on the municipality and municipal operations. See the list of activities in Annex 15.

15.1.3 Brief description of ongoing research and/or monitoring activities

Abiotic research and monitoring

[climatology, hydrology, geomorphology etc.]

Within the proposed biosphere reserve, Grenna Museum has extensive activities teaching about current climate and environmental research. In particular, lectures on current research in the polar regions are an important part of the museum's operations.

Environmental monitoring is ongoing on the national and regional levels with a focus on weather, air and water quality, environmental toxins etc. The Water Conservation Association is responsible for environmental monitoring of Lake Vättern. In addition, the County Administrative Board of Jönköping has the regional task of collecting data for programme areas that deal with air quality, coordination of measures regarding environmental toxins, health and the urban environment. This environmental monitoring is a part of a regional environmental monitoring programme for 2009-2014. See the list of activities in Annex 15.

Biotic research and monitoring

[flora, fauna etc.]

Some biotic research of national interest is under way in or close to the proposed biosphere reserve. For example, the University of Gothenburg is conducting research into the management of oak woodlands.

Environmental monitoring of national importance is being carried out for a large number of habitats and species. The County Administrative Board of Jönköping has the regional task of collecting data for programme areas that deal with agricultural land, forest land, wetlands, freshwater and the landscape. This environmental monitoring is a part of a regional environmental monitoring programme for 2009-2014. See the list of activities in Annex 15.

Socio-economic research and monitoring

[demographics, economics, traditional knowledge etc.]

The International Business School at Jönköping University has a research unit investigating Rural Entrepreneurship and Growth, RUREG. The goal of this research programme is to be a leading international centre focusing on entrepreneurship and innovation in four areas: business ownership, social commitment, policy and management, and academic knowledge. The expertise and research focus of the university, combined with the nearby biosphere reserve, its focus and networks, offer an opportunity for constructive collaboration and future research projects.

On-going socio-economic research of national importance is also being conducted regarding the history of Visingsö Island and Lake Vättern. Above all, the County Museum of Jönköping – located in the city of Jönköping just outside the proposed biosphere reserve – contains a lot of archaeological research and studies in the county and in the East Vättern Scarp Landscape.

For the past two years, doctoral student Kristina Börebäck has been monitoring the development of the East Vättern Scarp Landscape biosphere reserve from the perspective of environmental communications. The purpose of this case study is to observe knowledge-based processes dealing with the cornerstone of the biosphere reserve – sustainable development – and the change processes that occur in meetings and among the participants in the study. The study is a part of a doctoral thesis project at the Stockholm University Department of Education. As a doctoral student, Christina is also associated with Uppsala and the Centre for Sustainable Development

and the Centre for Environment and Development Studies, CEMUS. Monitoring the development of the proposed biosphere reserve is a longitudinal case study stretching from June 2009 to September 2011. The thesis is expected to be completed in October 2013.

On-going socio-economic monitoring is conducted by the municipalities, which annually assess employment, economy and demographics. The annual statistics for the Municipality of Jönköping are available online and in printed form with an English summary. See the list of activities in Annex 15.

15.1.4 Brief description of planned research and/or monitoring activities

As mentioned above, the East Vättern Scarp Landscape plans to develop a landscape strategy for the entire proposed biosphere reserve, weaving together the biological, socio-cultural and economic values into a whole. The aim of the landscape strategy is to carry it out in close collaboration with universities and institutes of higher learning on the one side, and local stakeholders such as landowners, associations and authorities on the other.

A research strategy will also be developed at the same time as this landscape strategy. The research strategy will describe how the East Vättern Scarp Landscape can contribute to bridging the gap between research and implementation/policy formulation as well as enhancing understanding and creating feedback mechanisms for practitioners. It will identify and specify key local and regional knowledge gaps and forms for strategic collaboration with universities and other institutes of higher learning.

Several of the planned research projects overlap with the division into abiotic, biotic and socio-economic, which was a conscious choice as a holistic view and interdisciplinary measures are a top priority. The Biosphere Candidate Office also works to create contacts and initiate research measures related to the theme issues and theme landscapes of the East Vättern Scarp Landscape (see Chapter 14.1).

The results of this research will be summarised and communicated at regular intervals through workshops, seminars and popular science articles, brochures etc. The clear focus of all of this is that the results will be clearly reflected in the landscape.

Abiotic research and monitoring

[climatology, hydrology, geomorphology etc.]

At the time of writing, we are not aware of any plans for abiotic research. Abiotic research and monitoring regarding Lake Vättern is planned and conducted by the Water Conservation Association.

Biotic research and monitoring [flora, fauna etc.]

The East Vättern Scarp Landscape will be used as a case study in a planned research project about biodiversity and ecosystem services linked to forest grazing lands and how they are used. Other countries involved in the project are Germany, Spain and Romania. The Swedish part of the project is a collaborative effort between the University of Gothenburg and Stockholm University with the support of Formas and the Swedish Environmental Protection Agency. Funding has yet to be approved.

The Swedish Biodiversity Centre (CBM) has plans for a research project to develop methods for documenting bio-cultural heritage. The East Vättern Scarp Landscape will serve as one of the most important case study areas in the project.

Socio-economic research and monitoring

[demographics, economics, traditional knowledge etc.]

In the coming five years, a planned research project entitled SAPES (Multifunctional agriculture: using biodiversity to maintain agricultural production and ecosystem services) will use the East Vättern Scarp Landscape as a case study area. The project is a collaboration between Lund University, the Swedish University of Agricultural Sciences in Uppsala (SLU) and Stockholm University. The overall objective is to be able to evaluate the consequences of various policy instruments and administrative systems for developing sustainable agriculture that secures biodiversity and related ecosystem services as assets to the community. The approach is interdisciplinary and based on knowledge of ecological and socio-economic processes from farm to region. The purpose is to integrate the entire chain of policy – land use – biodiversity – ecosystem services.

There are also plans for socio-economic research in archaeology and the value of historical relics.

Socio-economic monitoring is being planned through the municipalities in the area. During the biosphere candidacy, the need for specific monitoring of tourism development in the proposed biosphere reserve has been noted. The Municipality of Jönköping plans to do this in the coming year. See the list of activities in Annex 15.

15.1.5 Estimated number of national scientists participating in research within the proposed biosphere reserve on

- a permanent basis: 1
- a part-time basis: 3

15.1.6 Estimated number of foreign scientists participating in research within the proposed biosphere reserve on

- a permanent basis: 0
- a part-time basis: 0

15.1.7 Estimated number of masters and/or doctoral theses carried out on the proposed biosphere reserve each year:

2

15.1.8 Research station(s) within the proposed biosphere reserve:

[2] = permanent [0] = temporary

Within the proposed biosphere reserve, Grenna Museum has extensive activities teaching about current climate and environmental research. Lake Landsjön has a field station for activities such as bird watching and ringing. The stakeholders are also discussing connecting a research station to the future biosphere centre featuring all three functions of the MAB concept. See more in Chapter 14.1.

15.1.9 Permanent research station(s) outside the proposed Biosphere Reserve:

[If no permanent research station exists within the proposed Biosphere Reserve, indicate the location, distance to the core area, name and address of the most relevant research station]

Jönköping University
www.hj.se
Box 1026
551 11 JÖNKÖPING
SWEDEN

Jönköping University is about 7 km west of the biosphere reserve and its core areas.

15.1.10 Permanent monitoring plots

[Indicate the year established, the objective of monitoring, the type and frequency of observations and measurements, and whether an internationally recognized protocol is being used, for example the Smithsonian-MLAB MAPMON protocol for monitoring forest biodiversity]:

The Swedish Forest Agency has a permanent national monitoring plot in the East Vättern Scarp Landscape. These plots have been established since 1995 and are used to monitor how the forest is affected by various environmental factors and pests. Measures include: tree vitality (annually), leaf/needle chemistry (every two years), tree growth (every five years), groundwater chemistry (every four months) and atmospheric deposition and air quality (every month).

One sample area in the proposed biosphere reserve is a part of the Crown Drip Measurement Network, which was officially established in 1995 although the first measurements began ten years earlier. The purpose of the Crown Drip Measurement Network is to describe the forest's status, regional differences, development over time and the effects of acid rain. In addition to measurements of precipitation, the network also analyses samples of groundwater chemistry and air content. Samples are taken at regular intervals throughout the year, each month or quarterly and an annual average is calculated. The methods and measures are taken from the EU manuals for environmental monitoring.

The National Inventory of Landscapes in Sweden (NILS) is a monitoring programme that since 2003 has two permanent landscapes that are surveyed every five years in the East Vättern Scarp Landscape. The purpose is to map out biodiversity from a landscape perspective and to study changes over time. The survey focuses primarily on conditions for biodiversity and impact factors. A particular focus is on status and changes in land use and ground cover as well as the size and distribution of various habitats in the landscape.

Municipalities and the Swedish Environmental Research Institute (IVL) work together to measure air pollution in cities via the URBAN network. The method is designed to make it possible for Swedish municipalities to evaluate and describe air quality in urban areas. Measurements have been conducted since 1986 with the participation of about 40 municipalities annually. Within the proposed biosphere reserve, the city of Huskvarna has participated in the measurements.

15.1.11 Research facilities of research station(s)

[meteorological and/or hydrological stations, experimental plots, laboratory, computerized databases, Geographical Information System, library, vehicles, etc.]

The County Administrative Board, the Swedish Forest Agency and the municipalities have extensive GIS systems and GIS databases on a number of social sectors and completed nature surveys. The authorities also have a great deal of relevant literature about the area. Both the County Administrative Board and the municipality have access to official cars.

15.1.12 Other facilities

[e.g. facilities for lodging or for overnight accommodation for scientists, etc.]

Currently there are no specific facilities for overnight accommodation for guest scientists. However there is a large range of alternatives at hotels and youth hostels both in and near the biosphere reserve.

15.1.13 Does the proposed biosphere reserve have an Internet connection?

Yes, broadband connections are available at all participating organisations.

15.2 Environmental education and public awareness

[Environmental education – sometimes now referred to as education for sustainable development – can be aimed at schoolchildren, the adult population of the local communities, and visitors from home and abroad]

15.2.1 Describe environmental education and public awareness activities, indicating the target group(s):

There are many examples of environmental education and community information activities in the proposed biosphere reserve, for example through the environmental work of various businesses, agricultural and forestry organisations (such as LRF and the Conservation Society) and through lectures and excursions conducted by non-profit organisations and study associations (the Swedish Society for Nature Conservation, Gränna Skogsgrupp, the botanical Society etc.) for their members and the general public. A large portion of environmental education activities are provided by the authorities (such as the Municipality of Jönköping, the Swedish Forest Agency and the County Administrative Board of Jönköping) as well as various educational associations. Some examples of these activities are:

Guided nature walks for the general public are arranged by the County Administrative Board, the Municipality of Jönköping, the Swedish Society for Nature Conservation, the Botanical Society, the southern Lake Vättern mushroom club and others, with excursions to various natural areas (e.g. nature reserves or bird lakes) or focusing on specific species groups (e.g. bats or fungi). In addition, the Swedish Forest Agency annually arranges Forest Day, where everyone can learn about how the forest can be used as a multifaceted resource. Both guided nature walks and Forest Days have been arranged in the East Vättern Scarp Landscape on several occasions. Several events linked to the East Vättern Scarp Landscape are now organised each year. The Swedish Outdoor Association, scout corps and so on also frequently use the East Vättern Scarp Landscape in their activities.

The School of Education and Communication at Jönköping University works from a ‘sustainable development’ platform based on the concept of contributing to expanding and disseminating knowledge in Education for Sustainable Development (ESD). ESD developed out of an awareness that the education in the industrialised world needs reorientation. In collaboration with the Keep Sweden Tidy foundation and the Municipality of Jönköping, a project began in spring 2010 to train staff at pre-schools and compulsory schools over the next several years in the Green Flag (Eco-Schools) activity. In collaboration with the Municipality of Jönköping, the School of Education and Communication is also offering a course in 2010-2011 for upper-secondary teachers called ‘Education for Sustainable Development and Action Competence’.

A large number of pupils and students are taught each year at the compulsory schools, vocational schools and post-secondary schools both in and near the proposed biosphere reserve. Some of the pre-schools in the area are part of the Green Flag project, which means that they work actively with the environment in schools following a specific model. The Eco-Bus (see below)

teaches many students annually about biology and nature conservation in the East Vättern Scarp Landscape.

For companies wishing to obtain environmental certification, informational activities and environmental training courses are held in which the companies can learn more about how they can work actively with environmental issues in a structured manner. This is coordinated by the Municipality of Jönköping and carried out by a consulting firm.

15.2.2 Indicate facilities for environmental education and public awareness activities

[visitors' centre; interpretative programmes for visitors and tourists; nature trails; ecomuseum demonstration projects on sustainable use of natural resources]

Demonstration areas

One of the most powerful tools for creating interest in and increasing awareness about sustainable development, such as the management of valuable natural areas, is setting a good example. For this reason, the East Vättern Scarp Landscape project has specific demonstration areas, which aim to highlight good collaboration and its results in a few small areas to generate attention and interest from the local community. The idea of these areas is to serve as i) visiting areas for the general public, ii) outdoor classrooms for education and instruction and iii) outdoor laboratories for research and methods development. You can visit three types of demo areas around the East Vättern Scarp Landscape: pollarding, giant trees and forest grazing lands. Several other categories of demo areas – for example for the care of natural environments near population centres and consideration of valuable waters – have been discussed and are being developed. Today there are nine areas, each of them unique and requiring their own solutions for restoration and care.

School forests

There is a wide range of outdoor educational activities in the proposed biosphere reserve. Instructors work actively with recreational activities as well as thematic and traditional outdoor instruction. There are four registered school forests: at the Solstrålen Pre-school, the Kumlabý School, the Landsjö School on Visingsö and the Tenhult School. A school forest is a limited forest area utilised by a school. Theory is alternated with practice, often based on nature's terms. The Municipality of Jönköping has committed to work actively with school forests. A school and a landowner establish a written agreement in which the school is entitled to do a little bit more than what the general right of public access allows in order to create a working learning environment. Many other local pre-schools and schools also use nearby wetland areas and open lands for environmental education and recreation. In closing, it should also be mentioned that there is a model school in the area, Ribbaskolan in Gränna. This school investigates how teachers can improve students' results through continuing education and research. The project is headed by the School of Education and Communication in Jönköping. Expanding the common view of learning opportunities creates great potential for collaboration.

Tenhult upper-secondary school with a focus on natural resources

The upper-secondary school in Tenhult is one of about 50 in Sweden that focus on natural resources. With about 260 students and 65 staff members, the school offers vocational courses in equestrian activities, veterinary nursing, gardening and agriculture. The school and its lands have been operated organically since 1997 and bear the Swedish KRAV eco-label.

The Eco-Bus

Since 1992, the Municipality of Jönköping has operated a nature school on wheels, the Eco-Bus. The bus has equipment for advanced measurements and examination of animals and plants, but also provides personal equipment such as boots and raingear. Its operations are mainly geared towards day trips for older compulsory school and upper-secondary school students under the tutelage of trained, dedicated staff. Over the years, some 25,000 students have spent a day on the Eco-Bus, whose staff are all active in the East Vättern Scarp Landscape and Gränna Skogsgrupp. Many excursions take place in the proposed biosphere reserve. Course themes vary, but are based on experiences and comparative studies. Students compare different habitats and landscapes and how humans impact them. Broadleaf deciduous forests, coniferous forests and untouched forests are a recurring theme. Lakes and waterways are compared as regards acidic and base waters, or eutrophic versus oligotrophic environments. Land use history and biodiversity in different environments such as meadows, fields and grazed woodlands are also studied. Practical nature conservation in the form of felling of spruce plantations and filling in old ditches in nature reserves are regularly recurring measures. These operations have been evaluated in a masters' thesis in outdoor educational activities at the Institution of Aesthetics at Linköping University.

Local history societies

The voluntary local history society movement is a vital resource for the preservation of cultural heritage and for maintaining a living rural community in the area. The old parishes and their local community museums are still a vital precondition for country life. Many buildings that were falling down out in the countryside have been moved to local community museums and restored to their original condition to show how people lived in the olden days. In addition, there are significant collections of old agricultural tools and household utility items used by previous generations. Local history societies also carry out valuable documentation of life in the old days, for example by surveying old crofts, and publish magazines and books, as well as arranging study circles and tours of old crofts.

Grenna Museum and Open-Air Museum

The Grenna Museum contains very interesting historical information and a rich collection of objects. In 2004 Gränna Skogsgrupp, in collaboration with the County Administrative Board, created a permanent exhibition at the Grenna Museum about the Vättern Scarps. The Grännaberget Open-Air Museum is located just above Gränna. The museum's activity started back in 1912, and was soon expanded with more and more buildings in the area based on the Skansen model. Buildings, objects and the land area together are an important historical documentation of how the landscape has been used through time.

Husqvarna Factory Museum

In Huskvarna there is a unique collection of objects from the Husqvarna Factory. For more than 300 years, this company has been extremely multi-faceted and continuously develop new fields of production. This flexibility is particularly interesting from a sustainability perspective, as it has led to economic resilience in what was then the expanding factory town of Huskvarna. See more in Chapter 14.

Informational signs and the Internet

A large number of informational signs are posted in nature reserves and along the E4 European motorway in the area, describing the character and assets of the area. A website for the East Vättern Scarp Landscape (www.ostravatterbranterna.se) has been created to collect much of the

information about the area in one place. Information in English and other languages is being developed.

Walking trails

There are many walking trails in the East Vättern Scarp Landscape that visitors can explore on foot. The two longest ones – the John Bauer Trail and the Holavedsleden Trail – go through almost the entire proposed biosphere reserve. In addition to these, there are shorter trails at Gränna and Huskvarna and on Visingsö. A few years ago, an association was founded with the purpose of establishing a pilgrimage route between Jönköping and Alvastra. This means that the envisaged trail will follow the core areas along the entire proposed biosphere reserve, linking together the East Vättern Scarp Landscape between counties. It also unites Sweden with the continent through a network of pilgrimage routes in Europe.

Biosphere centre

In addition to the above existing resources, the participating organisations are also discussing opening a Biosphere Centre, which will be a hub of education and information in the area. There are plans for a natural and cultural exhibition focusing on the bio-cultural heritage preserved in traditional landscape use. For more information, see Chapter 14.1.

15.3 Specialist training

[Acquisition of professional skills by managers, university students, decision-makers, etc.]

[Describe specialist training activities: for example research projects for students; professional training and workshops for scientists; professional training and workshops for resource managers and planners; extension services to local people; training for staff in protected area management]

15.3.1 Workshops for researchers and practitioners

Within the East Vättern Scarp Landscape region, several workshops and conferences have been arranged in recent years to provide information to research and its users. In 2003 the Swedish Biodiversity Centre (CBM) held its Diversity Conference in the East Vättern Scarp Landscape with the theme ‘from environmental objectives to action in nature conservation’. In 2007 a workshop entitled ‘Bridges between Sustainable Landscapes’ was held in the East Vättern Scarp Landscape. The goal was to bring together researchers and practitioners who work with various landscape initiatives in Sweden (such as biosphere reserves, model forests, Sveaskog’s Ekoparks and the County Administrative Board’s landscape strategies). In 2009 the biosphere reserve candidate arranged a workshop for researchers and a seminar for the public on nature tourism: ‘Guldbaggar, drakguld och guldfiskar – tälja guld i naturen’ [Golden chanterelles, golden plover and goldfish – spinning nature tourism into gold]. For researchers and practitioners interested in the status and management of Lake Vättern, the Water Conservation Association arranges Lake Vättern Day. In 2009 it was held in the East Vättern Scarp Landscape with a themes involving collaboration. In previous years, the Gränna Skogsgrupp has brought together many interesting lecturers (researchers and others) with very small means for a number of ‘Gränna seminars’ focusing on nature conservation and biodiversity with a range of themes.

15.3.2 Activities for students

Through contacts with the universities in Stockholm, Gothenburg and others (such as the Ranger Programme and the DaCapo conservation school) and the Swedish University of Agricultural Sciences in Uppsala (SLU), several student projects have taken place in the East Vättern Scarp Landscape. The students have also received guidance and access to a wide network in the East Vättern Scarp Landscape. The results have been disseminated locally and posted on the East Vättern Scarp Landscape website. Several universities and other institutes of higher learning have also used the skills in the East Vättern Scarp Landscape to hire lecturers for courses. Many institutes of higher learning also use the area for construction.

15.3.3 Excursions and presentations for decision-makers and officials

The geographical location of the East Vättern Scarp Landscape, close to many national and regional authorities such as the Swedish Board of Agriculture, the Swedish Forest Agency and the County Administrative Board, is highly advantageous for spreading information and influencing policy. Many officials and decision-makers from these and other authorities visit the East Vättern Scarp Landscape to learn about working with sustainable landscape management. This creates a great opportunity to use the East Vättern Scarp Landscape as an arena for national and international excursions and conferences, which is already occurring to some degree. During the biosphere reserve candidacy, 30 district managers at the Indian Forest Service came here to learn about sustainable forestry and managing ecosystems in the East Vättern Scarp Landscape. Finnish, Polish and Russian groups have also visited the region.

15.3.4 Popular-science materials for the general public

Through the years a large number of reports and brochures have been produced to spread information about the area. One good example of how the assets in the landscape have been conveyed to the general public as popular science is the pollarding projects that was carried out in 2006-2009. The knowledge and experiences created through this project were summarized in report entitled *Traditionsbärarna* [Bearers of Tradition]. The report describes local knowledge of pollarding – which has come up through discussions and interviews with land users and other sources in the area – and more scientific knowledge acquired through studies of literature and discussions with biologists, historians etc. In addition, a brochure was published to provide easily accessible educational material to various stakeholders about pollarded trees as bearers of bio-cultural heritage. The report and the brochure largely aim to reflect article 8J in the Convention on Biological Diversity, which emphasises the importance of documenting and disseminating local traditional knowledge related to biological phenomena.

15.3.5 Courses for landowners and businesspeople

As landowners and businesspeople are often those who have direct influence on changes in the landscape, courses and targeted training for this group are very important and a top priority. Courses on such topics as pollarding and restoration of grazing lands have been held. In addition, a large number of theme courses are held through the EU's Rural Development Programme. The County Administrative Board arranges the large number of courses and activities for farmers with focuses such as rural development and biodiversity. Special courses are also arranged for professional fruit and berry growers. The Swedish Forest Agency arranges training for forest owners and businesspeople on the many assets of the forest.

15.4 Potential to contribute to the World Network of Biosphere Reserves

[Collaboration among biosphere reserves at a national, regional and global level in terms of exchange of scientific information, experience in conservation and sustainable use, study tours of personnel, joint seminars and workshops, Internet connections and discussion groups, etc.]

15.4.1 Collaboration with existing biosphere reserves at the national level

(indicate ongoing or planned activities)

The Swedish MAB network, which includes existing biosphere reserves and those being established, has allowed quite a bit of exchange and collaboration over the past years. Annual MAB workshops are arranged. In the past four years, these very valuable activities have been carried out:

- Stockholm, 2007, on the theme 'Research and practice'
- Nedre Dalälven River Landscape, 2008, on the theme 'The development function'
- East Vättern Scarp Landscape, 2009, on the theme 'Zonation'
- Blekinge archipelago, 2010, on the theme 'Ecosystem services'

In addition to the nationally organised MAB collaboration, the East Vättern Scarp Landscape works closely with several other Swedish biosphere reserves. This is particularly true of the Lake Vänern Archipelago and Mount Kinnekulle biosphere reserve, with which we have several joint activities under way and planned. On-going activities include an exchange of knowledge about collaborative processes and operational development. The most important planned activity is about developing a biological gap analysis to investigate the functionality of the entire landscape based on the quality and quantity of the protected areas and their surrounding lands (or in other words, the core areas, buffer zone and transition area). The East Vättern Scarp Landscape also has regular contacts with the Kristianstads Vattenrike Biosphere Reserve, which has many valuable experiences as Sweden's first post-Seville biosphere reserve. Exchanges between the Eco-Bus nature school and its counterpart in Kristianstad have taken place for more than 10 years. Over the past few years there has also been an exchange between Kristianstad University and the Swedish Forest Agency in Jönköping.

15.4.2 Collaboration with existing biosphere reserves at the regional or subregional levels, including promoting transfrontier sites and twinning arrangements

(indicate ongoing or planned activities)

[Here, 'regional' refers to the regions as Africa, Arab region, Asia and Pacific Latin America and the Caribbean, Europe. Transfrontier biosphere reserves can be created by two or more contiguous countries to promote cooperation to conserve and sustainably use ecosystems which straddle the international boundaries. Twinning arrangements usually consist of agreements between sites located at some distance in different countries to promote activities such as cooperative research projects, cultural exchanges for schoolchildren and adults, etc.]

In 2009, the East Vättern Scarp Landscape sent three people to the EuroMAB conference in Slovakia, where several initial contacts with other biosphere reserves were established. Contacts with our neighbour Finland were also re-established in 2009 through an EU-funded project called Ecoregion. Among other things, we discussed a joint Leader project related to invasive species between the East Vättern Scarp Landscape and northern Karelen. A more intense collaboration between the East Vättern Scarp Landscape and the planned Lake Päijänne biosphere reserve has also developed. Early in 2011, representatives from northern European biosphere reserves including the East Vättern Scarp Landscape gathered in the Finnish city of Turku to discuss networking in this part of the world.

15.4.3 Collaboration with existing biosphere reserves in thematic networks at the regional and national level

(indicate ongoing and planned activities) [Networks of sites which have a common geographic theme such as islands and archipelagos, mountains, or grassland systems, or a common topic of interest such as ecotourism, ethnobiology, etc.]

At the EuroMAB conference in Slovakia in 2009 the East Vättern Scarp Landscape took the initiative to create a thematic network related to sustainable forest use. It feels natural to pursue this theme from the East Vättern Scarp Landscape as much of our conservation, development and support work is focused on tree-bearing lands. We have a broad range of experts in the field. The Ecoregion project allowed this thematic network to be established. Future activities suitable for international collaboration with other biosphere reserves include development issues focusing on traditional and scientific knowledge about the use of natural resources, ecological functionality on the landscape level, tourism and quality assurance of tourism.

15.4.4 Collaboration with existing biosphere reserves at the international level

(indicate ongoing or planned activities)

[Notably through Internet connections, twinning arrangements, bilateral collaborative research activities, etc.]

Thus far the East Vättern Scarp Landscape does not have any established collaboration with other biosphere reserves (apart from the above) on the international level – however, participation in the EuroMAB conference of 2009 gave us several new contacts. Besides other biosphere reserves, the East Vättern Scarp Landscape has begun collaborating with Model Forest

regarding the Baltic region and beyond. There are great similarities between Model Forest and biosphere reserves, so we can benefit from many synergies by combining these networks on the international level. On the local level, initiatives have been taken to influence national and international collaboration structures and policies in the long term. We have also established collaboration with the Romanian village of Botiza, to which some 30 land users and biologists from the East Vättern Scarp Landscape travelled in 2008 to study its older agricultural landscape, how it is managed and what assets it has.

16 USES AND ACTIVITIES

16.1 Core area(s)

16.1.1 Describe the uses and activities occurring within the core area(s):

[While the core area is intended to be strictly protected, certain activities and uses may be occurring or allowed, consistent with the conservation objectives of the core area]

The core areas in the proposed biosphere reserve consist for the most part of hardwood forests and grazing land. In addition to these areas, there are also smaller core areas consisting of lakes and waterways, other woodlands and small marshlands.

The activities and operations carried out in the core areas are primarily:

- Nature conservation measures, such as hay-making, pollarding, grazing, exploitation felling and clearing
- Hunting and fishing
- Recreation and tourism
- Education, research and environmental monitoring

16.1.2 Possible adverse effects on the core area(s) of uses or activities occurring within or outside the core area(s)

(Indicate trends and give statistics if available)

Many of the adverse effects in the core areas come from land use and operations outside them (e.g. through the air or from neighbouring agriculture and forestry), in some cases outside the entire East Vättern Scarp Landscape and to some degree outside Sweden's borders. Water chemistry in the waterways is influenced by the fact that their drainage basins lie mainly outside and upstream of the proposed biosphere reserve. Populations of birds and wildlife are affected by operations outside the proposed biosphere reserve, such as hunting, fishing and obstacles to migration.

Examples of negative effects on core areas include:

- Eutrophication and environmental toxins in the water and air
- Acidification of soil and water via precipitation
- Encroaching vegetation on traditionally managed hay-making and grazing lands, due to factors such as lack of grazing livestock.
- Poor consideration and intensification of adjacent agriculture and forestry leading to fragmentation of the landscape and decreased biodiversity
- Disturbances in the form of noise from e.g. roads
- The spread of alien species such as the invasive giant hogweed (*Heracleum mantegazzianum*)
- Some degree of wear and litter and some disturbance of sensitive fauna

16.2 Buffer Zone(s)

16.2.1 Describe the main land uses and economic activities in the buffer zone(s):

[Buffer zones may support a variety of uses which promote the multiple functions of a Biosphere Reserve while helping to ensure the protection and natural evolution of the core area(s).]

The buffer zone on land consists primarily of privately owned forest and agricultural land. However, the majority of the buffer zone consists of Lake Vättern. The activities and operations carried out in the buffer zone are primarily:

- Agriculture with field cultivation and grassland management through grazing
- Forestry
- Fruit and berry growing
- Built-up areas and gardening
- Hunting and fishing
- Recreation and tourism
- Trade
- Education, research and environmental monitoring
- Transports on roads and railways
- Boating

16.2.2 Possible adverse effects on the buffer zone(s) of uses or activities occurring within or outside the buffer zone(s) in the near and longer terms:

Examples of adverse effects on the buffer zone include:

- Eutrophication and environmental toxins in the water and air
- Acidification of soil and water via precipitation
- Encroaching vegetation on traditionally managed hay-making and grazing lands, due to factors such as lack of grazing livestock
- Water regulation creating obstacles to migration in waterways
- Poor consideration and intensification of agriculture and forestry leading to fragmentation of the landscape and decreased biodiversity
- Future development such as establishment of new roads, quarrying for minerals and establishment of wind farms
- Disturbances in the form of noise from e.g. roads
- The spread of alien species such as the invasive giant hogweed (*Heracleum mantegazzianum*) and signal crayfish (*Pacifastacus leniusculus*)
- Wear, litter and disturbance of sensitive fauna

16.3 Transition area

[The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time.]

16.3.1 Describe the uses and activities occurring within the core area(s):

The transition area in the proposed biosphere reserve consists of woodland, agricultural land, urban areas and smaller built-up areas.

The activities and operations carried out in the transition area are primarily:

- Agriculture with field cultivation and grassland management through grazing
- Forestry
- Fruit and berry growing
- Built-up areas and gardening
- Hunting and fishing
- Recreation and tourism
- Trade and industrial operations
- Education, research and environmental monitoring
- Transports by road, rail and air
- Energy production from wind and hydropower

16.3.2 Possible adverse effects of uses or activities on the transition area(s):

Examples of adverse effects on the transition area include:

- Eutrophication and environmental toxins in the water and air
- Acidification of soil and water via precipitation
- Encroaching vegetation on traditionally managed hay-making and grazing lands, due to factors such as lack of grazing livestock
- Water regulation creating obstacles to migration in waterways
- Poor consideration and intensification of agriculture and forestry leading to fragmentation of the landscape and decreased biodiversity
- Future development such as establishment of new roads and railways, quarrying for minerals and establishment of wind farms
- Disturbances in the form of noise from e.g. roads and wind power
- The spread of alien species such as the invasive giant hogweed (*Heracleum mantegazzianum*) and signal crayfish (*Pacifastacus leniusculus*)
- Wear, litter and disturbance of sensitive fauna

17 INSTITUTIONAL ASPECTS

17.1 State, province, region or other administrative units:

[List in hierarchical order administrative division(s) in which the proposed Biosphere Reserve is located (e.g. state(s), counties, districts)]

Country: Sweden

County: Jönköping

Municipality: Municipality of Jönköping, Municipality of Tranås

17.2 Units of the proposed biosphere reserve

[Indicate the name of the different units (as appropriate) making up the core area(s), the buffer zone(s) and the transition area.]

Core area(s)

The core areas of the proposed biosphere reserve consist of existing nature reserves, Natura 2000 sites, forest habitat protection areas and shoreline protection areas. Work is already under way to establish another 11 nature reserves close to the core areas.

Buffer zone(s)

The proposed buffer zone consists of three existing national interests for nature conservation: Lake Vättern, the eastern shore of Lake Vättern with the Girabäcken and Västanå Nature Reserves, Röttleån River, Skärstaddalen Valley and more, as well as Visingsö Island. Apart from the national interest zones for nature conservation the buffer zone contains national interests for cultural heritage preservation. Visingsö Island also has an area of national interest for outdoor recreation.

Transition area

Other parts of the proposed biosphere reserve belong to the transition area.

17.2.1 Are these units contiguous or are they separate?

[A biosphere reserve made up of several geographically separate units is called a "cluster biosphere reserve". Please state if this is the case of the proposal.]

The proposed biosphere reserve is continuous. The core areas are separate, but located close to each other. This proximity will be further enhanced with additional nature reserves that are currently being established. The core areas are surrounded by a continuous buffer zone that borders on the transition area to the east.

17.3 Protection Regime of the core area(s) and, if appropriate, of the buffer zone(s)

17.3.1 Core Area(s)

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features)]

The zones in the proposed biosphere reserve East Vättern Scarp Landscape are fully based on the Swedish Environmental Code (1998:808). The regulations and guidelines in the Swedish Environmental Code for nature reserves, Natura 2000 sites, forest habitat protection areas and shoreline protection areas apply in the core areas. Special regulations for the above protected areas are defined in the decisions for the areas. The proposed core areas consist of 8 existing nature reserves, measuring in total about 660 ha, and 4 forest habitat protection areas (8 ha).

The part of the shoreline protection on land that is included in the core areas goes along Vättern's shore from Huskvarna to the Västanå Nature Reserve. Shoreline protection in the water follows the entire Vättern shore up to the northern border of the biosphere reserve. The surface area affected by shoreline protection is about 260 ha on land and 1,150 ha in water. It also consists mainly of Natura 2000 sites and/or planned nature reserves. In addition to a part of Lake Vättern, there are nine Natura 2000 sites in the core areas (a total of 640 ha). Annex 11 consists of documents confirming these areas. Some of the protected areas overlap, so the total surface area of the core areas of the proposed biosphere reserve is about 2,120 ha.

Nature reserves

Nature reserves are established by the County Administrative Board with the support of legislation in Chapter 7 of the Swedish Environmental Code. Each nature reserve is unique and is therefore regulated according to the Area Protection Ordinance (1998:1252) to preserve the natural assets or recreational values. The purpose of each reserve determines its own specific limitations. For example, forestry is prohibited in order to preserve and promote natural values linked to old forest. Through the Swedish Environmental Code and payments to landowners, nature reserves with regulations against land use create strong protection for the affected natural environments and species. When the East Lake Vättern Scarp Landscape project began in 1998,

there were three nature reserves in the core area; today there are eight. Another 11 are in the process of being established.

Natura 2000 sites

Areas with high natural values and which are representative of their regions are covered by the EU's Natura 2000 ecological network. When the European Commission designates a Natura 2000 site, it is not automatically protected; it must, however, become a priority of the authorities' conservation efforts and be listed in a special registry. Natura 2000 sites in the core areas are protected as nature reserves. They also have special conservation plans for each designated habitat, which enhances protection in the area.

Forest habitat protection areas

Smaller land and water areas in forests (usually under 20 hectares) that are living environments for threatened plant and animal species, are protected with the support of legislation in chapter 7 of the Swedish Environmental Code as forest habitat protection areas. Areas considered particularly worthy of protection can be included in forest habitat protection areas. These are administered after being set aside, and nature conservation measures should be carried out as needed to preserve the natural values. When the project began there was no habitat protection in the core areas. Currently there are four such areas.

Areas with shoreline protection

Shoreline protection (as defined in chapter 7, section 13 of the Swedish Environmental Code) is a general area protection that covers 100 metres from the shoreline of seas, lakes and waterways. The County Administrative Board of Jönköping has expanded shoreline protection to 300 metres from the shore along a large part of Lake Vättern. However, shoreline protection does not stretch east of the motorway. The purpose of shoreline protection is to preserve good living conditions for the flora and fauna on land and in water and to secure the general public's access to places for bathing and recreation.

17.3.2 Buffer Zone(s)

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features)] If the buffer zone does not have legal protection, indicate the regulations that apply for its management.]

In the buffer zone, special consideration should be taken in areas of national interest for nature conservation, outdoor recreation and cultural heritage preservation. On Lake Vättern, Natura 2000 regulations also apply. The total surface area of the buffer zone in the proposed biosphere reserve is 10,000 ha of land and 31,800 ha of water.

National interests

National interest is defined and regulated in the third and fourth chapters of the Swedish Environmental Code. An environment or object of national interest is one that has such great assets that it is of importance to the country as a whole. The purpose of defining a national interest is to secure a usage or preserve something for the future. Areas designated as being of national interest for nature conservation, cultural heritage preservation and outdoor recreation must be protected against measures that lead to significant harm to the environment.

The following categories of national interest are located in the buffer zone of the proposed biosphere reserve:

- National interest chapter 4 paragraph 2
- National interest for nature conservation
- National interest for cultural heritage preservation
- National interest for outdoor recreation

Areas of national interest according to chapter 4 are geographically defined by the Swedish Parliament. Thus, the fourth chapter of the Swedish Environmental Code includes special regulations for conservation of soil and water for certain areas in the country. The islands and shore area of Lake Vättern are of national interest for active outdoor recreation and tourism. “*In Lake Vättern, including islands and shore areas, special consideration shall be given to the interests of tourism and outdoor recreation, in particular outdoor recreational exercise, in connection with assessments of the permissibility of development projects or other environmental intrusion*” (Chapter 4, section 2 of the Swedish Environmental Code).

Other areas of national interest for nature conservation and outdoor recreation are designated by the Swedish Environmental Protection Agency after discussion with authorities such as the County Administrative Board (chapter 2 of ordinance 1998:896 of the Swedish Environmental Code). Areas of national interest for nature conservation must represent the primary characteristics of Swedish flora and fauna, illustrate the development of the landscape and show biodiversity in nature. Large, cohesive areas with characteristic habitats are prioritised. Smaller areas have also been designated as areas of national interest, for example if they contain rare geological forms or habitats.

Areas of national interest for outdoor recreation must have particular natural and cultural qualities, variations in the landscape and good accessibility to the general public. They are or might be attractive to visitors from large parts of the country, perhaps the entire country and even from abroad. Many different Swedish landscape types must be represented in the selection.

Areas of national interest for cultural heritage preservation are designated by the Swedish National Heritage Board and the County Administrative Board, and range from limited environments that reflect a certain historical era to large portions of the landscape that have been developed over a long time. They can be dense built-up environments or various types of heritage landscapes, with conservation values that may be representative or unique.

Areas of national interest and Natura 2000 sites in the buffer zone:

National interest chapter 4 paragraph 2

- Lake Vättern including islands and shore areas

National interest for nature conservation:

- Lake Vättern (31 300 ha of water)
- The eastern shore of Lake Vättern with the Girabäcken and Västanå Nature Reserves, Röttleån River, Skärstaddalen Valley and more (8,640 ha of land and 530 ha of water)
- Visingsö Island (2,670 ha of land)

National interest for outdoor recreation:

- Visingsö Island (2,670 ha of land)

National interest for cultural heritage preservation:

- Skärstaddalen Valley (2,460 ha of land)
- Visingsö Island (2,550 ha of land)
- Röttle, Västanå (140 ha of land)
- Gränna-Uppgränna (1,350 ha of land)

Natura 2000 sites:

- Lake Vättern (31,300 ha of water)

Note that the areas overlap. Annexes 2 and 11 consist of documents confirming these areas.

Parts of the buffer zone are also included in three areas of national interest for wind power. The areas have not been mapped out on a larger scale. Lake Vättern is of national interest for commercial fishing. Chapter 3, section 10 of the Swedish Environmental Code states that if an area is “of national interest for incompatible purposes, priority shall be given to the purpose or purposes that are most likely to promote sustainable management of land, water and the physical environment in general.”

17.4 Land use regulations or agreements applicable to the transition area (if appropriate)

In the transition area of the proposed biosphere reserve, land use is regulated according to applicable Swedish regulations and criteria. The most important laws affecting land use in the East Vättern Scarp Landscape and the voluntary instruments applied in the transition area are described below.

17.4.1 Right of public access

Sweden has long had a relatively unique right ensuring public access to natural areas. With this right come requirements to be careful with natural environments and wildlife and show consideration to the landowners and other people. Since 1994 this public right has been incorporated into the Swedish constitution. The actual laws that control the right of public access in practice are mainly part of the Swedish Environmental Code. They are mainly based on common praxis and a reverse interpretation of certain prohibitive laws (meaning that what is not specifically prohibited is permitted). The contents of the right of public access are primarily formulated based on precedential decisions. The right to access to all types of natural environments creates great opportunities for local self-support (such as mushroom and berry picking) and nature tourism. The great challenge for the proposed biosphere reserve is making use of this opportunity for future tourist and business ventures in such a way that they do not disrupt on-going land use or the landowners’ interests, but actively contribute to revenues for the entire local community.

17.4.2 The Planning and Building Act

The physical planning regarding construction and the use of soil and water is regulated by the Planning and Building Act. The aim of the Act is to promote sustainable community expansion with equality in living conditions and a good living environment for people in present-day society and for future generations. Each municipality must have an up-to-date general plan for the entire municipality. The general plan is the municipality’s guiding document for soil and water use. It details the municipality’s views on how development and conservation are to be prioritised. The subdivisions of the landscape have different recommendations in the general plan, depending on the general interests of the area.

The recommendations in the general plan weigh in the landscape assets in a similar way in the buffer zone as in the transition zone – that is, growth in built-up areas, a positive attitude towards construction in the countryside, but with strong limitations in areas with natural, cultural and recreational values or other general interests. These recommendations are judged compatible with the goals of the biosphere reserve, and future revisions of the general plan will occur in collaboration with the biosphere reserve.

17.4.3 The Cultural Monuments Act

Regulations for protecting valuable buildings, historical monuments, ancient relics, ecclesiastical monuments and certain cultural artefacts are set out in the Cultural Monuments Act. The Act states that everyone shares in the responsibility for this and that individuals as well as authorities must show consideration and care towards the cultural environment.

17.4.4 The Environmental Code

The Swedish Environmental Code regulations are based on the concept that society must realise the importance of protecting nature, and that this imparts a responsibility on people who use or otherwise change the natural environment. The Code includes the preservation of biodiversity, protection and care of valuable natural and cultural environments and resource conservation (recycling and reusing) to secure a healthy ecocycle.

Certain habitats are automatically protected by law, while others are protected through special decisions. Habitat protection means that no business activities can be pursued and no measures can be undertaken that can harm the natural environment. The following habitats are covered by general habitat protection; all occur richly in the East Vättern Scarp Landscape, specifically in the heritage landscape that defines most of the area: tree-lined avenues, springs with surrounding wetlands, clearance cairns, ponds and wetlands, stone walls and cairnfields.

17.4.5 The Swedish Forestry Act

All forest owners in Sweden are subject to the Swedish Forestry Act, which regulates the required amount of timber production and the consideration that must be shown to the countryside and the cultural environment. The law sets out the frameworks and basic requirements for the balance between production and conservation. Normally, however, it is both economically and ecologically motivated to carry out measures in addition to these requirements.

17.4.6 Shared responsibility between the State and forest owners – shared goals between production and the environment

Swedish forested lands have undergone massive changes in the 20th century. Rationalisation – for example, the introduction of stand harvesting – has significantly changed the countryside in the past 50 years. In the 1990s, an extensive, constructive debate occurred that led to major positive changes in the environmental work conducted in Swedish forestry. Demands were made for authorities and forest owners to work together to preserve valuable environments in the forest landscape. As a result, a ‘Swedish model’ has evolved defining how the production and environmental goals set by the Parliament for forests should be met.

This common vision has resulted in the goals for formal national protection, and in the commitments from forestry actors to voluntarily set aside areas under the principle of general consideration.

In practice, this means that the responsibility for maintaining the diversity of living environments, species and genes is shared between those who use the forest and the State. Forest users are expected to pursue nature conservation to the best of their abilities, by preserving living environments, such as individual trees, and consideration areas in various forestry activities.

Sometimes active measures are also taken to recreate living environments and to balance various processes, for example by cutting down standing deadwood and reducing grazing by wildlife. The State is expected to take responsibility for protecting stands and forests in order to create continuous areas. Well-conducted nature conservation measures and voluntary set-asides lead to a reduced need for protection in the form of nature reserves.

The East Vättern Scarp Landscape project developed out of conflicts between production and conservation interests in the area. As a result of dialogue and collaboration, a relatively high proportion, by Swedish standards, of forest lands have been set aside for nature conservation. The aim of the proposed biosphere reserve is to enhance functionality in the landscape and to adapt forestry so that the long-term survival of even sensitive species is assured, at the same time as the local population's opportunities to support themselves are maintained or improved. This requires continued collaboration and active dialogue.

Tree-bearing natural grasslands play a very important role for biological functionality of species linked to trees and shrubs in the mosaic landscape. The link between cultural historical (pollarding and harvesting of leaves) and biological conservation value is very clear. Using wood from pollarding to produce bioenergy can also contribute to sustainable energy production.

17.4.7 Mapping out strategies and tools for regulation of land use

Key habitats are forested areas with extremely high natural values. These forests have qualities that give them a key role for the unfavoured and threatened forest flora and fauna. Knowing where these areas are located is crucial for the forestry industry to live up to its responsibility to preserve biodiversity in the East Vättern Scarp Landscape.

Key habitats have been surveyed in the country since 1991. These surveys have also noted other objects with natural values that do not fully qualify as key habitats. The results have been used for advising and planning of nature conservation efforts. The East Vättern Scarp Landscape project began, as described above, as an effort to bridge the gap between the conflicting interests of conservation versus production. To resolve these conflicts, it was necessary to give the players involved an accurate common perspective and as complete an image as possible of the biological value clusters in the forest. In the late 1990s, the authorities conducted an in-depth survey of key habitats in the area, to a much greater extent than in the rest of the country. What is unique in the East Vättern Scarp Landscape is that the survey also mapped out wooded lands that are not forest (natural grasslands) using the same methods. Giving all involved parties a full, comprehensive view was a necessity and a key factor for the dialogue and the collaboration that followed.

The Swedish survey of key habitats created an extensive register of valuable forest lands. There is no formal protection of these lands by law, but they are covered by a consultation requirement prior to any actions taken on the forest. The knowledge gathered in survey of key habitats is reflected in, among other things, the certification systems and the authorities' strategies for formal protection. These strategies were devised nationwide and protective measures are concentrated in special biological value regions. The East Vättern Scarp Landscape as a whole is such a value region in which protective measures have come a relatively long way. The two surveys of key habitats formed the basis of the extensive protective measures that have been conducted in the past decade. See Chapter 17.3.1.

Several tools exist for achieving the environmental objectives, both voluntary and formally binding. The following list includes a brief summary of the most important voluntary tools (the formal instruments are discussed in Chapters 17.3.1 and 17.3.2). The ambition is to make the

East Vättern Scarp Landscape an arena for developing methods, testing new instruments and creating positive examples of applications. These efforts have been under way for more than a decade and have already influenced the application of the Swedish model.

17.4.8 Nature conservation agreements

Voluntary nature conservation agreements are agreements under civil law in which landowners refrain from activities such as forestry in exchange for limited financial compensation. It is an agreement between the landowner and the Swedish Forest Agency, often for a 50-year period. When the project began, there were no nature conservation agreements in the East Vättern Scarp Landscape; today there are 22. In 2010 a new type of nature conservation agreement was developed for use by both the County Administrative Boards and Swedish Forest Agency. These agreements are even more flexible in terms of duration and measures. The compensation for signing a nature conservation agreement is also higher than before, so they are expected to be more attractive to many landowners.

17.4.9 Green forestry plans and voluntary set-asides

Many of the landowners in the East Vättern Scarp Landscape manage forest and pastureland in a mosaic of different habitats. Most forest owners have a forestry plan with goal classifications for individual stands. The plan gives a description of the owners' forest lands and the measures that are considered suitable for them. A green forestry plan describes which forest areas are suitable as set-asides for nature conservation and can be used as a basis for certification of forest lands. On average, 5-8% of properties are voluntarily set aside for nature conservation, cultural heritage preservation or recreational assets. The area must be documented in a plan or other document.

In 2011, efforts began to create a 'blue layer' (nature conservation and consideration alongside water) in forestry plans. Södra Skogsägarna have worked closely with leading ecologists; one result will be a book about the value of forest waters and water consideration in forestry. Information days, study circles and demonstration properties are just some activities that will be included in the water project that began on the initiative of the World Wildlife Fund (WWF) and involving the other organisations in the biosphere reserve. The East Vättern Scarp Landscape plans to serve as a trial area in this matter as well, to create positive examples that can be duplicated across the country.

17.4.10 Forest certification

Two forest certification systems, the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) are new tools for preserving viable populations of all naturally occurring species. In order to certify their land, landowners must create conditions for species to survive in an area subject to forestry, through various forms of consideration and by voluntarily setting aside at least 5% of the surface area of forest for nature conservation (often through the use of green forestry plans – see above).

Felling must not occur in key habitats. Certification was a breakthrough in the art of establishing constructive dialogue between different interests and coming to an agreement. Voluntary set-asides are an important complement to the formally protected areas; they are also areas in which much of the need for restoration can be met.

17.4.11 Agri-environmental payments through the EU's Rural Development Programme

Pasture lands and hay meadows are among Sweden's most species-rich landscape types. Modern agriculture has rationalised many such lands out of existence, but within the proposed biosphere reserve they are still a significant and typical element of the landscape. Landowners who have pasturelands and hay meadows that are covered by the agri-environmental payments scheme through the Rural Development Programme have a five-year commitment and a management

plan for the area. This defines how the lands will be managed and forms the basis of the agricultural payments for the environmental and social benefits of these efforts.

17.5 Land tenure of each zone

[Describe and give the relative percentage of ownership in terms of national, state/provincial, local government, private ownership, etc. for each zone.]

Land ownership in the East Vättern Scarp Landscape is primarily private. These private properties are relatively small and for the most part are passed down in the family for generations. Increasingly, however, agricultural and forestry lands are owned by people who live elsewhere, perhaps in the city.

Municipal lands are located around the urban areas and are intended for future development or as valuable recreation areas. The municipality also owns the large Huskvarnaberget Nature Reserve in the core area.

The national forestry company Sveaskog owns a small part of the forest in the transition area and the National Property Board owns some forest and lands on Visingsö Island in the buffer zone. Other landowners include the Church of Sweden, local associations, corporations, foundations, estates of deceased people etc. Through its foundation, the Church owns only small properties in the area. There are no major commons in the proposed biosphere reserve.

17.5.1 Core Area(s)

State-owned land	5%
Municipal land	37%
Privately-owned land	58%
Other	0%

17.5.2 Buffer Zone(s)

The following data includes Lake Vättern

State-owned land	30%
Municipal land	2%
Privately-owned land	40%
Other	28%

17.5.3 Transition Area(s)

State-owned land	1%
Municipal land	2%
Privately-owned land	93%
Other	4%

17.5.4 Foreseen changes in land tenure:

[Is there a land acquisition programme, e.g. to purchase private lands, or plans for privatisation of state-owned lands?]

There are no general plans to change land ownership in the East Vättern Scarp Landscape. However, many property sales do occur annually among the privately owned lands.

17.6 Management plan or policy and mechanisms for implementation

[The Seville Strategy recommends promoting the management of each biosphere reserves essentially as a "pact" between the local community and society as a whole. Management should be open, evolving and adaptive. While the aim is to establish a process leading to elaborating a comprehensive management plan for the whole site reflecting these ideas and involving all stakeholders, this may not yet exist at the time of nomination. In this case however, it is necessary to indicate the main features of the management policy which is being applied to guide land use at present for the area as a whole, and the 'vision' for the future.]

17.6.1 Indicate how and to what extent the local communities living within and next to the proposed biosphere reserve have been associated with the nomination process.

[This can range from being an entirely locally driven initiative, to a more 'top down' approach led by government authorities or scientific institutions. Describe the steps taken and the stakeholders involved]

The plans to nominate the East Vättern Scarp Landscape as a biosphere reserve are the result of a collaboration between authorities and organisations that has gone on since 1998. It all started with intense conflicts between non-profit nature conservation organisations and landowners' organisations. Collaboration between authorities also needed improvement. The conflicts involved, among other things, the establishment of new nature reserves and surveys of key forest habitats. To create a forum for dialogue, representatives from the authorities and other organisations joined forces in the Östra Vätterbranterna (East Vättern Scarp Landscape) project. Since then, the group consists of the County Administrative Board, the Swedish Forestry Agency, the Municipality of Jönköping, the Federation of Swedish Farmers (LRF), the forest landowners' association Södra Skogsägarna, the World Wildlife Fund (WWF) and the Swedish Society for Nature Conservation via the local Gränna Skogsgrupp forest conservation association.

One key premise for the project was to work from the perspective of incorporating environmental protection and production in a holistic approach. This means that authorities in various roles and the special interest groups have been jointly responsible. The process in the East Vättern Scarp Landscape has been long, progressing from conflict to gradual understanding to constructive collaboration with a strong team spirit in the old project team. To achieve this, much effort has been put into building support and striving for participation from members of the community. This method has attracted local, regional and national attention.

To locate a permanent arena that can take advantage of the progress so far and further develop the East Vättern Scarp Landscape, the group jointly decided that a biosphere reserve best meets the needs that the stakeholders have identified. The efforts have been under way for more than 10 years – the development of this nomination formalises the effort and creates a more solid organisation. The need for a biosphere reserve developed locally, among people who had already been working along these lines for many years. Support was built for the biosphere reserve concept through the already established and involved local channels in the area. In particular LRF and the Gränna Skogsgrupp are very active; their members provide a local perspective on participation and support. It should be pointed out that, as representatives of land owners and users, LRF and Södra have been particularly interested in working to establish a biosphere reserve and have therefore been driving forces in the nomination process.

The parts of the region that are included in the nomination, but were not a part of the original geographic delimiters of the East Vättern Scarp Landscape project, were included through the participation of two organisations, Visingsörådet on Visingsö Island and Framtidsgruppen in Adelöv.

The Municipality of Ödeshög in the County of Östergötland, which borders on the proposed biosphere reserve in the north, has been collaborating with the project throughout the biosphere reserve candidacy. A work group was formed here consisting of representatives of authorities, landowners, business associations and non-profits. The proposed biosphere reserve will continue

this cross-border collaboration in the hope that it will lead to concrete projects involving the local community with positive results.

During the biosphere reserve candidacy, information has been spread through newsletters and to some degree also through the media. Meetings with ÖVB-forum and various informational meetings have been held at regular intervals. Many local stakeholders have been involved in ongoing and completed projects, surveys etc. and further enhanced participation in the biosphere reserve efforts.

17.6.2 Main features of management plan or land use policy

[Describe the 'vision' of what the proposed biosphere reserve is expected to achieve in the short and longer term, and the benefits foreseen for the local communities and other stakeholders.]

Development plan for the East Vättern Scarp Landscape

A development plan has been established to guide the operations in the East Vättern Scarp Landscape region. The plan is flexible and is updated annually and when the need arises. All efforts are based on the vision: *“To create a robust rural area, a sustainable ecosystem and an attractive landscape for users, residents and visitors, through active collaboration”*.

The vision will be achieved based on three overall goals, which are listed and described below, with the current priorities:

- A. Developing active collaboration
- B. Creating a viable rural area
- C. Creating a sustainable ecosystem
- D. Creating an attractive landscape

A. Developing active collaboration

Since the start of the East Vättern Scarp Landscape project, various organisations and representatives have jointly discussed solutions to challenges regarding the landscape and its management. Disagreements and conflicts of interest in the group have been solved through constructive, concrete, result-oriented dialogue. This collaboration needs to develop continuously, and as the East Vättern Scarp Landscape biosphere reserve is established, it should be expanded to embrace more parts of society. In particular local businesses such as tourism and processing of forestry and agricultural products play a key role in building up sustainable economic development. The most relevant priorities at the moment are listed below. The top priority has been to write this nomination; it has taken extensive time and energy away from other objectives.

Priorities:

- A.1. create an arena for collaboration on the local, regional, national and international levels
- A.2. develop local projects in which different special interest groups can work together
- A.3. Support education, exchange of information and research

B. Creating a viable rural area

The East Vättern Scarp Landscape has a living rural area that exudes love and caring for the community and its values through small-scale land use. The proximity to Jönköping has also made it easier for many users to continue keeping the landscape open on a part-time basis through e.g. grazing and haymaking. Both large and small farms have been able to develop side by side. This is also true of business – Husqvarna Bruk has been the biggest industry in the city, while small industries have developed in the country, sometimes with connections to agriculture and forestry. To continue positive rural development, innovation and new networks are needed.

The biosphere reserve organisation wants to serve as a catalyst for projects and a coordinator of stakeholders who want to work for the projects. Current priorities are listed below.

Priorities:

- B.1. create prospects for long-term sustainable use of cultural and natural resources
- B.2. make it easier for businesses and residents to expand their economic activities
- B.3. develop the East Vättern Scarp Landscape concept to a quality brand for local products and services

C. Creating a sustainable ecosystem

The biological values in the East Vättern Scarp Landscape have been known for a long time. In 1997 the World Wildlife Fund (WWF) named the area one of Europe's 100 and Sweden's 5 most valuable forest areas for conservation of biodiversity. The East Vättern Scarp Landscape has also been a priority for formal and voluntary conservation measures. The County Administrative Board has worked hard to establish nature reserves of the environments that were suited to this, while other methods were developed on a voluntary basis to create long-term conservation and management. As a model area for sustainable development, the East Vättern Scarp Landscape seems to be at the forefront of development of new knowledge and new instruments and methods of collaboration that can help create a more sustainable ecosystem. The most relevant priorities at the moment are listed below.

Priorities:

- C.1. preserve valuable and threatened species, environments and landscapes in the long term
- C.2. develop an ecology infrastructure between the most valuable environments in the landscape
- C.3. create ideal conditions for nature conservation measures of environments that require management

D. Creating an attractive landscape

The East Vättern Scarp Landscape is a region that a very large number of people travel through. Every day, an average of 15,000 vehicles pass through the East Vättern Scarp Landscape on the E4 and thousands of visitors come to tourist attractions like Huskvarna and Gränna-Visingsö (see chapter 14.2 for more information). However, only a handful of travellers take the time to stay a few days in the area or visit the interesting places and landscapes outside the lay-bys and urban areas. In other words, there is great potential for spreading information and starting new businesses based on the landscape as a tourist attraction. At the same time, the East Vättern Scarp Landscape should work to make its natural and cultural values accessible to a broader target group, as well as supporting businesspeople whose clientele consists of people willing to pay for an added value experience.

Priorities:

- D.1. market the East Vättern Scarp Landscape on line, in the landscape and through printed materials
- D.2. develop attractions and walking trails to make it easier for people to discover the landscape
- D.3. create opportunities for businesspeople to develop tourism businesses

Regional and municipal policies, programmes and plans

In addition to the specific development plan for the East Vättern Scarp Landscape, there are also several regional and municipal documents that provide a solid foundation for sustainable development in the proposed biosphere reserve.

On the county/regional level, a regional development programme (RDP) has been established since 2008 with its sights set on 2020. The programme's targets include a good living environment, a good life in an attractive region, good transportation, a strong business community through company development and company renewal, and knowledge and skills throughout the region. A viable business community is crucial for residents in the region to have a good life. Therefore, the common goal is to give the region a comprehensive, competitive business community characterised by entrepreneurship, innovation and renewal. This is completely consistent with the focus of the biosphere reserve, and there are good prospects for working together towards common goals.

The most important documents in the Municipality of Jönköping are:

- General plan 2002 with relevant in-depth focuses
- Programmes for sustainable development – environment (see below)
- The Ålborg Commitments (see below)
- Green structural plan for (Jönköping and) Huskvarna
- Energy and climate programme
- Expansion strategy being developed
- Forest policy (being developed) and forestry plan
- Wind power policy
- Conditions and guidelines for adaptation to climate change

The general plan is the municipality's guiding document for soil and water use. It details the municipality's views on how the interests of development and conservation are to be prioritised. The general plan for the Municipality of Jönköping is overall positive towards supporting the building of new homes in the countryside. There are several small built-up areas in the transition area; it is vital to maintain commercial and public service in these areas and promote their development. In general, the built-up areas have some services, such as a supermarket, school, nursing home, utilities, sports facilities and recreation areas. According to the municipality's general plan, they also have areas intended for the construction of new homes and businesses.

However, more specific placement of such new construction must take into consideration the special conditions of the location, such as proximity to disruptive agricultural facilities, livestock, the overall impression of the landscape, building traditions and other general interests such as nature conservation. For some specific limited areas with high natural values, the general plan is restrictive as regards new construction to preserve general interests such as nature conservation, cultural heritage preservation and outdoor recreation. When planning and assessing applications for building permits, the municipality weighs the individual's interests against the general public interests.

The programme for sustainable development – environment is the municipality's collective efforts towards environmental objectives; it is updated annually. Progress is assessed twice a year and the results are published on the municipality's external website in a tool called the Hållbarometern (the Sustainometer). In connection with the annual update, important subprojects regarding the East Vättern Scarp Landscape are added, which allows the work to be coordinated and enhanced.

The European Sustainable Cities and Towns Campaign has formulated a vision of a sustainable future. To achieve this vision, a total of 50 commitments have been defined; these are called the Ålborg Commitments. The Municipality of Jönköping signed the commitments on 11 October 2007, which means that the city commits to targeted efforts to meet them. The Ålborg

Commitments embrace the concept of sustainable development from the economic, social and environmental perspectives, which is consistent with the foundations of work in the future biosphere reserve.

The Municipality of Jönköping has approved a wind-power policy defining the municipality's guidelines for assessing wind-power projects. Wide open agricultural landscapes, large marshlands and nature reserves, and the surroundings of built-up areas, are judged to be so valuable from a landscape perspective that wind power should not be established anywhere within these areas.

Management plans

There is no single management plan for the entire proposed biosphere reserve. However, Lake Vättern has long been covered by a water conservation plan, a fishery management plan and a conservation plan for the Natura 2000 site. The terrestrial part of the East Vättern Scarp Landscape is primarily owned by a large number of private landowners. Individual properties often have voluntary forestry plans, and also commitments under the Rural Development Programme. The core areas have their own specific management plans for each nature reserve.

Water conservation plan for Lake Vättern

Since the mid-1950s, the Water Conservation Association (Vattenvårdsförbundet) has developed five water conservation plans, which formed the basis of joint efforts around Lake Vättern to improve the environmental status of the lake. Developed in broad collaboration, these plans contain environmental targets, measures and indicators based on a national structure. Eight generational objectives and 68 goals are proposed. This will be revised in 2012. Large parts of the content of the water conservation plan are linked to the EU Water Framework Directive and to the Natura 2000 work, which has its own programmes and plans.

Management plans for nature reserves

Each nature reserve has a set management plan for its long-term care. The purpose of these management plans is to provide a practical programme of management, planning, procurement, implementation of stewardship measures and documentation and follow-up of objectives and favourable conditions in the area. Management of nature reserves is paid for by special state funding.

Forestry plans and commitments through the Rural Development Programme

See Chapter 17.4.

Landscape strategy for the East Vättern Scarp Landscape

The majority of the forest areas of particular biological value have been excluded from production in the proposed biosphere reserve. To achieve long-term preservation of species and environments, we need a functioning ecological infrastructure in which small protected areas serve as propagation sites, while portions of the landscape that are used for human activities contain qualities (such as shrub environments, deadwood and old trees) that allow the propagation and survival of threatened and rare species. Future efforts will therefore focus on research, information and education about the biological values on unprotected lands. The way individual landowners use and care for their lands must be combined with national formal protection measures. This is particularly important because the East Vättern Scarp Landscape consists largely of a rolling landscape alternating between cultivated land and forests. There are many biologically rich transition zones such as forest edges, shorelines etc. Maintaining them often requires management, so the dedication and knowledge of individual land users is crucial. Sustainable land use secures biological values and contributes to economic development.

To create a knowledge base, a project began in the East Vättern Scarp Landscape and the Lake Vänern Archipelago and Mount Kinnekulle biosphere reserve (with the support of the Swedish Environmental Protection Agency) to develop methods for biological gap analyses. This method is applicable on the national level, but the pilot study is planned to be carried out in the two biosphere reserves, which have the capacity to secure participation on a broad front. The analysis will form the basis of a new landscape strategy that also includes economic, cultural and social aspects.

17.6.3 The designated authority or coordination mechanisms to implement this plan or policy

[Name, structure and composition, its functioning to date]

The proposed biosphere reserve will be run as a non-profit organisation. Its interests and affairs will be overseen by a Board of Directors that will carry out decisions made at the annual general meeting, manage the organisation's finances and do its bookkeeping. In the day-to-day administration of the biosphere reserve, the board will be responsible for manning the Biosphere Candidate office, which also includes hiring staff. Board members will be selected from members of the organisation and must include representatives of the authorities and organisations that have been involved in the East Vättern Scarp Landscape project previously. The Municipality of Jönköping is proposed to chair the organisation.

17.6.4 The means of application of the management plan or policy

[For example through contractual agreements with landowners or resource users, traditional users' rights, financial incentives, etc.]

The proposed biosphere reserve contains areas whose land use is regulated by Swedish legislation, individual voluntary agreements or other financial incentives, such as nature conservation agreements, stewardship agreements and management grants. As regards voluntary agreements and plans (such as forestry plans), the most important tools for achieving stewardship and land-use objectives are providing advice and spreading awareness.

Nature reserves and Natura 2000 sites have been established in areas worthy of protection. This means that decisions have been made to benefit natural and recreational values. Special funding is available for such protected areas to ensure their care and management.

17.6.5 Indicate how and to what extent the local communities participate in the formulation and the implementation of the management plan or policy.

[informed/consulted: decision making role etc.]

The process leading up to the nomination of the East Vättern Scarp Landscape as a biosphere reserve was an open process in which stakeholder organisations and individuals were able to participate. An in-depth preliminary study was followed by a three-year long candidacy period with the goal of continuing to work with the MAB concept, developing networks and working with the UNESCO nomination. Since 1998 (see Chapter 17.6.1), a large number of organisations have been actively involved in the East Vättern Scarp Landscape. These organisations have continued their collaboration and continued to enhance their dedication to sustainable development during the biosphere reserve candidacy.

Representatives of landowners, authorities and nature conservation voluntary organisations collaborated in a work group with an executive committee to establish the development plan for the proposed biosphere reserve. These seven organisations (the Federation of Swedish Farmers (LRF), the forest landowners' association Södra Skogsägarna, the County Administrative Board, the Swedish Forest Agency, the Municipality of Jönköping, the World Wildlife Fund (WWF) and the Gränna Skogsgrupp (SNF)) have also been involved in producing materials for the nomination. A reference group, ÖVB-Forum, consisting of representatives from LRF, Södra,

local history societies and others, was formed to give local communities a say in decisions regarding the East Vättern Scarp Landscape.

During the biosphere reserve candidacy, suggestions have arisen to expand our commitment with additional organisations, including the County Council of Jönköping and the county hospital Ryhov regarding questions about nature and health, and the Regional Development Council and Smålands Turism for regional development. In addition, it has been suggested to invite in representatives from various research disciplines and various business associations and business advisors to deal with questions about economic development and entrepreneurship. These organisations may play an active part in the creation of new projects, the further evolution of the development plan, etc.

The steering committee that makes the decisions for the proposed biosphere reserve reflects the composition of the work group, consisting of representatives of various stakeholders in the area. During the biosphere reserve candidacy, the steering committee has made decisions on the focus of the East Vättern Scarp Landscape and its development plan.

The proposed biosphere reserve has continuously published information for the general public and the local communities. Newsletters have been published four to five times a year, information has been published on our website, in the media, in brochures and our annual reports. Opportunities to discuss and voice opinions have been presented at lectures, seminars, theme days etc. There have been many opportunities for the general public to ask questions and get involved in the development of the proposed biosphere reserve.

17.6.6 The year of start of implementation of the management plan or policy

The first development plan for the proposed East Vättern Scarp Landscape biosphere reserve was approved by the steering committee in 2009 and was later revised in 2010. The plan aims to be a living, dynamic tool in the work with the proposed biosphere reserve and will therefore be updated annually and as needed.

17.7 Financial source(s) and yearly budget

[Biosphere reserves require technical and financial support for their management and for addressing interrelated environmental, land use, and socio-economic development problems. Indicate the source and the relative percentage of the funding (e.g. from national, regional, local administrations, private funding, international sources, etc.) and the estimated yearly budget in the national currency.]

The basic financing after the establishment of the biosphere reserve is expected to correspond more or less to the funding during the candidacy. This funding has been allocated annually as follows:

National public funding:	SEK	500,000	(27%)
National NGO funding (WWF):	SEK	333,000	(18%)
Regional public funding:	SEK	570,000	(31%)
Regional NGO Funding (Södra/LRF)	SEK	27,000	(2%)
Local public funding:	SEK	400,000	(22%)
Total	SEK	1,830,000	(100%)

In addition, all organisations contribute significant voluntary efforts for various biosphere-related activities in the East Vättern Scarp Landscape. A large part of the biosphere reserve's operations will be project-oriented. There are good opportunities to fund these projects through EU programmes, the Rural Development Programme and various funds.

17.8 Authority in charge of administration of

17.8.1 the proposed biosphere reserve as a whole

[If appropriate, name the National (or State or Provincial) administration to which this authority reports:]

The Municipalities of Jönköping and Tranås

[If appropriate, name the National (or State or Provincial) administration to which this authority reports:]

Not applicable

17.8.2 Core area(s)

[Indicate the name of the authority or authorities in charge of administering its legal powers (in original language with English or French translation)]

The core areas of the biosphere reserve are administered by two national authorities on the central level: The Swedish Environmental Protection Agency and the Swedish Forest Agency.

On the regional and local level, the following authorities ensure adherence to all applicable laws:

Regional authorities: County Administrative Board of Jönköping and the Swedish Forest Agency

Local authorities: Municipality of Jönköping

These authorities are listed in Chapter 20.

17.8.3 Buffer Zone(s)

Coordination and administration of the buffer zone of the biosphere reserve on the central level: The Swedish Environmental Protection Agency and the Swedish National Heritage Board

On the regional and local level, the following authorities ensure adherence to all applicable laws:

Regional authorities: County Administrative Board of Jönköping, Swedish Forest Agency

Local authorities: Municipality of Jönköping, Municipality of Tranås

These authorities are listed in Chapter 20.

18 SPECIAL DESIGNATIONS

[Special designations recognize the importance of particular sites in carrying out the functions important in a biosphere reserve, such as conservation, monitoring, experimental research, and environmental education. These designations can help strengthen these functions where they exist or provide opportunities for developing them. Special designations may apply to an entire proposed biosphere reserve or to a site included within. They are therefore complementary and reinforcing of the designation as a biosphere reserve. Check each designation that applies to the proposed biosphere reserve and indicate its name]

UNESCO World Heritage Site

RAMSAR Wetland Convention Site

Other international conservation conventions/directives *[Please specify]*

Long term monitoring site *[Please specify]*

Lake Vättern in the area is an area subject to long-term monitoring through the Water Conservation Association (Vattenvårdsförbundet). Since 1957 the Association has worked to improve the environment in Lake Vättern by coordinating and evaluating studies, initiating concrete measures and spreading information.

(x) *Other. [Please specify]*

In 1997 the World Wildlife Fund (WWF) named the East Vättern Scarp Landscape one of Europe's 100 and Sweden's 5 most valuable forest areas for conservation of biodiversity.

In 2000 the Swedish Environmental Protection Agency designated the East Vättern Scarp Landscape as one of Sweden's most important regions of valuable broadleaf deciduous forests. The Swedish Forest Agency and the County Administrative Board of Jönköping developed a strategy in 2006 for the formal protection of forest land in the County of Jönköping. In it, the East Vättern Scarp Landscape is named one of the country's most important biological value regions.

19 SUPPORTING DOCUMENTS

(to be submitted with nomination form)

[Clear, well-labelled maps are indispensable for evaluating Biosphere Reserve proposals. The maps to be provided should be referenced to standard coordinates wherever possible.]

(X) General location map

[A GENERAL LOCATION MAP of small or medium scale must be provided showing the location of the proposed Biosphere Reserve, and all included administrative areas, within the country, and its position with respect to major rivers, mountain ranges, principal towns, etc.]

Annex 1

(X) Biosphere Reserve zonation map

(large scale, preferably in black & white for photocopy reproduction)

[A BIOSPHERE RESERVE ZONATION MAP of a larger scale (1:25,000 or 1:50,000) showing the delimitations of all core area(s) and buffer zone(s) must be provided. The approximate extent of the transition area(s) should be shown, if possible. While large scale and large format maps in colour are advisable for reference purposes, it is recommended to also enclose a Biosphere Reserve zonation map in an A4 writing paper format in black & white for easy photocopy reproduction.]

Annex 2

(X) Vegetation map or land cover map

[A VEGETATION MAP or LAND COVER MAP showing the principal habitats and land cover types of the proposed Biosphere Reserve should be provided, if available].

Annex 3

(X) List of legal documents

(if possible with English or French translation)

[List the principal LEGAL DOCUMENTS authorizing the establishment and governing use and management of the proposed Biosphere Reserve and any administrative area(s) they contain. Please provide a copy of these documents, if possible with English or French translation].

Annex 11

(X) List of land use and management plans

[List existing LAND USE and MANAGEMENT PLANS (with dates and reference numbers) for the administrative area(s) included within the proposed Biosphere Reserve. Provide a copy of these documents]

Annex 12

(X) Species list

(to be annexed)

[Provide a LIST OF IMPORTANT SPECIES (threatened species as well as economically important species) occurring within the proposed Biosphere Reserve, including common names, wherever possible.]

Annex 13

(X) List of main bibliographic references (to be annexed)

[Provide a list of the main publications and articles of relevance to the proposed biosphere reserve over the past 5–10 years].

Annex 14

A summary of other annexes is provided after the table of contents.

20 ADDRESSES

20.1 Contact address of the proposed biosphere reserve:

[Government agency, organization, or other entity (entities) to serve as the main contact to whom all correspondence within the World Network of Biosphere Reserves should be addressed.]

Name: Jönköpings kommun, Stadsbyggnadskontoret
Street or P.O. Box: Västra Storgatan 16
City with postal code: 551 89 JÖNKÖPING
Country: Sweden
Phone: +46-36-10 50 00 (switchboard)
Fax (or telex): +46-36-10 77 75
E-mail: stadsbyggnad@jonkoping.se

20.2 Administering entity of the core area:

Various authorities administer and manage core areas in the proposed biosphere reserve. See the description in chapter 17. For information on the applicable authorities, visit the following websites:

Name: Swedish Environmental Protection Agency
Website: www.naturvardsverket.se

Name: County Administrative Board of Jönköping
Website: www.f.lst.se

Name: Swedish Forest Agency
Website: www.skogsstyrelsen.se

Name: Municipality of Jönköping
Website: www.jonkoping.se

20.3 Administering entity of the buffer zone:

Various authorities administer and manage the buffer zone in the proposed biosphere reserve. See the description in chapter 17. For information on the applicable authorities, visit the following websites:

Name: Swedish Environmental Protection Agency
Website: www.naturvardsverket.se

Name: Swedish National Heritage Board
Website: www.raa.se

Name: County Administrative Board of Jönköping
Website: www.f.lst.se

Name: Swedish Forest Agency
Website: www.skogsstyrelsen.se

Name: Municipality of Jönköping
Website: www.jonkoping.se

ANNEX I. GENERAL LOCATION MAP

[A GENERAL LOCATION MAP of small or medium scale must be provided showing the location of the proposed Biosphere Reserve, and all included administrative areas, within the country, and its position with respect to major rivers, mountain ranges, principal towns, etc.]

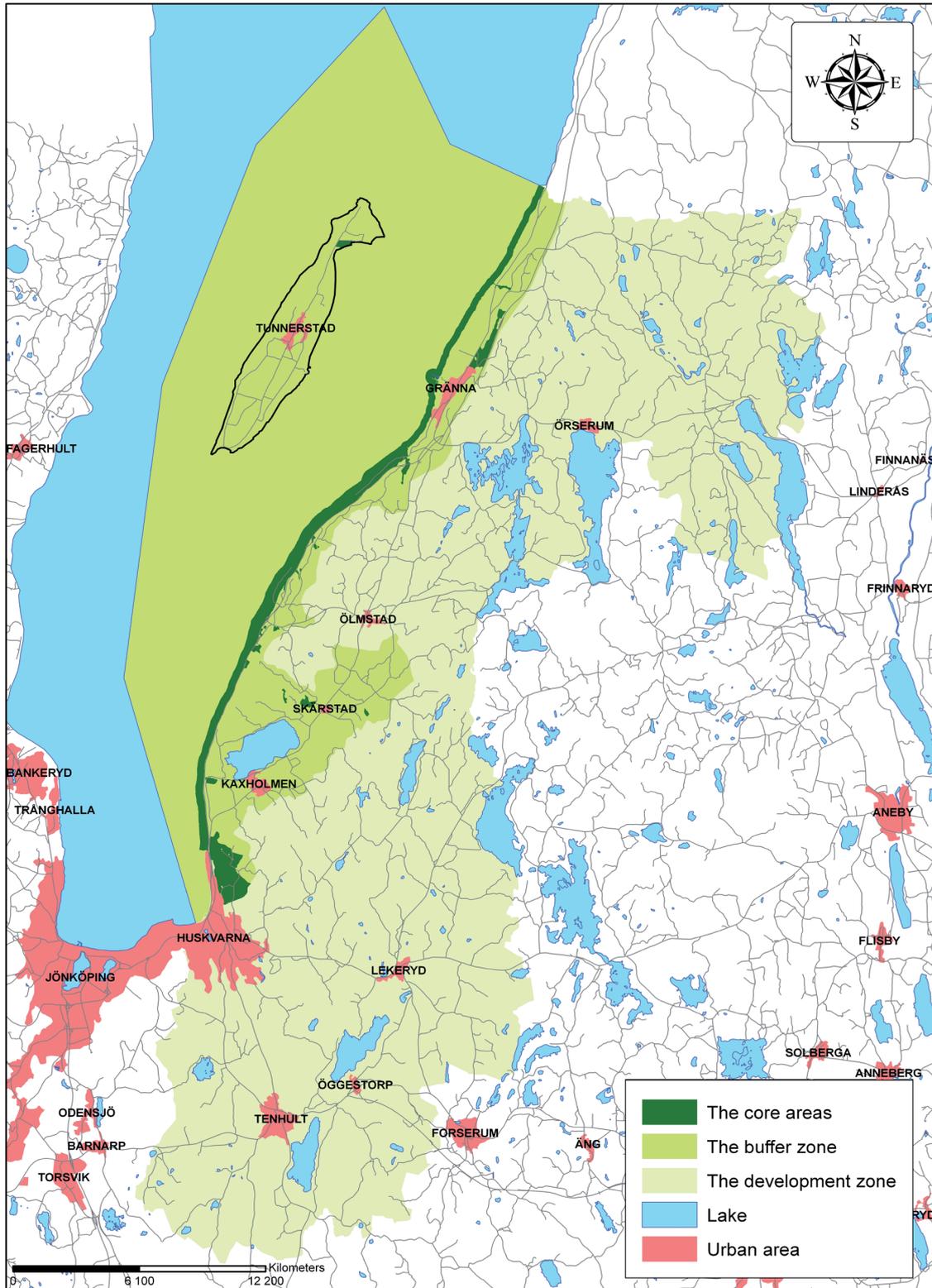
http://europa.eu/abc/maps/members/sweden_sv.htm

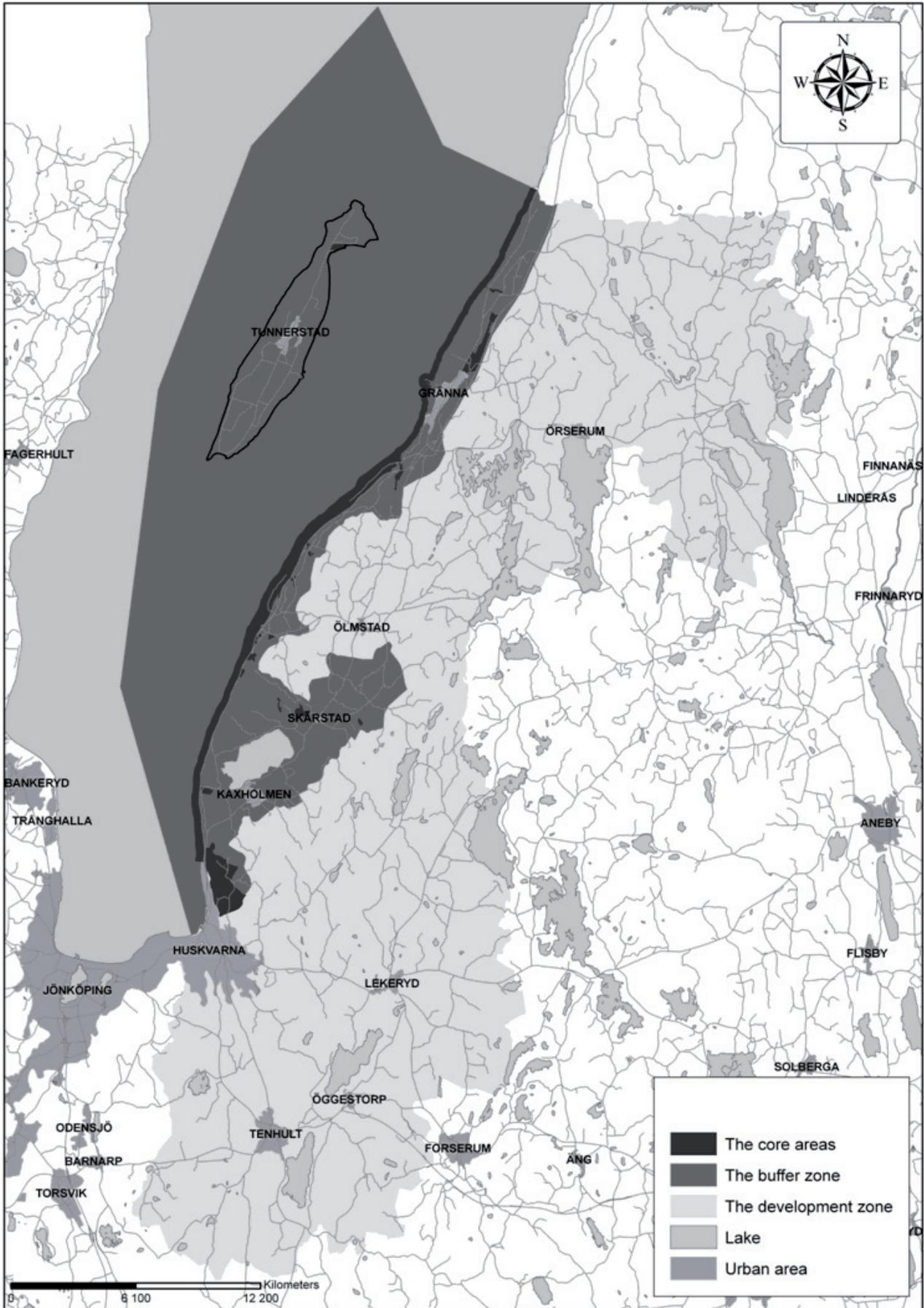


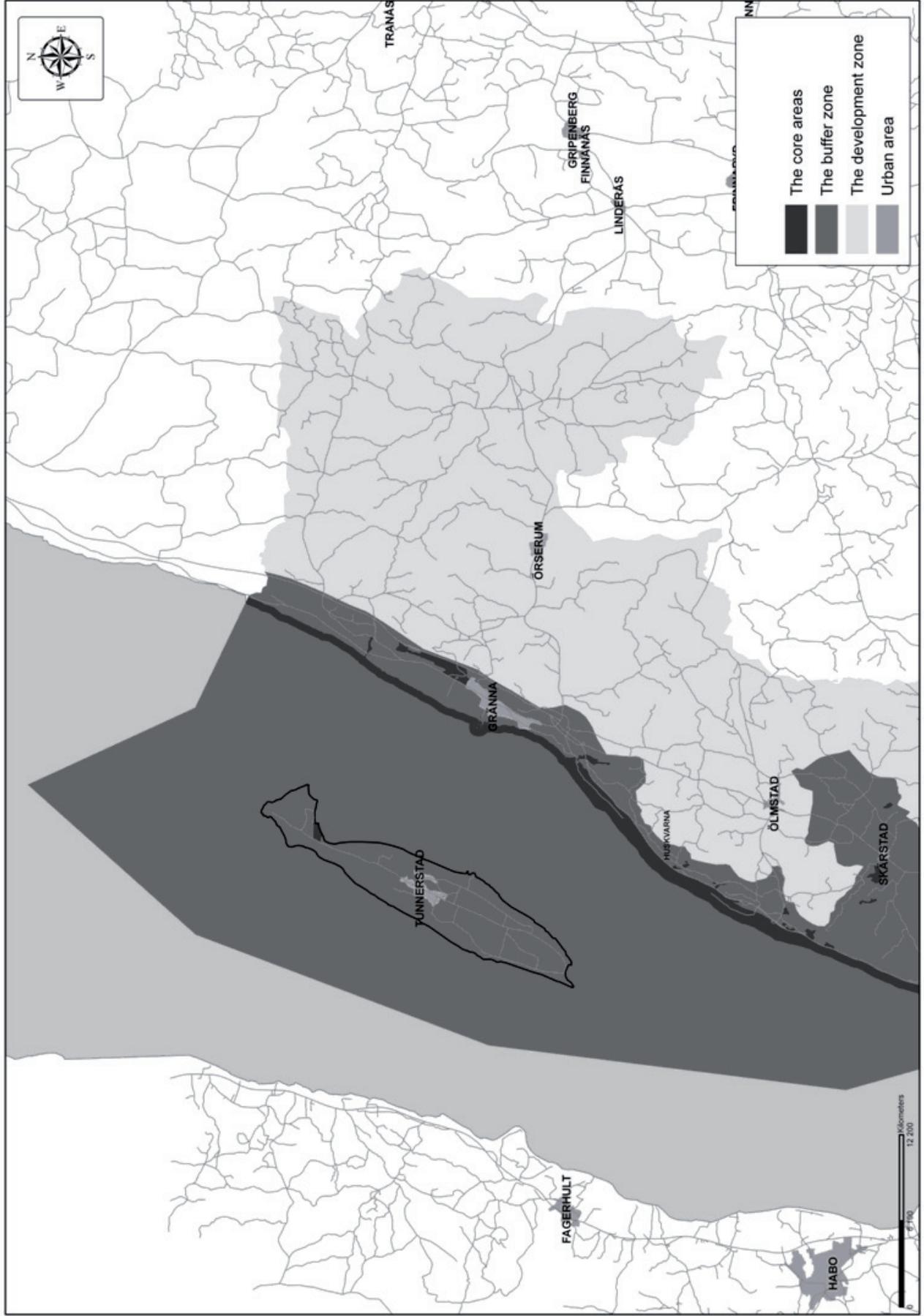
ANNEX 2. BIOSPHERE RESERVE ZONATION MAP

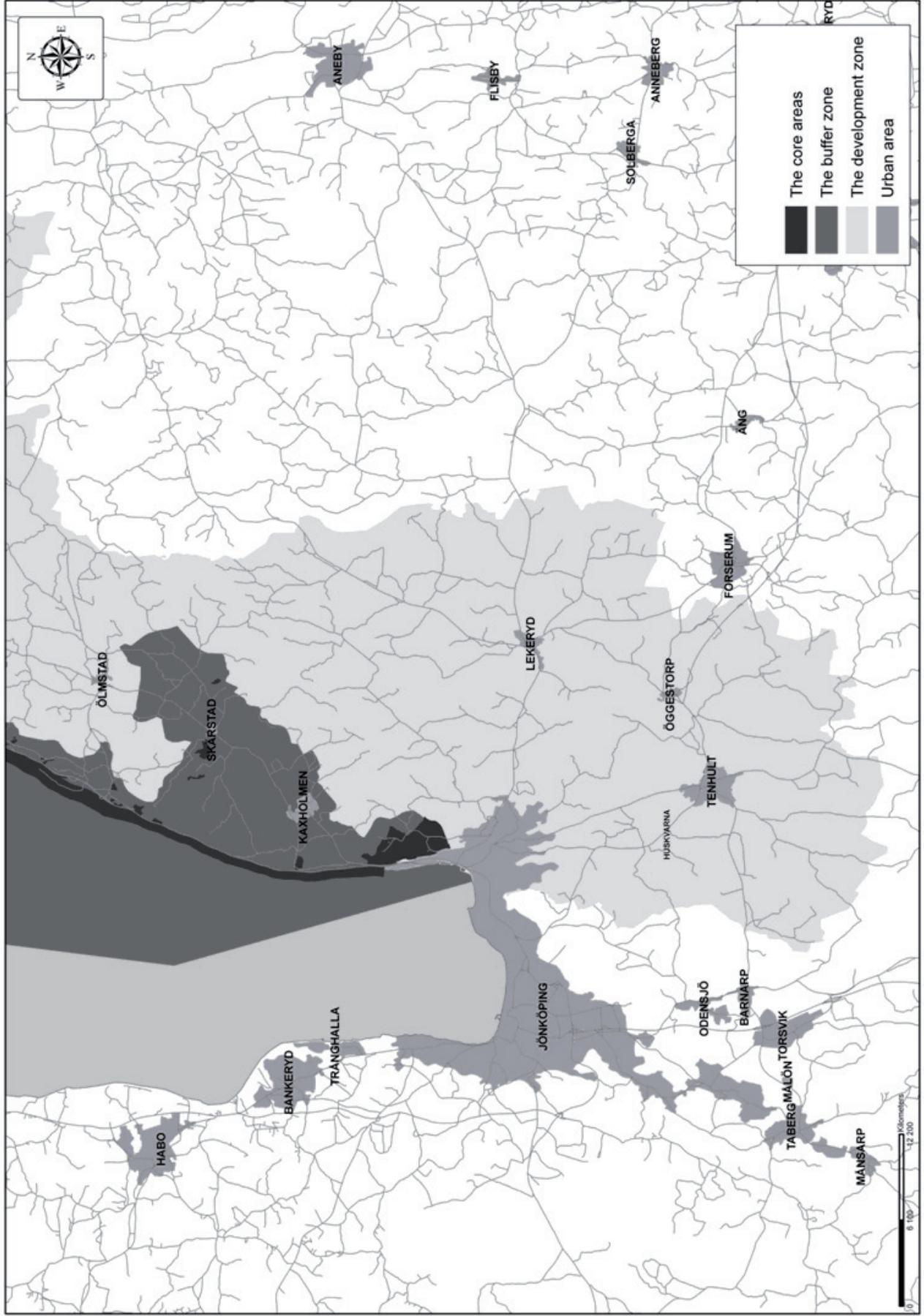
[large scale, preferably in black & white for photocopy reproduction]

[A BIOSPHERE RESERVE ZONATION MAP of a larger scale showing the delimitations of all core area(s) and buffer zone(s) must be provided. The approximate extent of the transition area(s) should be shown, if possible. While large scale and large format maps in colour are advisable for reference purposes, it is recommended to also enclose a Biosphere Reserve zonation map in a A-4 writing paper format in black & white for easy photocopy reproduction. It is recommended that an electronic version of the zonation map be provided]



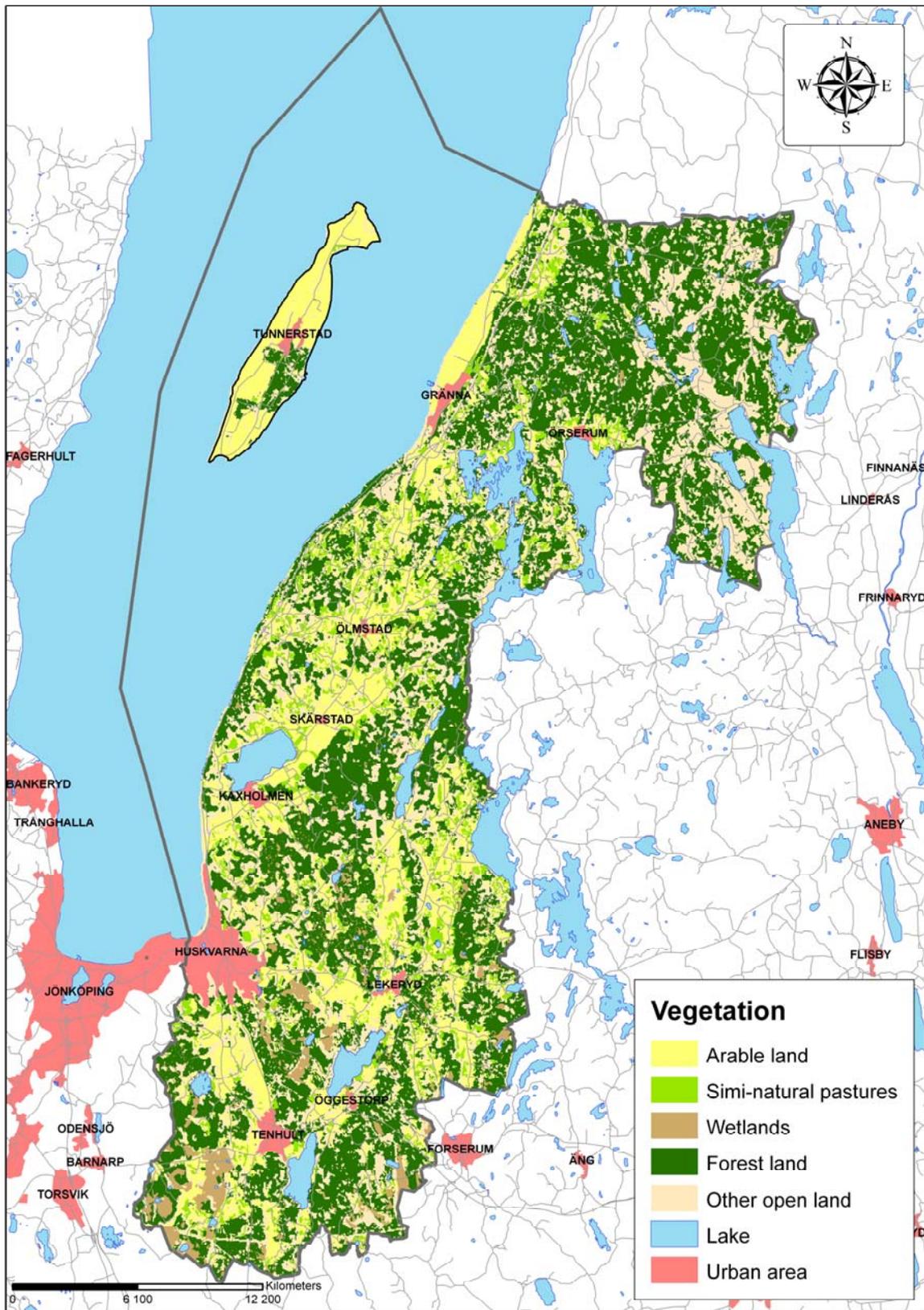






ANNEX 3. VEGETATION MAP

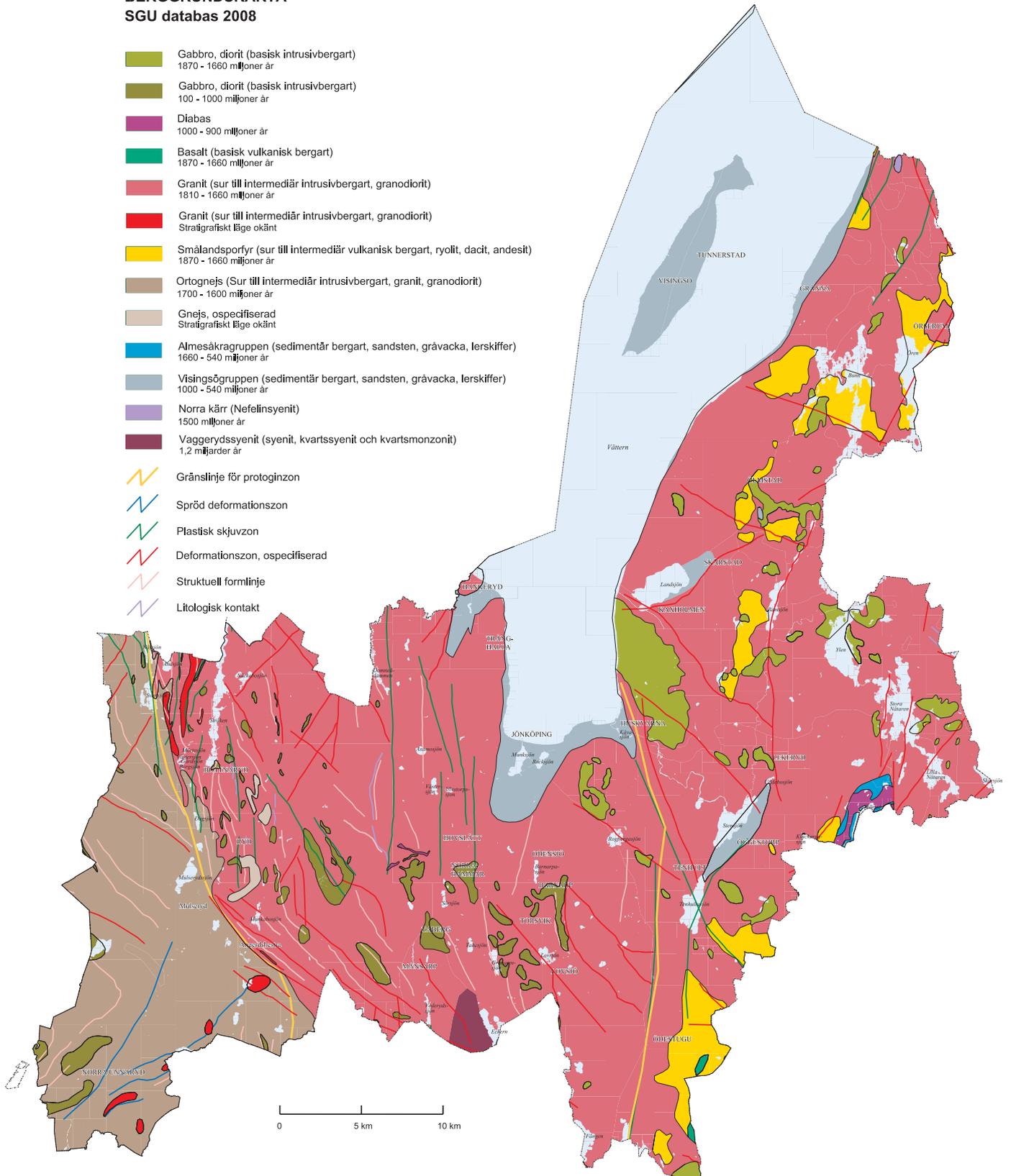
[A VEGETATION MAP or LAND COVER MAP showing the principal habitats and land cover types of the proposed Biosphere Reserve should be provided, if available].



ANNEX 4. BEDROCK GEOLOGY MAP

BERGGRUNDSKARTA SGU databas 2008

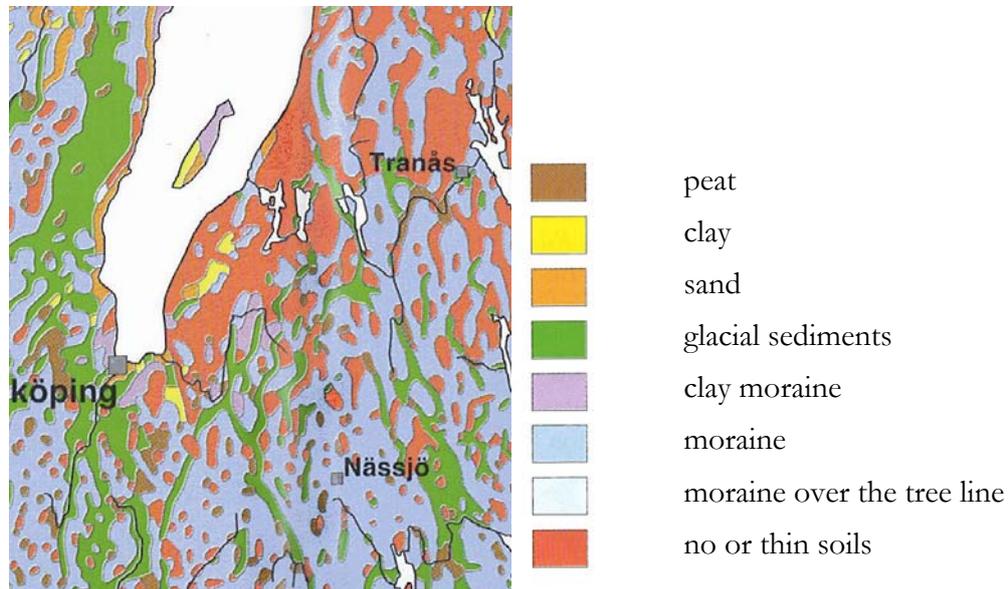
- Gabbro, diorit (basisk intrusivbergart)
1870 - 1660 miljoner år
- Gabbro, diorit (basisk intrusivbergart)
100 - 1000 miljoner år
- Diabas
1000 - 900 miljoner år
- Basalt (basisk vulkanisk bergart)
1870 - 1660 miljoner år
- Granit (sur till intermediär intrusivbergart, granodiorit)
1810 - 1660 miljoner år
- Granit (sur till intermediär intrusivbergart, granodiorit)
Stratigrafiskt läge okänt
- Smålandsporfyri (sur till intermediär vulkanisk bergart, ryllit, dacit, andesit)
1870 - 1660 miljoner år
- Ortognejs (Sur till intermediär intrusivbergart, granit, granodiorit)
1700 - 1600 miljoner år
- Gnejs, ospecificerad
Stratigrafiskt läge okänt
- Almesåkrgruppen (sedimentär bergart, sandsten, gråvacka, lerskiffer)
1660 - 540 miljoner år
- Visingsögruppen (sedimentär bergart, sandsten, gråvacka, lerskiffer)
1000 - 540 miljoner år
- Norra kärr (Nefelinsyenit)
1500 miljoner år
- Vaggeydsyenit (syenit, kvartssyenit och kvartsmonzonit)
1,2 miljarder år
- Gränslinje för protoginzon
- Spröd deformationszon
- Plastisk skjuvzon
- Deformationszon, ospecificerad
- Strukturell formlinje
- Litologisk kontakt



ANNEX 5. MAPS OF SOILS AND SOIL COVER

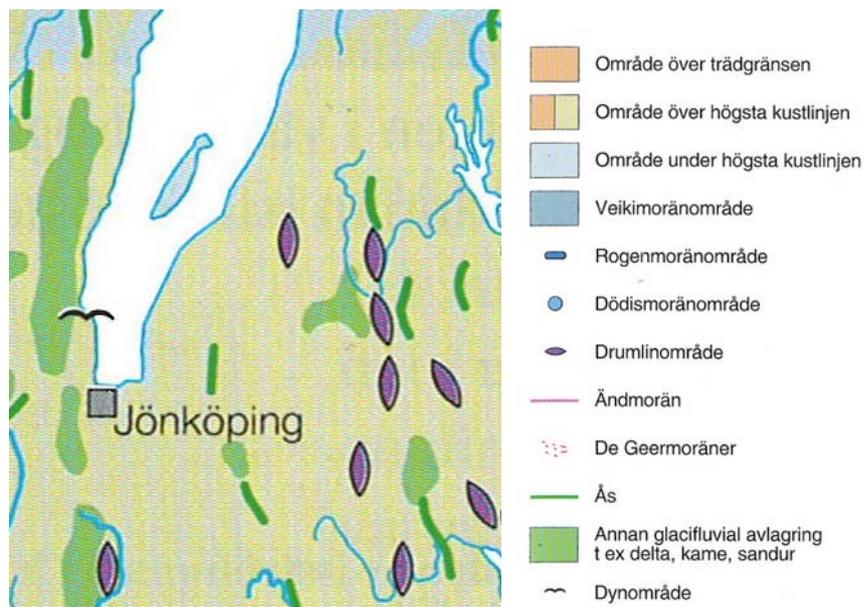
Soil type map

From the book; National Atlas of Sweden (SNA) Geology.



Soil type map

From the book; National Atlas of Sweden (SNA) Geology.



ANNEX 6. POPULATION MAP



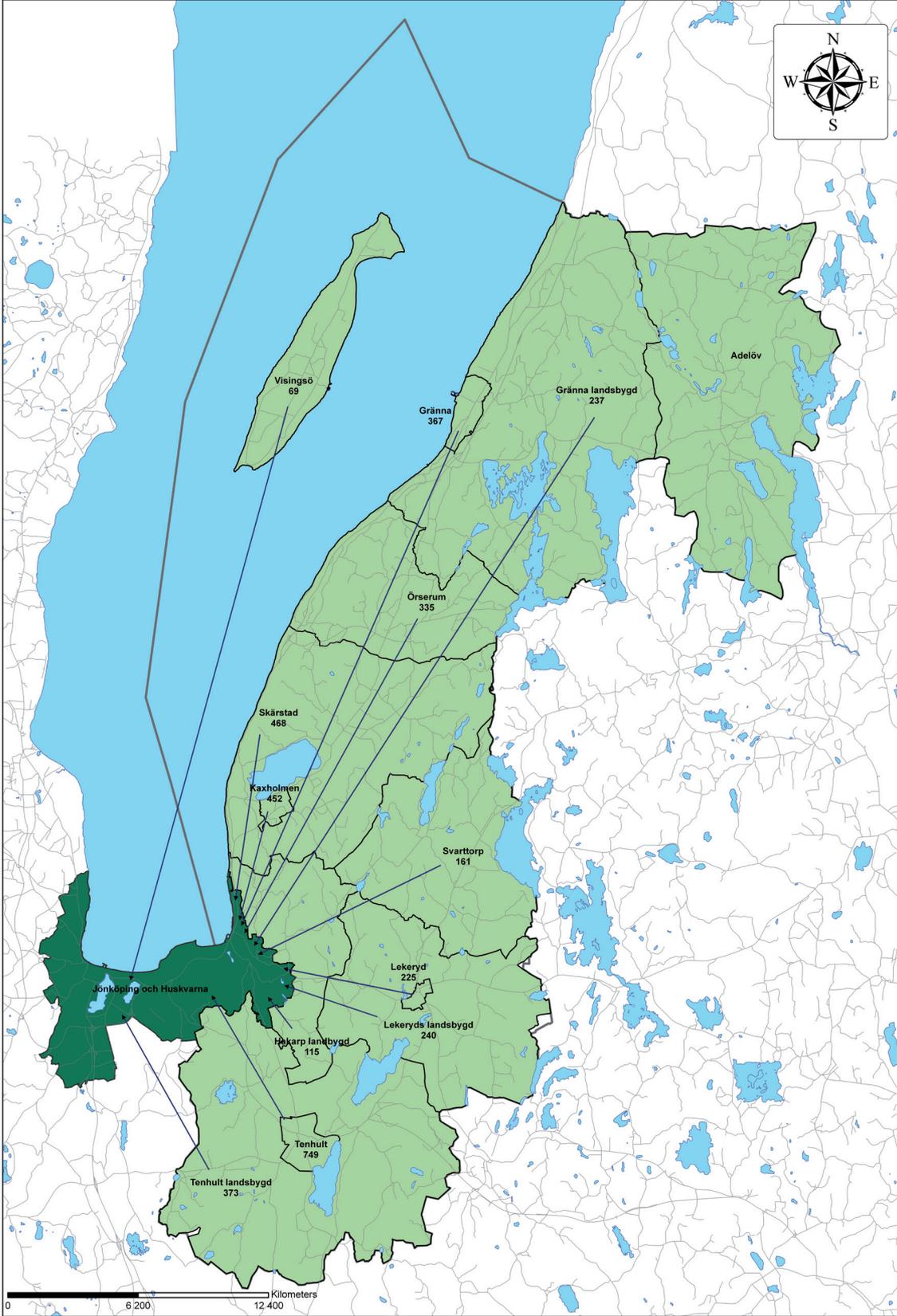
ANNEX 7. MAP SHOWING GAINFULLY EMPLOYED POPULATION



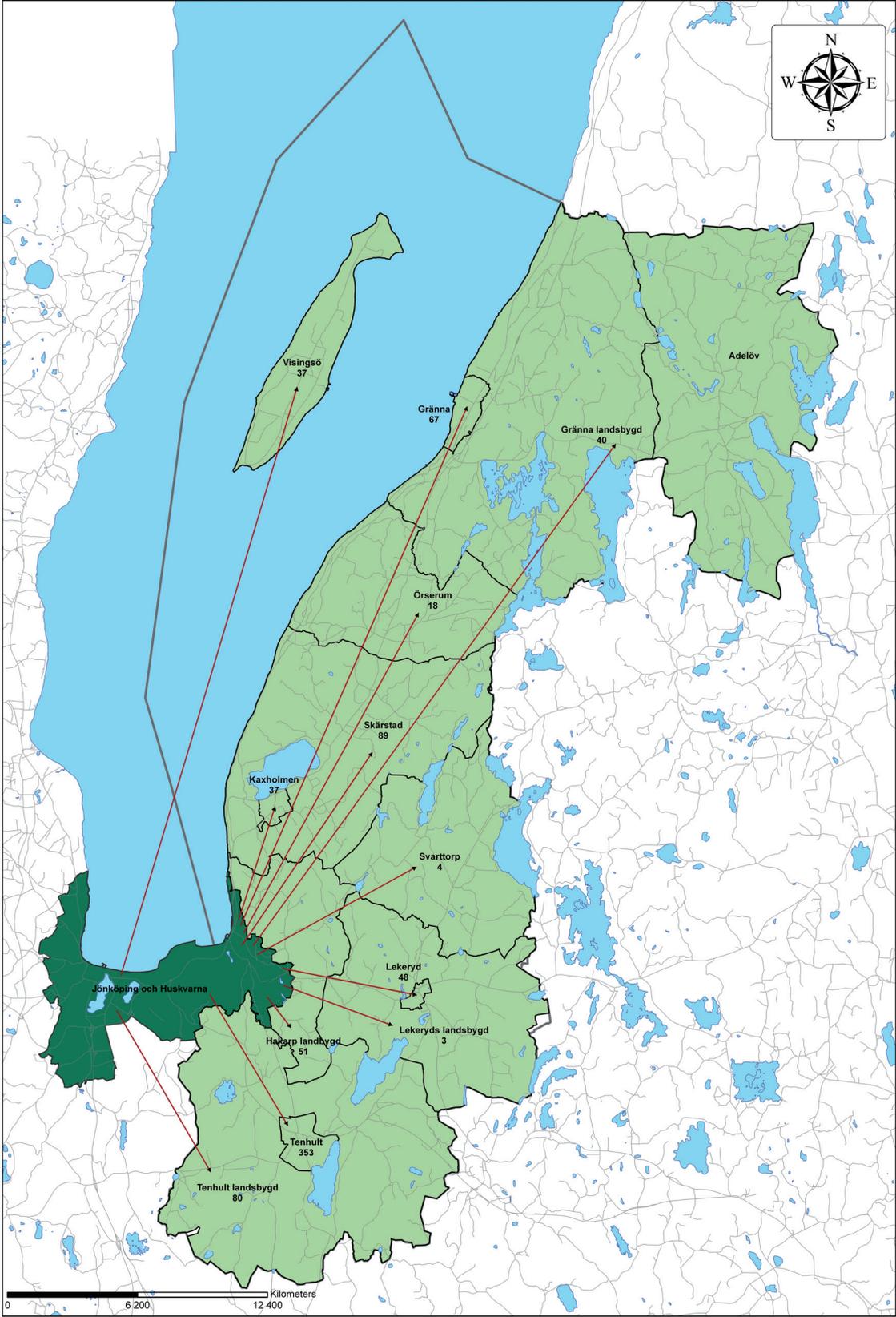
ANNEX 8. MAP SHOWING THOSE GAINFULLY EMPLOYED IN LAND-BASED INDUSTRIES



ANNEX 9. MAP SHOWING THOSE WHO COMMUTE TO THE AREA



ANNEX 10. MAP SHOWING THOSE WHO COMMUTE FROM THE AREA



ANNEX II. LIST OF LEGAL DOCUMENTS

[List the principal LEGAL DOCUMENTS authorizing the establishment and governing use and management of the proposed Biosphere Reserve and any administrative area(s) they contain. Please provide a copy of these documents, if possible with English or French translation].



Jönköpings distrikt
Carl-Olof Thulin
carl-olof.thulin@skogsstyrelsen.se
Tfn 036-19 62 06

Datum
2011-02-16

Diariernr
2010/5687

1(2)

Beslutade biotopskyddsområden och upprättade naturvårdsavtal inom Östra Vätterbranterna

Listan visar Skogsstyrelsens beslutade biotopskyddsområden enligt § 6 i förordningen om områdesskydd enligt miljöbalken samt upprättade naturvårdsavtal mellan Skogsstyrelsen och berörda markägare inom det föreslagna biosfärområdet Östra Vätterbranterna.

Biotopskyddsområden

År för bildande	Objektets nummer	Biotoptyp	Storlek (ha)
1998	145	Källor med omgivande våtmarker	1.0
1998	144	Äldre bestånd av lövträd	1.1
2000	266	Äldre naturskogsartade skogar	2.1
2001	112	Äldre naturskogsartade skogar	6.5
2002	523	Äldre naturskogsartade skogar	3.3
2002	512	Ravinskogar	2.3
2002	511	Ravinskogar	0.7
2002	510	Mark med mycket gamla träd	1.0
2002	521	Äldre naturskogsartade skogar	2.4
2002	522	Äldre naturskogsartade skogar	1.3
2003	105	Ras- eller bergbranter	2.5
2003	260	Äldre naturskogsartade skogar	3.7
2003	292	Ras- eller bergbranter	0.5
2003	291	Ras- eller bergbranter	0.6
2003	178	Äldre naturskogsartade skogar	1.1
2004	485	Mark med mycket gamla träd	4.0
2004	247	Äldre naturskogsartade skogar	4.2
2005	271	Äldre naturskogsartade skogar	3.8
2006	372	Äldre betespräglad skog	0.7
2006	369	Ras- eller bergbranter	1.4
2007	5947	Äldre naturskogsartade skogar	1.2
2007	4160	Äldre naturskogsartade skogar	4.1
2008	2991	Ras- eller bergbranter	2.2

Postadress
Huvudkontor
Skogsstyrelsen
551 83 Jönköping

Besöksadress
Vallgatan 8
Jönköping

Telefon
036-35 93 00
Fax
036-16 61 70

Organisationsnr
202100-5612
Momsreg.nr
SE202100561201

E-post
skogsstyrelsen@skogsstyrelsen.se
www.skogsstyrelsen.se

Naturvårdsavtal

År för upprättande	Objektets nummer	Biotoptyp	Storlek (ha)
1997	421	Ädellövskog	6.5
2002	540	Kulturmark, hage, skogsbete	52.8
2003	209	Kulturmark, hage, skogsbete	2.2
2003	179	Kantzön, korridor, bäck, ravin	0.7
2003	1	Ädellövskog	4.7
2004	57	Naturskogsartad lövskog	6.5
2004	105	Kulturmark, hage, skogsbete	3.5
2004	46	Kulturmark, hage, skogsbete	20.4
2004	512	Kantzön, korridor, bäck, ravin	5.3
2006	1067	Kulturmark, hage, skogsbete	12.7
2006	1125	Kulturmark, hage, skogsbete	3.2
2006	1095	Kulturmark, hage, skogsbete	7.6
2006	373	Kulturmark, hage, skogsbete	5.3
2007	6792	Kulturmark, hage, skogsbete	7.4
2007	402	Kulturmark, hage, skogsbete	3.8
2008	4653	Kantzön, korridor, bäck, ravin	1.0
2008	1350	Kulturmark, hage, skogsbete	5.0
2008	6194	Kulturmark, hage, skogsbete	3.3
2009	3223	Kulturmark, hage, skogsbete	41.2
2009	2937	Kulturmark, hage, skogsbete	3.1
2009	1561	Kulturmark, hage, skogsbete	3.6
2010	2933	Kulturmark, hage, skogsbete	13.5

På Skogsstyrelsens vägnar


Carl-Olof Thulin
Distriktschef



Malin Lund
Naturavdelningen
Områdesskydd
036 39 5226

Biosfärkandidatområde Östra
Vätterbranterna
Simon Jonegård
Skogsstyrelsen, Jönköpings Distrikt
551 83 JÖNKÖPING

Beslutade naturreservat, Natura 2000- områden, strandskydd och riksintressen inom planerade biosfärområdet Östra Vätterbranterna

Följande områden utgör fastställda naturreservat enligt 7 kap 4§ miljöbalken
(SFS 1998:808) inom det planerade biosfärområdet Östra Vätterbranterna

NATURRESERVAT (KÄRNOMRÅDEN)

Beslutsdatum	Namn	Areal(ha)
1998-09-17	Girabäcken	91
1972-03-10	Huskvarnabergen	345
1985-01-28	Vista kulle	14
2009-05-15	Vretaholm	106
1982-03-26	Västanå	145
1999-12-21	Erstad kärr	14
2004-03-24	Fåglarödjan	5
2009-04-20	Slottsberget	22

NATURRESERVAT (ÖVRIGA)

Beslutsdatum	Namn	Areal(ha)
1990-12-28	Brattaberget	68
1999-06-30	Jordanstorp	17
1990-08-30	Ramlaklint-Uvaberget	26
2006-01-11	Råbyskogen	115
2007-02-12	Strömsholmsskogen	19
2001-09-25	Huluskogen	40
2008-02-01	Kattehälet	25
2008-12-04	Ingaryd	52



Följande områden utgör av regeringen, med stöd av miljöbalken 7 kap 28 § (SFS 1998:08), beslutade Natura 2000-områden enligt habitatdirektivet (pSCI) och fågeldirektivet (SPA) inom det planerade biosfärområdet Östra Vätterbranterna

NATURA 2000 (KÄRNOMRÅDEN)

Regeringsbeslut pSCI	SPA	Namn	Areal(ha)
1997-01-30		Girabäcken	9
1998-12-22		Huskvarnabergen	345
1998-01-22		Vista kulle	14
2000-07-06		Vretaholm	72
1998-01-22		Västana	145
	2000-07-06	Erstad kärr	14
2004-04-01		Fåglarödjan	5
2004-04-01		Öland	8
2004-04-01		Grav	17
2004-04-01		Stickelösa	7
2004-04-01		Fingalstorp	11
1998-12-22		Vättern(del av)	1152

NATURA 2000 (ÖVRIGA)

200-07-06		Brattaberget	24
1998-12-22		Jordanstorp	17
1997-01-30	1996-12-19	Ramlaklint-Uvaberget	26
2004-04-01		Råbyskogen	115
2002-01-24		Strömsholmsskogen	7
1997-01-30		Huluskogen	40
2004-04-01		Vändelstorp	6
2002-01-24		Kabbarp	0,2
2002-01-24		Högaberg	0,2
2002-01-24		Prästekvarn	0,2
2000-07-26		Drängagråten	1,7
2002-01-24		Örserum	8
2004-04-01		Tokeryd	6
2006-05-04		Hakarps kyrkängar	58
1998-01-22		Sötåsasjön	63
1998-12-22		Vättern (del av)	30 100



STRANDSKYDD (KÄRNOMRÅDEN)

Vättern har sedan 1975-12-19 utvidgat strandskydd (300 m på land och i vatten) enligt 15 § naturvårdslagen inom det planerade biosfärområdet Östra Vätterbranterna. Gäller dock ej öster om väg E4.

RIKSINTRESSEN (BUFFERTZON)

Följande områden inom det planerade biosfärområdet Östra Vätterbranternas buffertzona utgör riksintresse för naturvård, friluftsliv och kulturmiljövård enligt 3 kap 6 § miljöbalken beslutade av Naturvårdsverket respektive Riksantikvarieämbetet.

Beslutsdatum	Identitet	Områdesnamn
2000-02-07	NRO06006	Vättern
2000-02-07	NRO 06007	Visingsö
2000-02-07	NRO06008	Östra Vätterstranden med Girabäcken, Västanå, Röttleån, Skärstaddalen m.m.
1988-09-19	FF1	Visingsö
2006-08-27	KF74	Skärstaddalen
2006-08-27	KF76	Visingsö
2006-08-27	KF77	Röttle, Västanå
2006-08-27	KF78	Gränna-Uppgränna

Malin Lund
Funktionschef områdesskydd

ANNEX II. LIST OF LEGAL DOCUMENTS – BRIEF TRANSLATION

Page 1-2

Designated habitat protection areas and nature conservation agreements within the East Vättern Scarp Landscape

The list shows areas set aside as habitat protection areas by the Swedish Forest Agency under the Ordinance on Area Protection (section 6) according to the Environmental Code, and nature conservation agreements drawn up between the Swedish Forest Agency and landowners concerned within the East Vättern Scarp Landscape. In total 23 habitat protection areas and 22 nature conservation agreements, designated between 1998 and 2010. See more under chapter 17.

Page 3-5

Designated nature reserves, Natura 2000 sites, areas with shoreline protection and areas of national interest within the East Vättern Scarp Landscape

The list shows areas set aside as nature reserves, Natura 2000 sites, areas with shoreline protection and areas of national interest by the Regional County Board of Jönköping according to the Environmental Code within the East Vättern Scarp Landscape. The nature reserve are totally 16 designated between 1972 and 2009. The number of Natura 2000 are totally 28 designated between 1997 and 2006. The sites of national interest is 8 in number and was designated between 1988 and 2006. See more under chapter 17.

ANNEX 12. LIST OF LAND-USE AND MANAGEMENT PLANS

[List existing LAND USE and MANAGEMENT PLANS (with dates and reference numbers) for the administrative area(s) included within the proposed Biosphere Reserve. Provide a copy of these documents]



Länstyrelsen
i Jönköpings län

Sida 1/1

Datum
2011-02-15

Beteckning
511-17765-2008

Er datum

Er beteckning

Malin Lund
Naturavdelningen
Områdesskydd
036 39 5226

Biosfärkandidatområde Östra
Vätterbranterna
Simon Jonegård
Skogsstyrelsen , Jönköpings Distrikt
551 83 JÖNKÖPING

Förteckning över beslutade skötselplaner för naturreservaten inom det planerade biosfärområdet Östra Vätterbranterna

Naturreservat	Reservatsbeslut	Skötselplanebeslut
Girabäcken	1998-09-17	2008-06-17
Huskvarnabergen	1972-03-10	1999-12-13
Vista kulle	1985-01-28	2005-11-22
Vretaholm	2009-05-15	2009-05-15
Erstad kärr	1999-12-21	1999-12-21
Fågglarödjan	2004-03-24	2004-03-24
Slottsberget	2009-04-20	2009-04-20
Brattaberget	1990-12-28	2009-01-20
Jordanstorp	1999-06-30	1999-06-30
Ramlaklint-Uvaberget	1990-08-30	2005-12-06
Råbyskogen	2006-01-11	2006-01-11
Strömsholmsskogen	2007-02-12	2007-02-12
Huluskogen	2001-09-25	2001-09-25
Kattehälet	2008-02-01	2008-02-01
Ingaryd	2008-12-04	2008-12-04

Malin Lund
Funktionschef områdesskydd

ANNEX 12. LIST OF LAND-USE AND MANAGEMENT PLANS – BRIEF TRANSLATION

Page 1

List of management plans agreed for the nature reserves within the East Vättern Scarp Landscape

The list shows the total list of management plans agreed for the nature reserves within the proposed biosphere reserve East Vättern Scarp Landscape, under the responsibility of the Regional County Board of Jönköping. See more under chapter 17.

ANNEX 13 SPECIES LISTS

[Provide a LIST OF IMPORTANT SPECIES (threatened species as well as economically important species) occurring within the proposed Biosphere Reserve, including common names, wherever possible.]

Sections of the annex:

- 13a Introduction to Annex 13
- 13b Globally red-listed species
- 13c Species listed in the EU's Birds Directive
- 13d Species listed in the EU's Habitats Directive
- 13e Nationally red-listed in the Critically Endangered category
- 13f Nationally red-listed in the Endangered category
- 13g Nationally red-listed in the Vulnerable category
- 13h Species of financial significance
- 13i Characteristic species for Lake Vättern
- 13j Characteristic species for eutrophic waters
- 13k Characteristic species for oligotrophic waters
- 13l Characteristic species for hardwood forests
- 13m Characteristic species for coniferous and mixed forests
- 13n Characteristic species for arable land
- 13o Characteristic species for natural grasslands
- 13p Characteristic species for built-up areas

Annex 13a)

Introduction to Annex 13

General about the red list

Both in Sweden and internationally, lists are compiled of species that for various reasons are judged to be threatened. These are called red lists. Red lists divide species into various threat categories. Thus, red lists are an objective tool for assessing if and which nature conservation measures are required. The Swedish Species Information Centre is one of the main bodies that collects and compiles data about Sweden's flora and fauna. The national red list is based on the global criteria from the International Union for Conservation of Nature (IUCN). The Swedish red list, published on 28 April 2010, uses the same categories.

EU-listed species

The Birds and Habitats Directives are the principal nature conservation ordinances in the EU. The Birds Directive applies to wild birds in Europe and the Habitats Directive applies to wild fauna, flora and habitats. The directives require the protection of the species themselves and their living environments. The primary purpose of the Habitats Directive is to achieve and preserve a favourable level of protection for certain species and habitats. The species must be able to survive in its natural surroundings in the long term and its natural distribution must not be reduced. The number of such living environments needed to secure the future viability of the population should also be sufficient. The general purpose of the Birds Directive is to achieve and preserve a level in certain bird populations that meets the ecological, scientific and cultural requirements. Annexes 13c and 13d list the species in the proposed biosphere reserve that are included in the EU Habitats and Birds Directives.

Annex 13b)

Species observed thus far in the proposed biosphere reserve that are globally red-listed according to the 2010 IUCN Red List of Threatened Species

Organism group	Scientific name	Common name	IUCN category
Mammals	<i>Barbastella barbastellus</i>	Barbastelle bat	NT
	<i>Lutra lutra</i>	European otter	NT
Bird	<i>Crex crex</i>	corn crake	NT
	<i>Gallinago media</i>	great snipe	NT
	<i>Numenius arquata</i>	Eurasian curlew	NT
Fish	<i>Coregonus trybomi</i>	winter-spawning vendace	CE
Beetle	<i>Osmoderma eremita</i>	hermit beetle	NT

Annex 13c)

Species observed thus far in the proposed biosphere reserve that are listed in the EU's Birds Directive

Organism group	Scientific name	Common name	EU code
Birds	<i>Aegolius funereus</i>	Tengmalm's owl	A223
	<i>Alcedo atthis</i>	common kingfisher	A229
	<i>Bonasa bonasia</i>	hazel grouse	A104
	<i>Botaurus stellaris</i>	Eurasian bittern	A021
	<i>Bubo bubo</i>	Eurasian eagle-owl	A215
	<i>Caprimulgus europaeus</i>	European nightjar	A224
	<i>Circus aeruginosus</i>	western marsh-harrier	A081
	<i>Crex crex</i>	corn crake	A122
	<i>Cygnus cygnus</i>	whooper swan	A038
	<i>Dryocopus martius</i>	black woodpecker	A236
	<i>Emberiza hortulana</i>	ortolan bunting	A379
	<i>Falco peregrinus</i>	peregrine falcon	A103
	<i>Ficedula parva</i>	red-breasted flycatcher	A320
	<i>Gallinago media</i>	great snipe	A154
	<i>Gavia arctica</i>	black-throated diver	A002
	<i>Gavia stellata</i>	red-throated loon	A001
	<i>Glaucidium passerinum</i>	Eurasian pygmy owl	A217
	<i>Grus grus</i>	common crane	A127
	<i>Haliaeetus albicilla</i>	white-tailed eagle	A075
	<i>Lanius collurio</i>	red-backed shrike	A338
	<i>Lullula arborea</i>	woodlark	A246
	<i>Pandion haliaetus</i>	osprey	A094
	<i>Pernis apivorus</i>	honey buzzard	A072
	<i>Philomachus pugnax</i>	ruff	A151
	<i>Podiceps auritus</i>	horned grebe	A007
	<i>Porzana porzana</i>	spotted crake	A119
<i>Sterna hirundo</i>	common tern	A193	
<i>Tetrao tetrix</i>	black grouse	A409	
<i>Tetrao urogallus</i>	western capercaillie	A108	

Annex 13d)

Species observed thus far in the proposed biosphere reserve that are listed in the EU's Habitats Directive, annex 2

Organism group	Scientific name	Common name
Mammals	<i>Lutra lutra</i> <i>Barbastella barbastellus</i> <i>Lynx lynx</i>	European otter Barbastelle bat lynx
Fish	<i>Cottus gobio</i> <i>Cobitis taenia</i>	European bullhead spined loach
Reptiles/amphibians	<i>Triturus cristatus</i>	great crested newt
Insects	<i>Osmoderma eremita</i> <i>Leucorrhinia pectoralis</i>	hermit beetle yellow-spotted whiteface
Mollusks	<i>Vertigo angustior</i>	narrow-mouthed whorl snail
Mosses	<i>Buxbaumia viridis</i> <i>Herzogiella turfacea</i> <i>Dicranum viride</i>	green foxtail herzodiella moss dicranum moss

Annex 13e)

Species observed thus far in the proposed biosphere reserve that are nationally red-listed according to the Swedish Species Information Centre in 2010 in the Critically Endangered (CR) category

Organism group	Scientific name	Common name
Fish	<i>Salvelinus umbla</i>	Vättern char
Lichen	<i>Cyphelium notarisii</i>	soot lichen

Annex 13f)

Species observed thus far in the proposed biosphere reserve that are nationally red-listed according to the Swedish Species Information Centre in 2010 in the Endangered (EN) category

Organism group	Scientific name	Common name
Mammals	<i>Barbastella barbastellus</i>	Barbastelle bat
Birds	<i>Podiceps nigricollis</i> <i>Remiz pendulinus</i>	black-necked grebe European penduline tit
Vascular plants	<i>Euphrasia rostkoviana</i> ssp. <i>Fennica</i> <i>Gentianella campestris</i> <i>Lappula squarrosa</i> <i>Taraxacum subalpinum</i> <i>Vicia pisiformis</i>	eyebright field gentian European stickseed dandelion species pea vetch
Lichen	<i>Caloplaca biatorina</i> <i>Chaenotheca cinerea</i> <i>Pyrenula nitidella</i> <i>Sphinctrina leucopoda</i>	Visingsö lichen – – frosted glass-whiskers
Moss	<i>Dicranum viride</i> <i>Apometzgeria pubescens</i> <i>Didymodon sinuosus</i>	dicranum moss downy veilwort wavy beard moss
Beetle	<i>Pedostrangalia revestita</i>	black-and-red longhorn beetle
Fungus	<i>Elaphomyces striatosporus</i>	–

Annex 13g)

Species observed thus far in the proposed biosphere reserve that are nationally red-listed according to the Swedish Species Information Centre in 2010 in the Vulnerable (VU) category

Organism group	Scientific name	Common name
Mammal	<i>Lutra lutra</i>	European otter
Butterfly	<i>Digitiivalva arnicella</i>	–
Butterfly	<i>Eustroma reticulata</i>	netted carpet
Birds	<i>Alcedo atthis</i> <i>Anas querquedula</i> <i>Carduelis cannabina</i> <i>Carpodacus erythrinus</i> <i>Emberiza hortulana</i> <i>Falco peregrinus</i> <i>Motacilla flava flava</i> <i>Numenius arquata</i> <i>Pernis apivorus</i> <i>Porzana porzana</i> <i>Philomachus pugnax</i> <i>Serinus serinus</i>	common kingfisher garganey linnet common rosefinch ortolan bunting peregrine falcon yellow wagtail Eurasian curlew honey buzzard spotted crane ruff European serin
Reptile	<i>Coronella austriaca</i>	smooth snake
Vascular plants	<i>Camelina microcarpa</i> <i>Carex hartmanii</i> <i>Fraxinus excelsior</i> <i>Lathyrus tuberosus</i> <i>Leonurus cardiaca</i> <i>Malva pulsilla</i> <i>Stellaria neglecta</i> <i>Ulmus glabra</i> <i>Thymus pulegoides</i> <i>Carex pulicaris</i> <i>Pulsatilla vulgaris vulgaris</i> <i>Vicia villosa</i>	littlepod false flax Hartman's sedge European ash tuberous pea motherwort – greater chickweed Scots elm broad-leaved thyme flea sedge common pasqueflower hairy vetch
Lichen	<i>Arthonia byssacea</i> <i>Bacidia incompta</i> <i>Bryoria bicolor</i> <i>Calicium abietinum</i> <i>Cybebe gracilentia</i> <i>Lecanographa amylacea</i> <i>Evernia divaricata</i> <i>Megalania grossa</i> <i>Menegazzia terebrata</i> <i>Opegrapha vermicellifera</i> <i>Pannaria conoplea</i> <i>Physconia grisea</i> <i>Ramalina obtusata</i> <i>Sphinctrina turbinata</i>	dot lichen sap-groove lichen two-colour horsehair lichen spike lichen – – ring lichen megalania lichen treeflute species of scribble lichen – shield lichen obtuse cartilage lichen –
Mosses	<i>Calyptogeia suecica</i> <i>Didymodon spadiceus</i> <i>Plasteurynchium striatulum</i> <i>Lophozia ascendens</i>	– wavy beard moss lesser striated feather-moss –
Beetles	<i>Abraeus granulum</i> <i>Euryusa sinuata</i> <i>Atomaria nigripennis</i> <i>Anisoxya fuscula</i>	species of clown beetle – – –

Organism group	Scientific name	Common name
	<i>Dinothenarus pubescens</i>	–
	<i>Pseudoglenes pentatomus</i>	–
	<i>Xyletinus ater</i>	–
	<i>Xyletinus longitarsis</i>	–
Fungi	<i>Biscogniauxia cinereolilacina</i>	–
	<i>Clavaria zollingeri</i>	violet coral
	<i>Clavulinopsis cinereoides</i>	–
	<i>Elaphomyces anthracinus</i>	–
	<i>Geastrum minimum</i>	tiny earthstar
	<i>Gloeoporus pannocinctus</i>	–
	<i>Hapalopilus salmonicolor</i>	–
	<i>Hydnellum geogenium</i>	–
	<i>Hygrocybe citrinovirens</i>	citrine waxcap
	<i>Hygrocybe ingrata</i>	–
	<i>Hygrocybe radiata</i>	slender waxcap
	<i>Hygrocybe ovina</i>	blushing waxcap
	<i>Hygrocybe spadicea</i>	date waxcap
	<i>Hypoxylon vogesiacum</i>	–
	<i>Inonotus cuticularis</i>	clustered bracket
	<i>Inonotus dryadens</i>	oak bracket
	<i>Lepiota ochraceofulva</i>	–
	<i>Lepiota grangei</i>	green dapperling
	<i>Lycoperdon mammiforme</i>	flaky puffball
	<i>Oligoporus guttulatus</i>	–
	<i>Oligoporus placenta</i>	–
	<i>Pycnoporellus fulgens</i>	–
	<i>Vohariella bombycina</i>	silky rosegill

The proposed biosphere reserve has 300 observed species in the Near Threatened (NT) category, 4 observed species in the Data Deficient (DD) category and 3 observed species in the Regionally Extinct (RE) category.

Annex 13h)

Species of financial significance

The species of financial significance listed below are a rough selection. There are additional important crops and animals in these groups, but we have listed those judged to have the greatest relevance in the proposed biosphere reserve.

Group	Latin name	Common name
Agriculture, crops	<i>Brassica campestris, var. oleifera</i>	field mustard
	<i>Brassica napus ssp. napus</i>	oilseed rape
	<i>Hordeum vulgare</i>	barley
	<i>Secale cereale</i>	rye
	<i>Solanum tuberosum</i>	potato
	<i>Triticum aestivum</i>	wheat
	<i>Ribes rubrum / nigrum</i>	currants
	<i>Malus domestica</i>	apple
	<i>Fragaria × ananassa</i>	garden strawberry
Agriculture, animals	<i>Apis mellifera</i>	western honeybee
	<i>Bos taurus</i>	cattle
	<i>Equus caballus</i>	horse
	<i>Ovis aries</i>	sheep
Forestry	<i>Picea abies</i>	Norway spruce

Group	Latin name	Common name
	<i>Betula pendula</i> <i>Populus tremula</i> <i>Pinus sylvestris</i> <i>Quercus robur</i>	silver birch aspen Scots pine pedunculate oak
Fishing	<i>Esox lucius</i> <i>Pacifastacus leniusculus</i> <i>Perca fluviatilis</i> <i>Coregonus acronius</i> <i>Salmo salar</i> <i>Salvelinus umbla</i>	northern pike signal crayfish European perch common whitefish Atlantic salmon char
Hunting	<i>Alces alces</i> <i>Capreolus capreolus</i> <i>Dama dama</i> <i>Sus scrofa</i>	elk European roe deer fallow deer wild boar

Annex 13i)

Characteristic species for Lake Vättern

Group	Latin name	Common name
Vascular plants	<i>Isoetes echinospora</i> <i>Isoetes lacustris</i> <i>Plantago uniflora</i> <i>Lobelia dortmannia</i> <i>Eleocharis acicularis</i> <i>Subularia aquatica</i> <i>Potamogeton sp.</i>	spiny-spored quillwort lake quillwort shoreweed water lobelia needle spikerush awwort pondweeds
algae	<i>Chara sp.</i> <i>Nitella sp.</i>	muskgrass brittleworts
Insects	<i>Heptagenia sulphurea</i> <i>Dinocras cephalotes</i> <i>Diura bicandata</i> <i>Hydropsyche contubernalis</i> <i>Hydropsyche pellucidula</i> <i>Ephemera vulgata</i> <i>Ephemera danica</i> <i>Baetis fuscatus-scambus</i> <i>Rhyacophila nubila</i> <i>Limnius volckmari</i>	yellow may – – marbled sedge grey flag caddisfly green drake green drake pale watery – –
Mollusks	<i>Ancylus fluviatilis</i> <i>Radix peregra-orata</i>	river limpet wandering pond snail
Crustaceans	<i>Gammarus pulex</i> <i>Pacifastacus leniusculus</i> <i>Monoporeia affinis</i> <i>Saduria (mesidotbea) entemon</i> <i>Pallasea quadrispinosa</i> <i>Mysis relicta</i> <i>Gammaracanthus lacustris</i> <i>Limnocalanus macrurus</i>	river shrimp signal crayfish – – – opossum shrimp – –
Fish	<i>Coregonus albula</i> <i>Coregonus lavaretus</i> <i>Lampetra fluviatilis</i> <i>Salvelinus umbla</i>	common whitefish vendace European river lamprey char

Group	Latin name	Common name
	<i>Salmo trutta trutta</i>	trout
	<i>Thymallus thymallus</i>	grayling
	<i>Myoxocephalus quadricornis</i>	fourhorn sculpin
	<i>Osmerus ederlanus</i>	smelt
Birds	<i>Mergus merganser</i>	goosander
	<i>Gavia arctica</i>	black-throated diver
	<i>Actitis hypoleucos</i>	common sandpiper
	<i>Pandion haliaetus</i>	osprey
	<i>Branta leucopsis</i>	barnacle goose
	<i>Mergus serrator</i>	red-breasted merganser
	<i>Phalacrocorax carbo</i>	great cormorant
	<i>Haematopus ostralegus</i>	Eurasian oystercatcher
	<i>Larus ridibundus</i>	black-headed gull
	<i>Larus canus</i>	common gull
	<i>Larus argentatus</i>	herring gull
	<i>Sterna hirundo</i>	common tern

Annex 13j)

Characteristic species for eutrophic waters

Group	Latin name	Common name
Vascular plants	<i>Nuphar lutea</i>	yellow water lily
	<i>Nymphaea alba</i>	European white water lily
	<i>Persicaria amphibia</i>	water knotweed
	<i>Phragmites australis</i>	common reed
	<i>Potamogeton natans</i>	broad-leaved pondweed
	<i>Schoenoplectus lacustris</i>	common club rush
	<i>Myriophyllum spicatum</i>	Eurasian water-milfoil
	<i>Potamogeton crispus</i>	curly-leaf pondweed
	<i>Botumus umbellatus</i>	flowering rush
	<i>Rumex hydrolaphatum</i>	great water dock
Leeches	<i>Erpobdella octoculata</i>	freshwater leech
	<i>Helobdella stagnalis</i>	–
Insects	<i>Lype sp</i>	caddisfly family
Mollusks	<i>Anodonta xx</i>	swan mussel
Crustaceans	<i>Pacifastacus leniusculus</i>	signal crayfish
	<i>Asellus aquaticus</i>	water louse
Birds	<i>Acrocephalus scirpaceus</i>	Eurasian reed warbler
	<i>Acrocephalus schoenobaenus</i>	sedge warbler
	<i>Mergus merganser</i>	goosander
	<i>Pandion haliaetus</i>	osprey
	<i>Circus aeruginosus</i>	western marsh-harrier
	<i>Botaurus stellaris</i>	Eurasian bittern
	<i>Emberiza schoeniclus</i>	reed bunting
	<i>Fulica atra</i>	Eurasian coot
Fish	<i>Abramis brama</i>	common bream
	<i>Esox lucius</i>	northern pike
	<i>Perca fluviatilis</i>	European perch
	<i>Rutilus rutilus</i>	roach
	<i>Sander lucioperca</i>	zander
Mammal	<i>Lutra lutra</i>	European otter
	<i>Myotis daubentonii</i>	Daubenton's bat

Annex 13k)

Characteristic species for oligotrophic waters

Group	Latin name	Common name
Vascular plants	<i>Nuphar lutea</i>	yellow water lily
	<i>Nymphaea alba</i>	European white water lily
	<i>Phragmites australis</i>	common reed
	<i>Potamogeton natans</i>	broad-leaved pondweed
	<i>Schoenoplectus lacustris</i>	common club rush
	<i>Isoetes echinospora</i>	spiny-spored quillwort
	<i>Isoetes lacustris</i>	lake quillwort
	<i>Plantago uniflora</i>	shoreweed
	<i>Lobelia dortmannia</i>	water lobelia
	<i>Myriophyllum alterniflorum</i>	water milfoil
algae	<i>Nostoc zetterstedtii</i>	–
Insects	<i>Amphinemura sulcicollis</i>	toothed brown stonefly
	<i>Capnia bifrons</i>	–
	<i>Ephemera danica</i>	green drake
	<i>Elmis aenea</i>	rifle beetle
Mollusks	<i>Ancylus fluviatilis</i>	river limpet
	<i>Anodonta anatina</i>	duck mussel
Crustaceans	<i>Pacifastacus leniusculus</i>	signal crayfish
	<i>Gammarus pulex</i>	river shrimp
Fish	<i>Esox lucius</i>	northern pike
	<i>Coregonus albula</i>	common whitefish
	<i>Coregonus lavaretus</i>	vendace
	<i>Lampetra fluviatilis</i>	European river lamprey
	<i>Perca fluviatilis</i>	European perch
	<i>Salvelinus umbla</i>	char
Birds	<i>Cinclus cinclus</i>	white-throated dipper
	<i>Motacella cinerea</i>	grey wagtail
	<i>Bucephala clangula</i>	common goldeneye
	<i>Mergus merganser</i>	goosander
	<i>Gavia arctica</i>	black-throated diver
	<i>Podiceps cristatus</i>	great crested grebe
	<i>Actitis hypoleucos</i>	common sandpiper
Mammal	<i>Lutra lutra</i>	European otter

Annex 13l)

Characteristic species for hardwood forests

Group	Latin name	Common name
Vascular plants	<i>Allium ursinum</i>	wild garlic
	<i>Anemone ranunculoides</i>	yellow wood anemone
	<i>Hepatica nobilis</i>	common hepatica
	<i>Mercurialis perennis</i>	dog's mercury
	<i>Poa nemoralis</i>	wood bluegrass
	<i>Hedera helix</i>	common ivy
	<i>Stellaria nemorum</i>	wood stitchwort
Mosses	<i>Eurhynchium angustirete</i>	–
	<i>Metzgeria furcata</i>	forked veilwort
	<i>Plagiobhila asplenoides</i>	featherwort
	<i>Plagiommium undulatum</i>	hart's tongue thyme moss

Group	Latin name	Common name
	<i>Rhytidiadelphus triquetrus</i> <i>Ulota crispa</i>	shaggy moss crisped pincushion
Fungi	<i>Boletus sp</i> <i>Phallus impudicus</i> <i>Skeletocutis nivea</i> <i>Phellinus igniarius</i> <i>Ganoderma applanatum</i> <i>Tremella foliacea</i> <i>Phellinus robustus</i>	boletes common stinkhorn hazel bracket willow bracket artist's bracket brown witch's butter robust bracket
Lichen	<i>Graphis scripta</i> <i>Opegrapha varia</i> <i>Lobaria pulmonaria</i>	common script lichen scribble lichen lung lichen
Mammal	<i>Meles meles</i>	European badger
Birds	<i>Columba aenas</i> <i>Dendrocopus minor</i> <i>Hippolais icterina</i>	stock dove lesser spotted woodpecker icterine warbler
Reptiles and amphibians	<i>Coronella austriaca</i>	smooth snake
Mollusks	<i>Succinea oblonga</i> <i>Bradybaena fruticum</i> <i>Ena obscura</i> <i>Aegopinella nitidula</i> <i>Euomphalia strigella</i> <i>Perforatella incarnata</i>	small amber snail – lesser bulin waxy glass snail – –
Arachnids	<i>Amaurobius fenestralis</i> <i>Segestria senocolata</i>	window lace-weaver snake-back spider
Insects	<i>Gnorimus nobilis</i> <i>Conopalpus testaceus</i> <i>Ampedus nigroflavus</i> <i>Anaglyptus mysticus</i> <i>Satyrinum w-album</i>	noble chafer – – rufous-shouldered longhorn beetle white-letter hairstreak

Annex 13m)

Characteristic species for coniferous and mixed forests

Group	Latin name	Common name
Vascular plants	<i>Calluna vulgaris</i> <i>Deschampsia flexuosa</i> <i>Epilobium angustifolium</i> <i>Galeopsis bifida</i> <i>Linneaea borealis</i> <i>Luzula pilosa</i> <i>Melampyrum pratense</i> <i>Oxalis acetosella</i> <i>Pteridium aquilinum</i> <i>Rubus idaeus</i> <i>Senecio sylvaticus</i> <i>Vaccinium myrtillus</i> <i>Vaccinium vitis-idaea</i>	heather wavy-hair grass fireweed small hemp-nettle twinflower hairy woodrush common cow-wheat common wood sorrel common bracken red raspberry woodland ragwort common bilberry cowberry (lingonberry)
Mosses	<i>Dicranum polysetum</i> <i>Dicranum scoparium</i> <i>Hylocomium splendens</i> <i>Hypnum cupressiforme</i>	wavy dicranum dicranum moss glittering wood moss cypress-leaved plait-moss

Group	Latin name	Common name
	<i>Isotbecium alopecuroides</i> <i>Plagiomnium affine</i> <i>Pleurozium schreberi</i> <i>Ptilidium pulcherrimum</i> <i>Sphagnum girgensobnii</i>	larger mouse-tail moss many-fruited thyme moss big red stem moss naugehyde liverwort Girgensohn's sphagnum
Fungi	<i>Fomitopsis pinicola</i> <i>Trichaptum abietinum</i> <i>Russula</i> <i>Suillus, Xerocomus, Tylopilus, Leccinum</i> <i>Piptoporus betulinus</i> <i>Fomes fomentarius</i> <i>Leccinum scabrum</i> <i>Stereum hirsutum</i> <i>Inonotus radiatus</i> <i>Antrodiella boehnelii</i> <i>Stereum subtomentosum</i> <i>Sparassis crispa</i>	red banded polypore purplepore bracket – boletales birch bracket tinder fungus birch bolete hairy curtain crust alder bracket apricot club yellow curtain crust cauliflower mushroom
Lichen	<i>Cladonia sp</i> <i>Peltigera polydactyla</i> <i>Usnea sp</i> <i>Bryoria sp</i>	reindeer lichen finger lichen beard lichen horsehair lichen
Mammal	<i>Martes martes</i>	European pine marten
Arachnids	<i>Araneus diadematus</i> <i>Erigone sp</i> <i>Evercha falcata</i> <i>Linyphia triangularis</i>	European garden spider dwarf spiders jumping spider hammock weaver
Mollusks	<i>Aegopinella pura</i>	clear glass snail
Insects	<i>Aegomorphus clavipes</i> <i>Necydalis major</i> <i>Aderus populneus</i> <i>Mycetina cruciata</i> <i>Microrhagus lepidus</i> <i>Catocala fraxini</i> <i>Limenitis populi</i>	– – antlike leaf beetle handsome fungus beetle click beetles blue underwing poplar admiral
Birds	<i>Glaucidium passerinum</i>	Eurasian pygmy owl
Reptiles/amphibians	<i>Rana arvalis</i>	moor frog

Annex 13n)

Characteristic species for arable land

Group	Latin name	Common name
Vascular plants	<i>Epilobium adenocaulon</i> <i>Fumaria officinalis</i> <i>Lamium purpureum</i> <i>Malus domestica</i> <i>Ribes nigrum</i> <i>Satellaria media</i> <i>Tripleurospermum perforatum</i>	American willowherb common fumitory red dead-nettle apple tree blackcurrant common chickweed scentless false mayweed
Mosses	<i>Leucodon sciuroides</i>	squirrel-tail moss
Fungi	<i>Monilia fructigena, sclerotinia fructigena</i> <i>Erysiphe graminis</i>	fruit rot powdery mildew
Lichen	<i>Xanthoria parietina</i>	golden shield lichen

Group	Latin name	Common name
	<i>Lasallia pustulata</i>	rock tripe
Mammal	<i>Mustela nivalis vulgaris</i>	stoat
Birds	<i>Oenanthe oenanthe</i>	northern wheatear
Reptiles and amphibians	<i>Natrix natrix</i>	grass snake
Mollusks	<i>Vallonia costata</i>	–
Arachnids	<i>Trochosa terricola</i>	ground wolf spider
	<i>Philodromus collinus</i>	running crab spider
Insects	<i>Sitobion avenae</i>	grain aphid
	<i>Auchenorrhyncha</i>	leafhoppers, treehoppers, planthoppers
	<i>Carabidae</i>	ground beetles
	<i>Bombus distinguendus</i>	great yellow bumblebee

Annex 13o)

Characteristic species for natural grasslands

Group	Latin name	Common name
Vascular plants	<i>Agrostis capillaris</i>	common bent
	<i>Alchemilla sp</i>	lady's mantle
	<i>Betula pendula</i>	birch
	<i>Cirsium palustre</i>	marsh thistle
	<i>Corylus avellana</i>	common hazel
	<i>Filipendula ulmaria</i>	meadowsweet
	<i>Filipendula vulgaris</i>	fern-leaf dropwort
	<i>Fraxinus excelsior L.</i>	European ash
	<i>Geranium sylvaticum</i>	wood cranesbill
	<i>Lathyrus linifolius</i>	bitter vetch
	<i>Pimpinella saxifraga</i>	burnet saxifrage
	<i>Poa pratensis</i>	smooth meadow grass
	<i>Polygala vulgaris</i>	common milkwort
	<i>Potentilla erecta</i>	tormentil
	<i>Prunus avium</i>	wild cherries
	<i>Quercus robur</i>	English oak
	<i>Ranunculus repens</i>	creeping buttercup
<i>Scorzonera humilis</i>	viper's grass	
<i>Succisa pratense</i>	devil's bit scabious	
<i>Geum rivale</i>	water avens	
Mosses	<i>Orthotrichum sp</i>	orthotrichum mosses
	<i>Hedwigia ciliaris</i>	–
Fungi	<i>Phellinus robustus</i>	robust bracket
	<i>Macrolepiota procera</i>	parasol mushroom
	<i>Hygrocybe</i>	waxcaps
	<i>Lecanum scabrum</i>	birch bolete
	<i>Grifola frondosa</i>	hen of the woods
	<i>Xylobolus frustulatus</i>	oak mosaic fungus
	<i>Lecanum quercinum</i>	orange oak bolete
	<i>Marasmius oreades</i>	scotch bonnet
	<i>Geoglossum</i>	earthtongue
<i>Clavulinopsis corniculata</i>	meadow coral	
Lichen	<i>Gyalecta ulmi</i>	elm's gyalecta
	<i>Lecanora epanora</i>	rim lichen
	<i>Evernia prunastri</i>	oakmoss
	<i>Pertusaria amara</i>	bitter wart lichen

Group	Latin name	Common name
	<i>Chrysothrix candelaris</i> <i>Calicium viride</i> <i>Lecanora varia</i>	mustard powder lichen spike lichen rim lichen
Mammal	<i>Mustela erminea</i>	ermine
Birds	<i>Sylvia communis</i> <i>Jynx torquilla</i>	greater whitethroat Eurasian wryneck
Reptiles and amphibians	<i>Triturus cristatus</i> <i>Rana temporaria</i> <i>Vipera berus</i> <i>Anguis fragilis</i> <i>Lacerta vivipara</i>	great crested newt common frog European adder slow worm viviparous lizard
Mollusks	<i>Vertigo sp.</i>	–
Arachnids	<i>Micrommata virescens</i> <i>Misumena vatia</i>	green huntsman spider flowering crab spider
Insects	<i>Zygaena sp.</i> <i>Hesperia comma</i> <i>Cupido minimus</i> <i>Digitivalva arnicella</i> <i>Cryptophagus micaceus</i> <i>Phloeophagus sp.</i> <i>Notorbina muricata</i> <i>Vespa crabro</i>	burnets silver-spotted skipper small blue – silken fungus beetle genus of weevils – European hornet

Annex 13p)

Characteristic species for built-up areas

Group	Latin name	Common name
Vascular plants	<i>Aegopodium podagraria</i> <i>Armeria maritima</i> <i>Arrhenatherum elatius</i> <i>Bellis perennis</i> <i>Chenopodium polyspermum</i> <i>Euphorbia peplus</i> <i>Euphrasia stricta</i> <i>Galium verum</i> <i>Juncus bufonius</i> <i>Linaria repens</i> <i>Linaria vulgaris</i> <i>Lupinus polyphyllus</i> <i>Lycopersicon esculentum</i> <i>Oxalis stricta</i> <i>Physalis peruviana</i> <i>Plantago major</i> <i>Plantago maritima</i> <i>Quercus robur</i> <i>Solidago canadensis</i> <i>Taraxacum ap.</i>	ground elder sea thrift false oat grass daisy many-seeded goosefoot petty spurge drug eyebright lady's bedstraw toad rush pale toadflax common toadflax large-leaved lupine tomato common yellow woodsorrel cape gooseberry greater plantain sea plantain English oak Canada goldenrod dandelion
Mosses	<i>Syntrichia ruralis</i> <i>Rhytidiadelphus squarrosus</i> <i>Cephalozia bicuspidata</i>	sandhill screw moss springy turf moss two-horned pincerwort
Fungi	<i>Coprinus comatus</i> <i>Penicillium</i>	shaggy ink cap common mould

Group	Latin name	Common name
	<i>Armillaria mellea</i> <i>Marasmius oreades</i> <i>Lycoperdon</i> <i>Daedalea quercina</i>	honey mushroom scotch bonnet puffball mushrooms oak mazegill
Lichen	<i>Anaptychia ciliaris</i>	eagle's claws
Mammals	<i>Capreolus capreolus</i> <i>Mus musculus</i> <i>Erinaceus europaeus</i> <i>Talpa europaea</i> <i>Pipistrellus pipistrellus</i> <i>Rattus norvegicus</i>	European roe deer house mouse European hedgehog European mole common pipistrelle brown rat
Arachnids	<i>Ixodes ricinus</i> <i>Tegenaria domestica</i> <i>Pardosa monticola</i> <i>Callilepis nocturna</i>	castor bean tick domestic house spider ground wolf spider moon spider
Insects	<i>Aglais urticae</i> <i>Gonepteryx rhamni</i> <i>Musca domestica</i> <i>Lasius niger</i> <i>Vespidae</i> <i>Aromia moschata</i> <i>Cicindela</i>	small tortoiseshell butterfly brimstone butterfly housefly black garden ant wasp musk beetle a genus of tiger beetles
Birds	<i>Cornus monedula</i> <i>Columba</i> <i>Pica pica</i> <i>Fringilla coelebs</i> <i>Phylloscopus trochilus</i> <i>Turdus merula</i> <i>Turdus pilaris</i> <i>Sitta europaea</i> <i>Parus caeruleus</i> <i>Parus major</i> <i>Emberiza citrinella</i>	jackdaw doves and pigeons European magpie chaffinch willow warbler common blackbird fieldfare Eurasian nuthatch blue tit great tit yellowhammer
Reptiles/amphibians	<i>Bufo bufo</i>	common toad
Mollusks	<i>Cepaea hortensis</i>	white-lipped snail

ANNEX 14. LIST OF MAIN BIBLIOGRAPHIC REFERENCES

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ANNEX 15. LIST OF RESEARCH AND MONITORING ACTIVITIES

Examples of abiotic research

Title: *Persistent organic pollutants in benthic foodwebs*. Author: N Holmqvist, Lund University. Year: 2007.

Title: *Weichselian lithostratigraphy, depositional processes and the deglaciation pattern in the southern Vättern basin, south Sweden*. Author: D Waldermarsson, Lund University. Year: 1986.

Title: *On the chemical state and mobility of lead and other trace elements at the biogeosphere/technosphere interface*. Author: M Bäckström, Örebro University. Year: 2002.

Title: *Photochemical Alterations of Dissolved Organic Matter – Impact on Heterotrophic Bacteria and Carbon Cycling in Lakes*. Author: S. Bertilsson, Linköping University. Year: 1999.

Title: *Roadmap for Trend Detection and Assessment of Data Quality*. Author: K Wahlin, Linköping University. Year: 2008.

Title: *The different roles of crayfish in benthic food webs*. Author: P Stenroth, Lund University. Year: 2005.

Title: *Dynamics of omnivorous crayfish in Freshwater Ecosystems*. Author: K Olsson, Lund University. Year: 2008.

Title: *Omvandling av organiskt kväve till nitrat i Vättern [Conversion of organic nitrogen to nitrates in Lake Vättern]*. Author: E von Wachenfeldt, Uppsala University. Year: 2002.

Title: *Konsekvenser av höga nitrathalter i Vättern [Consequences of high nitrate levels in Lake Vättern]*. Author: E Nandorf, Uppsala University. Year: 2002.

Title: *Ursprung och utnyttjande av kolpoolen i sjöar med olika humus- och trofistatus [Origin and usage of the carbon pool in lakes with different humus and trophic states]*. Author: E Kritzberg, Lund University. Year: 2002.

Title: *Öring i Vätternbäckar [Trout in streams around Lake Vättern]*. Author: Mikael Ljung University of Gothenburg. Year: 2005.

Title: *Näringsvävsmodellering i Vättern [Food web modelling in Lake Vättern]*. Author: Dahl & Rosenqvist, Uppsala University. Year: 2005.

Title: *En näringsvävsanalys för att undersöka storrödningens tillbakagång i Vättern [A food web analysis to examine the decline of Vättern char]*. Author: M Setzer, University of Skövde. Year: 2005.

Title: *Fiskeundersökningar i Vätterns strandzon [Fishing surveys in the Lake Vättern shoreline zone]*. Author: J Norrgård, University of Gothenburg. Year: 2004.

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- Remote-sensing analysis of water quality in Lake Vättern. Swedpower Water Cons.
- The char food web. University of Skövde
- Hydrographic bottom mapping. Stockholm University
- Climatic effects. Uppsala University

- Pharmaceutical remnants in the environment. Linköping University
- Decomposition of humus. Uppsala University
- Organic carbon in Lake Vättern. Lund University
- Paleolimnologic study. Umeå University
- Transformation of organic environmental toxins. Lund University
- No-fishing areas for char. Swedish Board of Fisheries
- Joint administration of fishing. Stockholm University

Examples of abiotic environmental monitoring

- Water chemistry in the southern part of Lake Vättern, phytoplankton
- Environmental toxins in Vättern char
- Fish monitoring
- Run-off from utilised forest lands: water chemistry sampling 2x per month
- Breeding birds in Lake Vättern
- Environmental toxins in signal crayfish (Water Conservation Association)
- Coordinated recipient sampling
- Svartån River drainage basin
- Water chemistry in Lake Vänstern
- Trending waterways
- Röttleån River – water chemistry, biological studies
- Precipitation/ozone measurements
- Visingsö Island F21A – Metals in precipitation, ground-level ozone
- Värnvik F12A – Crown Drip Measurement Network
- Kettle holes in the Huskvarnaån River: (a report from the regional environmental monitoring in the County of Jönköping)
- Liming in the Municipality of Jönköping 1999–2001. Goal achievement and effects: a report from liming in the County of Jönköping
- Lake Landsjön – threats and future
- Spread of road-traffic pollutants to Lake Vättern and its tributaries – with a study of two Vättern streams along the E4
- Description of the alkaline rock types at the Norra Kärr fen – a geological guide

Examples of biotic research

Title: *Från odugligt berg till nyckelbiotop – om förändringar i mosaiklandskapet i Östra Vätterbranterna från storskiftet till idag* [From worthless hills to key habitat – on changes in the mosaic landscape of the East Vättern Scarp Landscape from the great 19th-century land reform to today]. Author: J Guslén. Year: 2008.

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Title: *Quantification of changes in oak habitats from the 18th century until today in south-east Sweden*. Author: S Jonsson. Year: 2007.

Title: *Landskapsekologisk undersökning av ädellövskogen i Östra Vätterbranterna* [Geological landscape study of the hardwood forests in the East Vättern Scarp Landscape]. Author: L Adamsson, Lund University. Year: 2010.

Examples of biotic environmental monitoring

- Habitat survey in waterways (Narbäcken, Röttleån, Huskvarnaån, Lillån and Stensjöån) and lakes (Ramsjön and others)
- Rich fens
- Trees worth protecting
- Swedish bird survey
- Bats
- Flora monitoring
- Large diurnal butterflies in meadows and pasturelands
- Microhabitats in the agricultural landscape
- Game birds
- Mapping of old burns from satellite data
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- Birds on northern Visingsö Island, published in 1982
- Nature conservation survey of plant ecology on the Västana scarp toe with the Röttleån River in the Municipality of Jönköping
- Hultarp, Municipality of Jönköping – Botanical survey
- Mosses of Åsabäcken Stream, Study of the moss flora in a key habitat on Mount Grännaberget
- Strands Ravine, a part of the Huskvarnabergen Nature Reserve in the Municipality of Jönköping – plant ecology study
- General survey of vegetation in a broadleaf deciduous forest area northeast of Kaxholmen. With suggested stewardship measures.
- Signesbo, Municipality of Jönköping – Botanical survey
- Habitat survey of five Vättern streams in 1999: Narbäcken, Röttleån, Ölandsbäcken, Vätterslundsäcken and Huskvarnaån
- Fauna corridors along five waterways on the eastern side of Lake Vättern: Narbäcken, Röttleån, Ölandsbäcken, Vätterslundsäcken and Huskvarnaån
- Bat survey in the County of Jönköping, field report, 2000
- Environmental monitoring of breeding bird species in the County of Jönköping, 2002–2007
- Tidans drainage basin: assessment of the natural values of waterways in the County of Jönköping, 2005
- Vättern tributaries in the County of Jönköping: assessment of the natural values of waterways, 2007
- Evaluation of electrofishing in the Municipality of Jönköping, 1999–2001.
- Evaluation of electrofishing in the Municipality of Jönköping, 2002–2004: Goal achievement and effects: a report from liming in the County of Jönköping
- Vättern trout. Does the distance from Lake Vättern make a difference to the trout populations in four Vättern streams?
- Great crested newt (*Triturus cristatus*) – survey in the eastern part of the County of Jönköping, 2004
- Meadows and pasturelands in the Municipality of Jönköping 1999–2001. Parts 1 and 2

Examples of socio-economic research

Title: *Ekobussen – en rullande naturskola i Jönköping. Deltagarnas uppfattningar om samverkan och den pedagogiska modellen* [The eco-bus – a nature school on wheels in Jönköping. Participants' thoughts on collaboration and the educational model]. Author: P König. Year: 2005.

Title: *Kopplingen mellan tätort och tätortsnära natur – En undersökning i biosfärområde Östra Vätterbranterna* [The link between cities and nearby natural areas – a study in the East Vättern Scarp Landscape Biosphere Reserve]. Author: M Bjernhagen. Year: 2008.

Title: *Östra Vätterbranterna – Resilience in Social-ecological systems (SES)*. Author: K Käll, Stockholm University. Year: 2006.

Title: “*Vid höglandets rand*” [At the edge of the highlands] research questions formulated before the development of land areas for a new road between Öggestorp and Åkarp in Rogberga Parish. The surveys so far have resulted in two theses:

Title: *Vegetation and land-use in Småland Uplands, southern Sweden, during the last 6000 years*. Author: P Lagerås. 1996.

Title: *Landskapsutnyttjande, bete och odling på Sydsvenska höglandet under äldre järnålder, Exemplet Öggestorp* [Landscape use, grazing and growing on the South-Swedish Highlands in the early Iron Age. A study of Öggestorp]. Author: L Häggström. Year: 2005.

Title: *Ängs- och betesmarkers betydelse för fastighetsvärden* [Importance of meadows and grazing lands for property values]. Swedish Board of Agriculture report 2010:5.

Title: “*Visingsö – Vätterns pärla*” [Visingsö, Gem of Lake Vättern] research questions about Visingsö Island presented in a report with several separate articles. Editor: P Nicklasson. Year: 1998.

Title: *Råg och rön. Om mat, människor och landskapsförändringar i norra Småland, ca 1550-1700* [Food, people and landscape changes in Northern Småland c. 1550–1700]. Author: Å Vestbö-Franzén, Stockholm University. Year: 2005.

Title: *Visingsös bebyggelse och landskap i äldre lantmäterikartor och 1500-talets handlingar* [Buildings and landscape on Visingsö in older survey maps and 16th-C documents]. Author: J Agertz & Å Vestbö-Franzén, County Museum of Jönköping. Year: 2008.

Title: *Extra Muros – on the results of research studies in the ‘outer area’ around the ruins of Näs Castle on Visingsö*. Author: Kristina Jansson, County Museum of Jönköping. Year: 2004.

Title: *Storbög från yngre järnåldern* [Late Iron-Age burial mound]. Author: Påvel Nicklasson, Lund University. Report from student digs in Skärstad Parish in a joint project between the Department of Archaeology and Ancient History at Lund University and the County Museum of Jönköping. Year: 1993–94.

Title: “*Bollarps gård, Vireda socken*”. Research study of a previously unknown abandoned medieval farm. Author: County Museum of Jönköping in collaboration with the Vireda local history society. Year: 1995–96, with a follow-up in 2008.

Title: *A matter of trust – Social interaction in a nature conservation issue in the Eastern Slopes of Lake Vättern*. Author: B Berglund, SLU. Year: 2010.

Title: *Iron Age and Medieval regional settlement dynamics and agropastoral strategies in Jönköpings län, Vista and Treta härad*. Research project headed by T L. Thurston, University at Buffalo, State University of New York in collaboration with the County Museum of Jönköping. Year: Field work began in Bredestadsdalen Valley in 2009 and will continue on Visingsö in 2010.

Other socio-economic studies

Visingsös landskapsbistoria i ny belysning [Visingsö's landscape history in a new light]. This article is a part of a series that is still being published within the framework of the Visingö Project network. Title: *Bebyggelsehistorisk tidskrift* nr 57, 2009. Author: Å Vestbö-Franzén, County Museum of Jönköping.

Kulturlandskap under vatten [Cultural landscape under water]. Ongoing interdisciplinary research project on marine relics in the Huskvarnaviken Bay. Joint project between the Swedish National Heritage Board, the County Museum of Jönköping and Södertörn University. Report from UV Stockholm 1996:97 (Mikael Nordström and Johan Rönnby: Marine archaeological study of the Huskvarnaviken Bay) and report 2005:18 from the County Museum of Jönköping (Mikael Nordström and Johan Rönnby: Trial dig in a potential medieval cairn in Huskvarnaviken Bay).

The Hyllinge Find in the parish of Skärstad. Planned research study by the County Museum of Jönköping in collaboration with the County Administrative Board at the site of a Bronze-Age tip find.

“Visingsö’s value-creation power” preliminary study by Pia Juusola, doctoral student in economics at the Jönköping International Business School. The preliminary study was initiated by the Swedish National Heritage Board as a complement to the established management plan for the Visingsborg Castle ruin. It will also form the basis of a future doctoral thesis on the economic value of cultural heritage, which will study the interaction between property and other cultural parameters to indicate whether the cultural heritage and environment of specific cultural objects generate economic values for various groups in the community.

Examples of socio-economic monitoring

- Waterside living: A method of varying the conservation value of shoreline areas
- Bearers of Tradition – a summary of expertise about pollarded trees and harvesting of leaves in the East Vättern Scarp Landscape, 2008
- For a follow-up of the economy and demographics, see the statistical yearbook for the Municipality of Jönköping at <http://www.jonkoping.se/>

ANNEX 16. LETTER OF RECOMMENDATION



SÖDRA



Naturskyddsföreningen



Rekommendationsbrev inför bildandet av biosfärområde Östra Vätterbranterna

Undertecknade organisationer har, allt sedan starten 1998, deltagit i arbetet inom det tidigare projektet, numera biosfärkandidatområdet Östra Vätterbranterna. Vi har aktivt stöttat de många delprojekt som genomförts och har sett Östra Vätterbranterna som ett viktigt område för dialog och samverkan runt landskapets nyttjande och bevarande.

I en trakt som kännetecknas av både höga naturvärden och ett aktivt brukande av skog och jordbrukslandskap har förankringsprocessen hos lokala aktörer hela tiden varit central. Utan medverkan av såväl brukarna som deras organisationer hade projektets framgångar knappast varit möjliga. Naturvårdens organisationer har bidragit med kunskaper både om globala, regionala och lokala bevarandevärden. Ur de tidiga konflikterna har vuxit fram en dialog och samverkan som nu kan tjäna som modell för andra områden i landet med liknande förutsättningar.

Inom ett framtida biosfärområde bedömer vi att det finns stora möjligheter att utveckla en helhetssyn för långsiktigt hållbar utveckling med hänsyn tagen till och aktiv medverkan av skilda intressen från myndigheter, markägare och brukares organisationer samt naturvårdens företrädare.

LRF, Naturskyddsföreningen, Södra skogsägarna och Världsnaturfonden WWF ser processen fram till ansökan om biosfärområde som en god fortsättning på det mer än tioåriga projektet Östra Vätterbranterna och har aktivt deltagit i processen med framtagande av ansökan.

Organisationerna vill härmed uttrycka sitt stöd för ansökan och ser fram emot att bli en del av ett världsomfattande nätverk för hållbar utveckling.

Lars-Göran Pettersson
Förbundsordförande
Lantbrukarnas riksförbund

Mikael Karlsson
Ordförande
Naturskyddsföreningen

Christer Segersten
Ordförande
Södra Skogsägarna

Håkan Wirtén
Generalsekreterare
Världsnaturfonden WWF

ANNEX 16 - TRANSLATION

Letter of recommendation for the establishment of the East Vättern Scarp Landscape Biosphere Reserve

The undersigned organisations have participated in the East Vättern Scarp Landscape collaboration since it began in 1998, even before it evolved into a biosphere reserve candidate. We have actively supported the many sub-projects that have been carried out and have seen the East Vättern Scarp Landscape as an important area for dialogue and collaboration regarding landscape use and conservation.

In an area characterised by high natural values and at the same time active use of forests and agricultural landscapes, it has always been crucial to establish support among local stakeholders. Without the participation of the users and their organisations, the project's successes would not have been possible. Nature conservation organisations have contributed their expertise in global, regional and local conservation values. Dialogue and collaboration have grown out of previous conflicts, and the methods developed can serve as a model for other areas in the country in similar situations.

It is our belief that a future biosphere reserve will have great opportunities to develop a holistic view for long-term sustainable development that takes consideration of and enjoys the active participation of diverse interests from authorities, landowners, user organisations and representatives from nature conservation organisations.

The Federation of Swedish Farmers, the Swedish Society for Nature Conservation, Södra Skogsägarna and the World Wildlife Fund have all actively participated in developing the biosphere reserve nomination. They see the nomination process as a good continuation of the ten-plus-year East Vättern Scarp Landscape project.

The organisations hereby express their support for the nomination and look forward to becoming a part of the worldwide network for sustainable development.

Lars-Göran Pettersson
Chairman
Federation of Swedish Farmers

Mikael Karlsson
Chairman
Swedish Society for Nature Conservation

Christer Segersten
Chairman
Södra Skogsägarna

Håkan Wirten
Secretary General
World Wildlife Fund (WWF)