

# Nedre Dalälven River Landscape

## Biosphere Reserve Nomination Form



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Cover photo: The delta where the Dalälven flows into Färnebofjärden Bay

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## **PART 1: SUMMARY**

### **1. 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]

Nedre Dalälven River Landscape

### **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)

The Nedre Dalälven region is unique because of the significant natural and cultural values created by the river, and because the river forms a clear border zone between the northern and southern flora and fauna of Northern Europe. The entire proposed biosphere reserve is over 308,800 hectares and stretches some 170 km along the lower reaches of the River Dalälven, from inland out to the sea.

The region boasts Scandinavia’s widest range of vertebrates (mammals, birds and fish) and invertebrates at this latitude. The region is home to 487 species on the national red list.

The majority of the lands along the river are designated as nature reserves or Natura 2000 sites. Certain areas are included in the international Ramsar Convention on Wetlands, and a key part of the core area is the Färnebofjärden National Park. The entire area contains some 30 nature reserves.

Large areas surrounding the Nedre Dalälven are of national interest due to their collective natural and cultural values. This is one of 24 areas in the country in which special regulations apply and the interests of active outdoor recreation and tourism are to be given special consideration under section 3.6 of the Swedish Environmental Code (1998:808).

#### **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).

The four county administrative boards have developed regional environmental quality goals. The nine municipalities have local environmental goals all aiming to promote sustainable community development. A biosphere reserve here could have a coordinating function for the region, serving as an example to demonstrate the benefits of collaboration between county administrative

boards, municipalities, universities and other players regarding sustainable community development.

In past decades, the Nedre Dalälven region has experienced gradual depopulation, as the basic industries of agriculture and forestry have evolved, and as a result of structural changes in the steel and iron industries. However, recent years have seen a growing interest in moving to the region. The county administrative boards aim to facilitate regional/local development of the area's industries. The landscape values and location of the region promote tourism companies and entrepreneurs. For many years the region has pursued sustainable development efforts, including several development projects.

For example, 133 Leader+ projects have been carried out. The total resources invested in these projects amounted to at least SEK 130 million. Most of the projects had sustainable development as a clear and important aspect, as the summary below indicates.

According to information provided by the project groups, the projects have contributed to:

- the creation of over 200 new jobs
- the preservation of over 200 jobs
- the creation of over 500 new networks

In an earlier assessment, 90 project teams were surveyed about the effects of their projects as of February 2006. Of these 90 projects, 77% reported improved business acumen, 94% reported an improved climate for collaboration, 93% reported greater faith in the future, 85% reported improvements in entrepreneurship and 87% reported improved skills.

**Table 1**

<b>Examples of projects completed</b>	Culture	Nature	Tourism	Sustainable development
Crafts assessment in Nora parish	x			
From the 18 <sup>th</sup> century to the Internet	x			
Nature's music	x			x
Crafts across county borders	x			
Artisans in the deanery's wing	x		x	
Local costumes of Gästrikland	x			
Folk music festival along the Nedre Dalälven	x		x	x
Fishing network project Leader+ Nedre Dalälven		x	x	x
Marma Future	x	x	x	x
Tourism network	x	x	x	x
The Pråmleden Trail	x	x	x	x
Ecological/resource-conserving construction and housing in Stjärnsund	x			x
Excavation of the Brunn silver mine	x			
Future in the Vik region	x	x	x	x
Miniplantan, a boost for forestry and local entrepreneurs		x		x

### **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).

#### **Research, environmental monitoring and education**

Research has long been conducted in the area, in a range of fields. Offering education measures with regional ties and attracting even more research to the area creates opportunities for a long-term well-functioning community that can make use of the unique resources of the area.

Research and environmental monitoring must be coordinated if projects are to be further developed and realised. This coordination has begun through the efforts of a team of researchers and educators participating in the biosphere reserve nomination project and meeting in the Green House of Knowledge (see below).

### **Gröna Kunskapshuset (the Green House of Knowledge)**

The Green House of Knowledge is a resource centre for knowledge about sustainable land use. Targeting all age groups, it features examples of how the land has been used in the past and present.

### **Naturum**

The Naturum nature centre in Gysinge teaches about the natural and cultural environment in the Färnebofjärden National Park.

### **Information on flora and fauna**

Is provided in the nature reserves

### **Folk high schools**

Färnebo

Sjövik

### **Upper-secondary schools**

Säter, Hedemora and Avesta

The agricultural upper-secondary schools in Jälla and Östby also have some operations in the area

### **Universities with ties to the area:**

Mälardalen University

University of Gävle

Högskolan Dalarna

Uppsala University

Swedish University of Agricultural Sciences

**Environmental monitoring** also has a long tradition in the area, in many sectors.

The aspects of environmental monitoring that are government-funded are coordinated by the Swedish Environmental Protection Agency and the county administrative boards. Monitoring is currently carried out in ten programme areas.

The county administrative boards monitor Sweden's 16 national environmental quality goals. In addition to government-sponsored environmental monitoring, many important studies are carried out here by organisations such as municipalities, air pollution control associations, universities and other institutes of higher education and non-profit organisations. Environmental monitoring in Sweden meets the EU requirements stating that member states must monitor conditions as defined in Natura 2000 and other programmes.

### **Environmental monitoring**

County administrative boards

Municipalities

Swedish Meteorological and Hydrological Institute (SMHI)

Swedish Forest Agency

Dalälvens vattenvårdsförening (Dalälven Water Protection Association)

Air pollution control associations of the counties of Dalarna, Västmanland, Uppsala and Gävleborg

#### **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).

The Nedre Dalälven area has a varied landscape with a range of ecosystems linked to the local habitats. These include a large river with bays, lakes, tributaries and waterways, rapids, ravines, microhabitats in the farmland, river meadows, shore grasslands, productive forest lands, old-growth forest, freshwater swamp forest, broadleaf deciduous forest and grazing lands. The Nedre Dalälven is located in the borderland between the European broadleaf deciduous forest region, with a large proportion of hardwood trees, and the northern coniferous forest region. The biological border of Norrland – *limes norrlandicus* – runs through here, and the meeting of north and south is more obvious here than anywhere else. Biodiversity in the region is extensive.

The Bronze Age (1500–500 BC) and the early Iron Age (500 BC–500 AD) can be seen as a long transition between the hunter-gatherer culture and agricultural settlements. People began farming the land, creating the open landscape we see today. Historically, humans have had a major impact on the landscape and the ecosystems associated with these habitats. Today agriculture and forestry are pursued throughout the area. Recreational fishing is an important factor that attracts people to the region, which sees over 100,000 fishing days annually, half of them local and half visitors. Ten per cent of the visitors are from other countries.

A total of 65,800 people live in the planned biosphere reserve (2009), of whom about 30,000 live in the cities of Avesta, Hedemora and Säter.

##### **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.)

A large part of the core area consists of the Färnebofjärden National Park, which is known for its great biodiversity. The vegetation differs widely in different parts of the national park. The south features coniferous forests and marshes with a northern character, while the vegetation in the north is richer, with a large proportion of hardwood trees, primarily oak and lime. The fauna is diverse and Färnebofjärden is known for its rich bird life. Over a hundred species of birds regularly breed here, including all seven Swedish woodpecker species, Ural owl, osprey and whooper swan. Mammals include strong populations of elk, roe deer, hare and marten. Other mammals found in the area include lynx, beaver, otter and bear. Wolf and wolverine have passed through the area. Several rare and threatened insect species live in dead and dying trees,

including *Cucujus cinnaberinus* (cinnabar-red flat bark beetle), *Ceruchus chrysomelinus*, *Tragosoma depsarius* (hairy pine borer) and *Acanthocinus griseus*. Several threatened species have their strongest base in Sweden – and in at least one case in all of Northern Europe – in the Nedre Dalälven region (for example *Platynus longiventris*, classed as endangered, EN). Among the most threatened species are several requiring targeted measures to ensure their survival in Sweden, for which the Swedish Environmental Protection Agency has requested funding in the coming years for species-specific action programmes. The following action programmes (established by the Swedish Environmental Protection Agency or being formulated) are directly or indirectly affected by the water regime:

White-backed woodpecker (*Dendrocopos leucotos*)  
Flooded jellyskin lichen (*Leptogium rivulare*)  
Dichelyma moss (*Dichelyma capillaceum*)  
Cinnabar-red flat bark beetle (*Cucujus cinnaberinus*)  
*Ceruchus chrysomelinus* beetle  
*Platynus longiventris* beetle  
*Plagionotus detritus* beetle

Of the above species, the white-backed woodpecker, dichelyma moss and the *Cucujus cinnaberinus* beetle are included in the EU Habitats Directive. The same is true of the *Xyletinus tremulicola* and *Phryganophilus ruficollis* (false darkling) beetles. Most of the abovementioned species have displayed a continuously negative population growth in the Nedre Dalälven area in recent decades. This trend is largely due to the on-going intrusion of spruce trees, which in turn is caused by the water regulation in the area.

The entire planned biosphere reserve contains 487 red-listed species. Annex 3: Nationally red-listed species

Unique species: *Dichelyma* moss (the region boasts the greatest concentration of this moss in the world), *Hedemora hens* and certain apple varieties, such as Malmbergs Gylling from Gysinge.

Species of financial significance include:

Fishing: salmon, sea trout, pike, grayling and zander

Livestock: cattle

Crops: oat, barley, wheat, rye, turnip rape, meadow plants (meadow fescue, Timothy grass and red clover), protein crops (fava beans and peas)

Forestry: pine, fir and birch

Hunting: elk, roe deer and hare

#### **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”).

For many years, an organised collaboration has been pursued throughout the Nedre Dalälven region to preserve and use the area’s high-quality natural and cultural values as resources for the community’s economic development in a way that is sustainable in the long term.

To enhance the collaboration in the area, the Nedre Dalälven Special Interest Association was founded in 1986, consisting of the municipalities and companies with interests in the area. All nine municipalities in the proposed biosphere reserve are members of the association and have contributed financially and personally to the work of preparing for the creation of a biosphere reserve. Land-based industries are highly represented among member companies. A large majority of the land and water owners in the area are members of the association. The association's policy statement is in principle unchanged since its formation:

Based on the Nedre Dalälven's unique, high-quality natural and cultural values and its strategic, central position in the country, NeDa works to:

- promote the region overall with a positive profile
- benefit its members
- develop tourism
- contribute to households and businesses moving into the region

This development work shall take into consideration the interests of the land-based industries, natural, cultural and environmental interests and the members' other interests.

In 1998 the Färnebofjärden National Park was founded in a central part of the area. In addition to the national park, a large number of nature reserves and Natura 2000 sites have been designated, mainly in the river landscape. Several Ramsar sites are also designated here.

Leader\* Nedre Dalälven and the Nedre Dalälven Special Interest Association are separate legal entities, but share an office and staff, including the working party for the Nomination Form.

Between 2001 and the end of 2008, support amounting to SEK 50.9 million had been paid out to 133 projects, 108 of them local and 25 of them network projects involving the entire Leader area. In addition, young people in the area have conducted over 40 small projects with a simplified application procedure, called 'youth cheques'. The total resources invested in these 133 projects amounted to at least SEK 130 million. Sustainable development was a more or less key element in most of the projects. A grant from Leader+ allowed NeDa to begin its work with the Biosphere Reserve Nomination Form.

According to information provided by the project teams, the projects have contributed to:

- the creation of over 200 new jobs
- the preservation of over 200 jobs
- the creation of over 500 new networks

\* Leader is a method of local development, in which various parts of the community work to develop the local economy. In a tri-partite partnership, associations team up with business and the public sector (e.g. the municipality) to achieve joint goals. The purpose of the Leader project is to make it possible for people living in rural areas to realise their ideas and visions for developing the community by organisations applying for funding for various development projects. In the 2008–2014 period, Leader is a part of the Swedish Rural Development

Programme, which is funded by the EU, the government and the municipalities. The overall purpose of the programme is to promote economically, ecologically and socially responsible development of rural areas.

#### **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 are(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.)

a) The proposed biosphere reserve covers approximately 308,800 hectares and has excellent opportunities to meet the three functions of a biosphere reserve: conservation, development and logistic support. Preserving biodiversity and the cultural environment is weighed against utilisation interests and research and education for sustainable development.

#### **Conservation**

The core areas are surrounded by buffer zones that enhance the protection of the core areas. The total size of the core area is nearly 23,400 hectares, an area judged to be big enough to meet the long-term conservation goals for the area. The conservation goals of the core area reflect the extremely rich biodiversity in the area.

Example of a conservation goal from the Gysinge Nature Reserve:

“To preserve a representative area of the Nedre Dalälven, including forest, rapids and delta landscape, in which deciduous forest, aquatic habitats and river meadows have a great value for the lower fauna and bird life.”

The proposed biosphere reserve covers about 170 km along the lower portion of the Dalälven River, before it runs into the Bothnian Sea. The upper portion of the area is characterised by hilly landscape with forested mountains up to 300 metres above sea level.

As the river approaches the coast, it passes through the glacial river delta areas that characterise the landscape. These areas consist of large amounts of fine-grain material, which creates a malleable, changing terrain. Clear delta landscapes occur in places where the river changes from a single channel into wide bays and where it runs into the sea, where a small delta area is continuously reshaped. Other parts of the river landscape also change continuously through erosion and sedimentation.

Several esker ridges cross through the area in a north-south direction, a characteristic element of the landscape. In several places the ridges create peninsulas and islands when they cross the lower reaches of the river. The ridges are exceptional groundwater catchments and are generally used to provide high-quality drinking water to the built-up areas. The esker ridges have also been used since ancient times as travel routes, settlements and also to a great degree as sand and gravel quarries for construction and roads.

b) The Nedre Dalälven is located in the border areas between the four counties of Dalarna, Västmanland, Uppsala and Gävleborg, and encompasses rural parts of nine municipalities. Throughout history, the river has affected a significant complementary area, often dozens of

kilometres from the river, influencing culture and the natural geography. There are several built-up areas here, including three small cities: Säter, Hedemora and Avesta.

### **Transition area**

Downstream of Avesta, the Dalälven flows out into fairly flat terrain, which covers most of the area. Large parts of the area are wooded and are used for forestry, while agriculture is pursued in the valleys and flatter areas.

Parts of the river landscape also feature large lakes (bays), separated by sections of rapids. Some of the rapids have been utilised for hydropower, while others are undeveloped. Where the river flows out into the bays, delta landscapes are formed. In the rapids, the river often splits into separate channels, creating an overall mosaic effect. The original natural fluctuations in the water level are in part affected by two major water reservoirs, far upstream from the area, called Trängslet and Siljan. The hydropower plants in the proposed biosphere reserve are run-of-the-river plants, which means that they have no reservoirs to store water.

The local business sector is characterised by industrial activity, based on long-standing tradition and natural access to forest, ore and running water. Forestry and the forest industry, as well as iron and steel, are the most important basic industries in the region. The forest as a raw material has led to the establishment of sawmills and the pulp, cardboard and paper industry, and was also one of the basic conditions for the large-scale mining industry that was established in the 17th century.

Agriculture continues to be a key industry in the southern parts of the region, where it joins up with the flatlands of the Lake Mälaren valley and in the areas along the river in Southern Dalarna. The open heritage/agricultural landscape has largely been preserved over the centuries, which is very significant for the region's attraction value for residents and visitors. Above all, the edges of the heritage landscape, where it borders on forest and water, are valuable for biodiversity and are one of the key issues in the establishment of the biosphere reserve.

Thanks to the extremely high-quality natural and cultural values, as well as the important strategic, central location, the tourism industry also has good prospects. It has been developed for over 20 years, in part through the Nedre Dalälven Collaboration (NeDa).

According to the official tourism statistics, TEM, for tourism in the Nedre Dalälven area in 2007, day visitors and hotel guests in the area spent SEK 556 million and provided full-time jobs to 477 people. The results refer to everyone who has spent a night in commercial accommodation or made a day trip to the area. Day visitors represent the largest volumes, and in 2007 there were over a million day visitors who had travelled at least 100 km one way.

A total of 65,500 people live in the region, of whom 61,500 live in the transition area. This is the primary site where models for sustainable use of resources are tested, but efforts to pursue sustainable development are under way throughout the region.

## **Logistic support**

such as research, monitoring, environmental education and community information, summarised as education for sustainable development, is pursued in many different formats in the Nedre Dalälven area.

Target groups:

- Students and pupils of all ages, from pre-school to basic university courses, and teachers
- Tourists and other visitors from Sweden and other countries.
- Company training courses.
- Community information from public organisations, such as municipalities and county administrative boards, targeting the general public and households.

## **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 the Färnebofjärden National Park and 20 nature reserves. The reserves closest to the river are included in the core area. All of them are protected under Swedish law by the Environmental Code from 1999. Some parts are also designated Ramsar sites (the national park and Lake Hovran area) and several are also Natura 2000 sites.

The total surface area of the core areas is about 23,400 hectares, which is 7,6 % of the total area of the planned biosphere reserve. The biggest part of the core area is the Färnebofjärden National Park, measuring 10,100 hectares (of which 4,110 hectares are water).

The Swedish Government (via Sveaskog and the Environmental Protection Agency) owns 70% of the land in the core area. Sveaskog is a government-owned company and Sweden's biggest owner of forest lands.

To the far west lies the Säterdalen nature reserve. The area around Lake Hovran in the Municipality of Hedemora contains two such reserves, and the Municipality of Avesta has four, in the core area. Several large reserves border on the national park, including Gysinge and Östa, which were founded long ago, and Ista and Hedesundafjärden, which are newer. Further downstream/eastwards along the river are the big Bredforsen, Spjutholmen and Båtfors nature reserves. In the far east, by the sea, lies the Billudden reserve, measuring 1,930 hectares. Having access to untouched nature is important to humanity as well as the natural world. The national park and the nature reserves ensure the preservation of natural assets for future generations.

For researchers, the protected areas serve as key reference areas when studying the effects of human activity and long-term natural processes and their dynamics.

## **Primary conservation goals of the core area**

### **Färnebofjärden National Park**

Established in 1998

Area: 10,100 hectares

Administered by: County Administrative Board in Gävleborg

The purpose was to preserve one of Sweden's most valuable areas from an environmental protection perspective. Färnebofjärden Bay is the part of the river that is least affected by water regulation, forestry and development. Regular flooding has made its mark on the environment. Natural river meadows and deciduous broadleaf forests with many very large trees are characteristic for the region. Due to its location in a biological borderland, the area demonstrates a multi-faceted blend of southern and northern Swedish wildlife. The fauna is rich in species and few places in Sweden can compare in the diversity of forest and wetland birds. A large number of species of wood-living insects benefit from the extensive deciduous forests with many dead and dying trees.

### **Östa**

Nature reserve established in 2006

Area: 597 hectares

Administered by: Municipality of Heby

Purpose of establishing the nature reserve:

- to preserve and recreate older coniferous and mixed forests, open raised bogs, forested marshlands and herb-rich meadowlands and the geological and hydrological values.
- preserve biodiversity and ensure good conditions for the long-term survival of demanding and threatened species in the area.
- preserve an area with great value for active outdoor recreation and tourism and promote nature experiences for the general public, for example by administering outdoor facilities or developing environmental education.
- natural habitats defined according to Natura 2000 shall achieve or maintain favourable conditions.

### **Bredforsen**

The basis for the decision was that Bredforsen and its surroundings along the Nedre Dalälven have water areas, wetlands, deciduous and mixed forests with such significant natural values, which are also sensitive to various types of physical influence, that the area should be declared a nature reserve.

The purpose of the reserve is to preserve the general character of the landscape, wetlands and terra firma forest, to promote deciduous trees, preserve the hardwood trees in the area and to preserve or create natural forest. In addition, the reserve aims to preserve and maintain meadowlands through haymaking and grazing. Forest grazing will continue. The conservation

and care of the area as a nature reserve will benefit biodiversity in the largely broadleaf forests, in the wetlands and in the rapid-flowing parts of the river.

**The Båttfors area** has long been considered one of Sweden's most valuable in terms of wood-living insects. The area has also been studied in that light since the 1930s and is therefore interesting from an environmental monitoring perspective. Over half of the more than 200 red-listed species known from the reserve are beetles, most of them associated with trees (wood-living, etc.). Several species found here are on the outskirts of their propagation area. Several southern species are more or less dependent on hardwood trees, particularly oak. The unique character of the area, its relatively untouched nature, geographical location and more make the area valuable for many groups of organisms.

**(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 19,350 hectares, or 6 % of the planned biosphere reserve. Its area is largely equal to the areas between protected zones and the outer boundary for shoreline protection. This protection varies between 100 and 300 metres from the waterline, both up on land and out in the water. These are areas in which special consideration is taken of natural and cultural environments, outdoor recreation and the general public's access to the waterfront (see also 17.3.2).

Protection of riverbanks, shores and coastal areas is covered by the Swedish Environmental Code, chapter 7, sections 13–18. The buffer zone also includes areas with environmental protection contracts, bird protection and forest protection contracts.

In the buffer zones, agriculture and forestry are pursued, grazing lands and woods are cleared and hay is made. There are also large recreation areas supporting various kinds of nature tourism.

50 % of the land in the buffer zone is owned by companies and 40 % is privately owned.

**(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 majority of the border of the planned biosphere reserve consists of the drainage basin of the Nedre Dalälven. There are some deviations in a few places, where the outer edge of the biosphere reserve follows municipal boundaries and the boundary of company-owned forest.

The transition area is 266,000 hectares, 86 % of the entire biosphere reserve. The majority of the land is privately owned (67 %).

The cities of Säter, Hedemora and Avesta are located in the transition area, which is where most of the population lives. Smaller cities and communities are surrounded by agricultural land, small villages and forest.

One task of the proposed biosphere reserve is to strive to achieve balance between urban and rural environments in such a way as to balance the resources of the area with social and financial development in a sustainable way. Ecological farming, environmentally certified forestry and tourism are examples of activities already being pursued in the transition area. Agriculture and forestry are a key part of the future of sustainable development, considering the supply of raw materials and energy in communities aiming to reduce their dependence on fossil fuels and surmounting the climate crisis. Modern environmentally certified forestry takes consideration of a range of interests in achieving this goal.

Landowners will be involved through representation in the Development Council, which consists of representatives of the affected authorities, municipalities, land and water owners and other organisations. They can also be involved via future projects to be initiated.

**4.6 “Organizational 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)

**The work of gaining support for the establishment of a biosphere reserve**

Extensive meetings in the community with affected parties have clarified the focus of the biosphere work in Nedre Dalälven: To contribute to preserving the open landscape. This is crucial in order to maintain an attractive community for the residents and to attract new residents and tourists. This means that landowners, in particular farmers and the Federation of Swedish Farmers (LRF), are a very important group.

A network has been created consisting of researchers representing all the nearby universities and other institutes of higher education. Their goal is to obtain resources for research and education in the area. The research team is also involved in the practical work of preparing the biosphere reserve nomination.

Representatives from the nine municipalities have regularly participated in the process and several municipal ecologists have worked with the nomination regarding habitats/land cover types. A group of representatives from the area’s four county administrative boards has also worked actively with parts of the biosphere nomination.

In addition, NeDa has arranged several popular seminars discussing the future biosphere reserve.

### **Establishment of a Biosphere Candidate Office for the Nedre Dalälven River Landscape**

A Biosphere Candidate Office will be established in Gysinge and run as a non-profit organisation with the Nedre Dalälven Special Interest Association as the coordinator. One biosphere coordinator and another 1–2 part-time employees will contribute to the continuous operations. In addition to them, project-funded people may be involved in the operations.

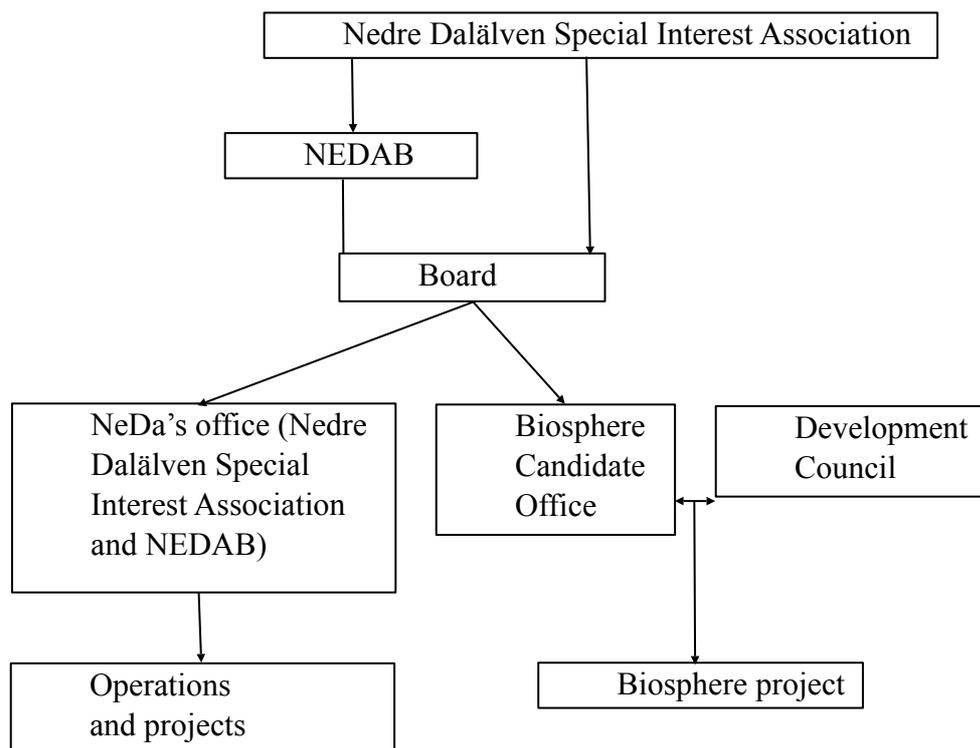
The office will not be any kind of authority, as the establishment of a biosphere reserve does not entail any new rules or regulations. The primary task is to coordinate operations affecting both development and conservation. A key element is to promote collaborative processes for socially, economically and ecologically sustainable development.

A plan of operations will be developed during 2010.

The Nedre Dalälven Special Interest Association is owned by its members, consisting of major institutions with interests in the region, primarily big companies (including a large majority of the land and water owners), all nine municipalities included in the area, regional bodies and organisations. Representatives of all municipalities in the Nedre Dalälven region and representatives of various parts of the business community serve as both regular and alternate board members. The board is responsible for the operations and economy of the proposed biosphere reserve.

A special Development Council is being established in which representatives of associations, the business community, landowners, authorities and other players in the area are welcome to actively pursue issues in the biosphere reserve project.

## Organisation of the Nedre Dalälven River Landscape biosphere reserve



### 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?

Existing legislation regulates the operations in the core area.

The buffer zone is largely regulated by the shoreline protection that has been legislated since the 1950s. It is covered by the Swedish Environmental Code. The latest change to this legislation went into effect on 1 July 2009. The purpose of shoreline protection is to secure the general public's access to shore areas and preserve good living conditions for the flora and fauna on land and in water in the long term. Shoreline protection applies up to 100 metres from the shoreline, both up on land and out in the water. This protected area can be expanded up to 300 metres, which has been done in large parts of the Nedre Dalälven. By 2014 these expanded areas will be reviewed and revised.

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

### Goals of the biosphere reserve establishment

The biosphere model is a method of working with sustainable development in a structured, long-term manner. The biosphere reserve will be a base for network-building, transfer of knowledge, ideas and experiences, and the implementation of operations. It will be a lasting complement to limited-time measures in programmes and projects.

The government, municipalities, land and water owners and others in the business community have been working together since the 1970s to promote ecologically, economically and socially sustainable development in the Nedre Dalälven region. Modern challenges include the climate issue and adapting development to a globalised world. The biosphere reserve will create new opportunities and serve as a platform for long-term sustainable community development.

**The biosphere reserve will:**

- Promote the region with a positive profile
- Enhance the identity of the region and attract the interest of the surrounding world.
- Further develop tourism.
- Create greater opportunities for people and businesses to live and work in the region.
- Contribute to households and businesses moving into the region.
- Conserve the river landscape through use.
- Make the most of local interests, knowledge and commitment.
- Monitor trends, such as new technology, forms of support and research.
- Create and further develop national and international networks.
- Promote collaboration for sustainable community development.
- Make the area a role model for sustainable development.

**General plans for land use**

The nine municipalities in the area all have general plans for how the land will be used. They show how various stakeholders will work together and how the municipalities plan to protect the national interests of environmental protection, preservation of ancient monuments, outdoor recreation and more as defined by central authorities.

The general planning currently involves indicating Rural Transition areas and Waterfront Rural Transition areas, with the participation of representatives of NeDa and the Biosphere Candidate Office.

**Development plan for the biosphere reserve**

The Biosphere Candidate Office, NeDa's board and the development council will jointly produce a development plan for the biosphere reserve, starting in 2010.

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

The board of the Nedre Dalälven Special Interest Association will be responsible for the operations and finances of the biosphere reserve. In addition to the board, a council will be formed to develop efforts towards establishing a biosphere reserve. The Development Council should consist of people from associations, the business community, landowners, authorities and other players in the area. Meetings should be open so that anyone who is interested can participate.

(d) programmes for research, monitoring, education and training? (Describe briefly research/activities monitoring (ongoing or planned) as well education and training activities)

Many fields of *research* have been pursued in the area for a very long time. The research conducted in connection with Nedre Dalälven is mainly linked to the University of Gävle, Högskolan Dalarna, Uppsala University, Mälardalen University and the Swedish University of Agricultural Sciences.

Research and environmental monitoring must be coordinated if projects are to be further developed and realised. The group of researchers who have worked continuously with this issue are applying for funds to create a position as research coordinator for the biosphere reserve.

*Environmental monitoring* also has a long tradition in the area, in a range of sectors. The Dalälven Water Protection Association has monitored developments in a range of lakes and waterways in the Dalälven's catchment area, to determine whether the environmental conditions change over time and assess the importance of individual sources.

The part of environmental monitoring that is government funded is coordinated by the Swedish Environmental Protection Agency and the affected county administrative board. Sweden's county administrative boards monitor the country's 16 national environmental quality goals.

One part of the future measures will be to participate in the global exchange of information using Biosphere Reserve Integrated Monitoring (BRIM).

*Education and trainee posts* have been important activities in the region for several years, in connection to operations run by the Green House of Knowledge, the Ekomuseum Bergslagen, Naturum, upper-secondary schools, folk high schools and Naturskolan. Many other players are involved, including companies, organisations and authorities providing environmental training and trainee posts.











## PART II: DESCRIPTION

### 6. Latitudes and longitudes of area

[Indicate in degrees – minutes, seconds. Indicate coordinates of the central point of the proposed biosphere reserve and if possible, the outer limits of the buffer zone]

**Centre of the proposed biosphere reserve:** Gysinge 60°17'00"N, 016°53'00"E

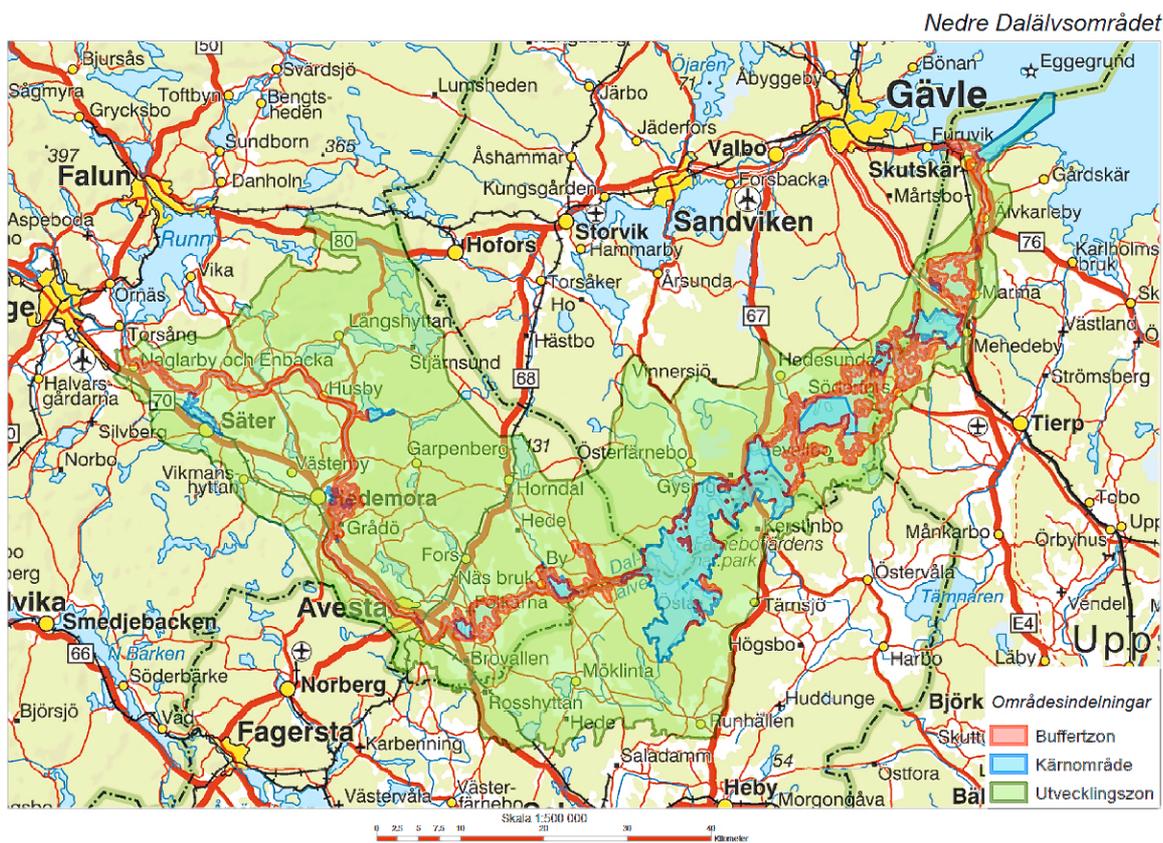
**Outer borders of the proposed biosphere reserve:**

Northernmost point: Billudden 60°39'00"N, 017°53'00"E

Easternmost point: Billudden 60°39'00"N, 017°53'00"E

Southernmost point: Broddbo 60°01'00"N, 016°28'00"E

Westernmost point: Naglarby 60°26'00"N, 015°34'00"E



## **7. Size and spatial configuration (see map):**

7.1 Size of terrestrial Core Area(s): 13,156 hectares

If appropriate, size of marine Core Area(s): 8,671 / 1,597 hectares

7.2 Size of terrestrial Buffer Zone(s): 11,444 hectares

If appropriate, size of marine Buffer Zone(s): 7,816 / 89 hectares

7.3 Approx. size of terrestrial Transition Area(s) (if applicable): 247,496 hectares

If appropriate, approx. size of marine Transition Area(s): 18,124 / 400 hectares

### **7.4 Brief rationale of this zonation (in terms of the various roles of biosphere reserves) as it appears on the zonation map:**

Zonation was conducted according to the Swedish model and is adapted to the conditions of the area. This means that the area was divided into three zones: transition area, buffer area and core area.

Core areas are protected by law and are intended to preserve the natural and outdoor-activity values. The core areas consist of a national park and nature reserves, all protected under the Swedish Environmental Code of 1999. Some parts have multiple protections and are also designated Ramsar sites (the national park and Lake Hovran area). Several are also Natura 2000 sites.

Buffer zones surround or link the core areas. Activities and use of resources that are compatible with protection of the core area are encouraged.

Both agriculture and forestry are conducted in the buffer zones, which also include large recreation areas with a range of nature tourism offerings.

#### **Transition area**

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

Land use here is primarily regulated by the municipalities' general development plans. Some areas have various kinds of protection in the transition area as well, for example nature reserves not connected to the river.

## **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.]

The Nedre Dalälven is primarily located in the boreal needleleaf forests of northern Sweden, but lies at the boundary to the temperate and subpolar broadleaf forest region of the south. This is where the northern taiga meets the outermost edges of the European broadleaf forest, and the

area features an unusually large number of hardwood trees for this latitude. The meeting between north and south is more clearly visible here than anywhere else in the country.

## **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 inland ice sheet covering Sweden receded from this area 9,600 years ago. After the Ice Age ended, the area was covered by the Yoldia Sea, and later by Ancylus Lake. When the Littorina Sea formed some 6,000 years ago, the majority of this area was a bay, where only the highest mountains saw light of day as islands. Most of the area is located below the highest coastline, and the living conditions of the first humans here changed as the land rose and the bay receded.

The first people settled by the jagged shoreline of this shallow bay of the Littorina Sea. Parts of the region were used quite intensively during the Stone Age (about 5000–3000 BC), which is indicated by the significant number of round stone axes found here. Those who settled here followed the river and the shores of the bay. The north-south-running esker ridges tie the region together, and have always been crucial to humans for building roads and settlements. This boundary between the water and the esker ridges was an early site of human activity and settlements. The earliest culture in the area has been traced to the 70-metre curve above the current sea level. In those days the river ran into the sea about where Avesta is today, while Tyttbo was a narrow sound stretching as far as Bäringen.

Most likely the migration of rich salmon populations, and perhaps other fish species, led to a dense population centre (for the era) here at the mouth of the river in southern Dalarna. Gradually the mouth of the river moved northeast, and around Year 0 the Älvkarleby waterfall ran into the sea.

### **Hunting and fishing**

Hunting and fishing have always been vital to the people of the region, particularly before they settled and began farming. The rich migrations of salmon in the river have been important to locals even into the modern day, which can be seen in the first written documents from the area. Älvkarleby is mentioned for the first time in a papal letter regarding salmon dating from 1167, and the first time many other places in the region are mentioned, it is also related to salmon.

Salmon and its migration is one of the factors that unite the area, and it has been crucial to the food supply in the riverside areas for centuries. But salmon also led to internal strife in the community. Farmers from the tracts around Hedesunda and Österfärnebo, and from southern Dalarna, took to arms several times through history and marched on Älvkarleby in the lower reaches of the river to ensure that the people there let the salmon pass beyond the lowest falls.

Fishing is still an important element of life in the area today; not professional or subsistence fishing, but recreational, offering nature experiences and quality of life to locals and visitors alike.

Hunting is mainly reserved for local residents, and serves as a vital tie between game preserves and individual hunters throughout the area.

## **Iron, silver and copper mining**

Alongside the natural geography and the river, the common denominator for the area is the mining and processing of iron, silver and copper.

From primitive iron processing using bog ore to the modern steel mills of today, iron, silver and copper mining have been key industries for the region, employing many people throughout history. One of the main reasons for this is the ore belt running through Northern Uppland, Southern Gästrikland, Northern Västmanland and Southern Dalarna. Another factor is the waters in the area, which were vital to the development of mining and the transport of ore and metals. Close proximity to the market and the capital in the Lake Mälaren valley, both historically and in the modern era, was probably also very important.

In the Middle Ages, in the 13th and 14th centuries, mining took a huge step forward when the Government and the King began supervising the industry and new mining districts were established. The result was practically a private company based on a charter issued by the King to mine owners.

In much of the area, mining – i.e. farmers owning and operating mines and foundries – was a significant industry from the Middle Ages until well into the 19th century. At times mining was even more important to the farmers than agriculture. The elegant mine owners' mansions bear witness to this era.

**Gudsberga Monastery** is a former Cistercian monastery in the parish of Husby, in what is now the Municipality of Hedemora. Founded in 1486, it became Sweden's last Cistercian abbey, and the only monastery ever built in Dalarna. However, in 1527 King Gustav Vasa began dissolving the monastery, seizing its land for the crown.

Today the monastery is a partially excavated ruin in the community of Kloster and is a part of the Ecomuseum Husbyringen.

## **Rise of the big ironworks**

Iron and copper mining were revolutionised in the 17th century when the government tightened its control over the industry. The new mining policy strove for enhanced efficiency and technological advancement, with an emphasis on ornamental products and large-scale export. The local mine owners found themselves in a weakened position in relation to the new powers in the region – nobles, the bourgeoisie in the major cities, and foreign industrialists.

Generous privileges were granted to the nobles and the bourgeoisie, who gained sole rights to refine the pig iron from the foundries. Expert European smiths were brought to the region at this time, primarily from Belgium (Walloons) and Germany, and some of them were given positions of power. These new powers bought – or more or less confiscated – local farms, leaving the farmers no recourse but to transport goods to and from the ironworks, often by force. A large number of the small foundries and hammer mills closed. The era of privately owned mines was drawing to a close, with only occasional examples existing in the 19th century.

They were replaced by giant ironworks, some of which came to be Sweden's biggest. Big Walloon ironworks were founded in the southeastern part of the area, Northern Uppland, which had never had privately owned mines to the same extent. Now that resources existed to make use of the river's power, five giant ironworks were established by the Nedre Dalälven in less than 20 years' time (from the mid-17th century). During the ironworks era, which lasted until the start of the 18th century, no less than 20 ironworks were founded in the affected municipalities.

### **The modern steel industry**

Even today, hundreds of years after the golden age of the giant ironworks in the 17th and 18th centuries, technological advances, streamlining and restructuring are still going on. Only a handful of major producers still exist in the area. Söderfors is the only ironworks left in Uppland, while in southern Dalarna smaller units are located in Långshyttan and Vikmanshyttan, and one large ironworks in Avesta. All are completely or largely under foreign ownership.

Of the mining operations, only Garpenberg still remains. It is difficult to compare production volumes between previous eras and today because the quality of the ore is completely different. Many times as many tonnes of ore are produced today with just a handful of ironworks, compared with the many works of the 17th and 18th centuries. Iron and steel manufacture, forestry and wood processing are still the base industries of the area. However, the number of employees and people directly involved in the industry is significantly lower than in the past.

### **Importance of mining for local culture**

Early in the mining era, works were mainly owned by farmers, who had significant principal or additional income from the mines. They were also active in the transport system required for the operation of the furnaces and hammers, and for shipping the finished products. The river was a key transport route for the iron industry as early as the Middle Ages.

The development that began with the Sala silver mine in the 12th century, leading to the establishment of new, large ironworks primarily in the 17th century, affected the local population even more. They gained more contact with the outside world and made a significant, lasting mark on the countryside and the local culture.

The many ironworks in the area received thousands of ore shipments each year from the mines in Dannemora and Norberg as well as the many mines in the area. Even more numerous were the charcoal shipments from area charcoal stacks. Each ironworks received thousands of loads of coal from the surrounding forests and ore from even more distant mines during the winter months. In addition, firewood and timber were shipped to the works and the mines, and pig iron was sent to the foundries.

The products, including pig iron and finished products such as anchors and materiel for the armed forces, were transported to the shipping ports in Gävle and Västerås. Among all the people involved in all this, the actual ironworks workers were a minority. In one period in Gysinge, for example, there were 50 ironworks employees while a total of 3,000 people were needed for the works' operations. The Walloons are known for their work as smiths and other foundry staff, but in fact more Walloons were charcoal burners and woodcutters.

All of these shipments, many of which covered quite long distances by the standards of the day, brought together people in various parts of the area, and forged bonds between people that came to shape the culture of the communities here. However, the area is not only known as a historical meeting place for people, but also as a place for meetings between cultures.

Skilled German mining experts came to the region as early as the Middle Ages, and in the 16th century under King Gustavus Vasa's era a new wave of Germans arrived. They were the core of Swedish iron production until the early 17th century. Even more important to the industry's development than the Germans were the Walloons from Belgium, who came in even greater numbers, first to the northern Uppland ironworks and then spreading through the area.

The meeting with these skilled professionals at various levels and over time has made deep and lasting changes in the technological and cultural development in the area. This is most clearly visible in the changes made by the ruling class, usually of foreign origin, on the local ironworks. They created the manor culture, the special type of ironworks manors with park-like grounds and elegant buildings and interiors. The structure of the works towns has been maintained and their patterns are still discernible in the modern towns.

Technological advances, the innovation culture created by the area's mining industry, are also significant. For example, Christopher Polhem, the father of Swedish mechanics, founded the Stjärnsund ironworks, and mechanical genius Gustav de Laval worked at the nearby Kloster ironworks. The first successful Bessemer blower, which revolutionised the steel industry worldwide, was installed at the Edske blast furnace. In Gysinge, the world's first electric steel furnace went on line in 1900. Last but not least, Louis De Geer founded the 17th-century Uppland ironworks and played a key role in the Walloon immigration. He is called the father of Swedish industry.

### **Agriculture and forestry**

A common denominator for this area is the historical ties between mining, agriculture and forestry.

The Bronze Age (1500–500 BC) and the early Iron Age (500 BC–500 AD) can be seen as a long transition between the hunter-gatherer culture and agricultural settlements. A more extensive new colonisation in the region probably occurred in the late Iron Age (about 500–1050 AD), in all likelihood due to the opportunities of combining farming with ore extraction. Towards the end of the Iron Age, the Viking Era, there were significant settlements in the area.

At the end of the Middle Ages, settlements in the region were largely grouped into the farming villages we still see today. Because meadow hay was vital winter fodder, the animals spent their summers grazing in the more barren woods. This is the root of the extensive *shieling culture* that existed in the area until well into the 20th century (the last shieling year in Tinäset was 1914).

In some locations where the altitude produced an ideal climate, the unwashed till was farmed by immigrated Finns, primarily in the 17th century. Using burn-beating cultivation, they were able to settle in previously unusable areas.

Another common trait in the area is the significant use of river meadows for haymaking. Because the meadows flooded regularly, they were often far from the actual farms. Their hay provided an essential contribution to the farms and sometimes a surplus that could be sold to the cities. These managed meadows were a feature of the landscape until a bit into the 20th century, and some are now being managed again as a way to preserve the landscape and the traditional farming culture. Alongside this blend of mining and agriculture, the area also has a very typical *meadow and grazing culture*.

In primarily the 17th century, many large ironworks and copperworks were founded in the area. For two centuries the mines and ironworks had an almost insatiable need for charcoal, firewood and timber. Nearly all forest within a 20-kilometre radius was consumed.

The ironworks' and the Government's interest in forests and farms is the reason for the large continuous forested areas, which are owned today by Sveaskog and Bergvik Skog AB. About half of the forests in the area are owned by these two companies. Not until the development of sustainable forestry in the 20th century did the forests recover from the depletion during the ironworks era.

Major social change occurred here, as elsewhere, in connection with the land reform of the mid-19th-century. However, the redistribution of land occurred to different degrees in different parts of the country. What is significant for this area is that the majority of villages were able to retain their old character as nuclear or linear settlements. This, combined with the fact that the open land today covers about the same area as that on the oldest surveyor's map dating back to the 17th century, gives the area its special character.

As the river began to lose its importance for carrying charcoal, timber and firewood to the ironworks and products from them, it gained new importance for other types of transport. Starting in the latter half of the 19th century, giant sawmills and pulp, paper and cardboard plants were built in the area. The raw material was wood from the Dalarna forests, which was transported down the river. The timber floating culture began in 1855.

Many lakes were regulated for timber floating; their spring flood was dammed up, to be tapped during the timber floating season in summer. The mating grounds for fish were negatively impacted when the river channels were cleared for timber floating. In many places, wooden or stone arms were built out into the water to control its depth and flow. Several log chutes were built to facilitate transport past difficult sections of the river. Altogether there were over 3,500 km of general timber floating routes in the water system of the Dalälven. In 1952, 30 million logs were floated down the Dalälven. Timber floating was discontinued in 1970, but the traces are still visible.

This period lasting over a century created new contacts between people in the widespread river region. Today no timber floating exists, and the forestry industry has gone through extensive mechanisation and structural changes in the latter half of the 20th century. Only a small portion of the companies that were directly active in forestry 40 years ago are still active today. One of the companies has seen its workforce cut from 25,000 in the 1960s to just about 1,000 today. Despite all the lost jobs, however, forestry and the forest industry, as well as iron and steel, are

the most important basic industries in the region. These industries still bring together the countryside and the city, and contribute to the unity of the area.

### **Hydropower**

The use of hydropower has had the greatest effect on shaping the river landscape. Several hundred years before modern-day power plants were built, the river powered many flour mills and sawmills, and in the 17th century many stone enclosures and dams were built to control and regulate the water. Since then, increasingly more advanced construction projects have been implemented. The oldest hydropower plants – Näs, Gysinge and Avesta Lillfors – which were built around the turn of the 20th century, involved relatively limited intervention with the river, while later facilities, such as Söderfors, Untra, Lanforsen and Älvkarleby, impact the environment more.

The original natural fluctuations in the water level are mainly affected by two major water reservoirs, far upstream from the area, called Trängslet and Siljan. The hydropower plants in the proposed biosphere reserve are run-of-the-river plants, which means that they have no reservoirs to store water.

The Dalälven has 27 power plants producing over 4,000 GWh/year, which is about 8% of the country's entire hydropower production. Älvkarleby and Trängslet are the biggest power plants in the Dalälven. In addition to the power plants and the regulated water, power lines are a highly visible element of the landscape.

The Society for Nature Conservation currently approves electricity from hydropower plants built before 1995 under its Good Environmental Choice label. This environmental label is motivated by the fact that the damage is already done, the operation of the power plants does not pose any new environmental threat and that the investments have already been made, so they should be made use of.

## 10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE

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

**10.1 Core Area(s): 36 people**

**10.2 Buffer Zone(s): 4,413 people**

**10.3 Transition Area(s): 61,370 people**

**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]

The Nedre Dalälven is located in the border areas between the four counties of Dalarna, Västmanland, Uppsala and Gävleborg, and encompasses rural parts of nine municipalities.

Throughout history, the river has affected a significant complementary area, often dozens of kilometres from the river, influencing culture and the natural geography. Built-up areas lie in a circle around the outer edges of the area, while in the middle are villages and a few small communities with populations of no more than 2000. Historically, many of the communities in the area have been very significant even for the surrounding larger communities. There are three small cities in the area: Säter, Hedemora and Avesta.

The population density is about 9.5 people per square kilometre (in comparison with the national average of 22 people per square kilometre and the EU average of 115 people per square kilometre).

The local business sector is characterised by **industrial activity**, based on long-standing tradition and natural access to forest, ore and running water. There are still world-leading **steel mills** in the area: in Avesta, Långshyttan, Vikmanshyttan and Söderfors.

**Forestry and the forest industry**, as well as iron and steel, are the most important basic industries in the region. The forest as a raw material has led to the establishment of sawmills and the pulp, cardboard and paper industry, and was also one of the basic conditions for the mining industry.

**Agriculture** continues to be a key industry in the southern parts of the region, where it joins up with the flatlands of the Lake Mälaren valley and in the areas along the river in Southern Dalarna. The primarily forested landscape is interspersed with occasional agricultural lands, in particular around Österfärnebo and Hedesunda north of the river. Although the lands had long been allowed to revert to their original state, the open heritage landscape has largely been preserved, which is very important to the area's attractiveness as a place to live and visit. The Nedre Dalälven area has a large proportion of ecological production compared with the rest of Sweden.

Thanks to the extremely high-quality natural and cultural values, as well as the important strategic, central location, the **tourism industry** also has good prospects. The strategic and central location means that the area is in an excellent position to reach the European market via Arlanda airport, Stockholm and the Lake Mälaren Valley, just an hour's distance away. The lack of traditions regarding small-scale entrepreneurship keeps development from advancing as fast as it has potential to do.

**Living environments** consist primarily of villages, small works communities, small towns and three old cities with populations between 5,000 and just 10,000. The rural area, with its many villages and small works communities, has retained and developed its living environments based on the history of the cultural environment.

### **Villages**

The area is dominated by a very large number of small villages, most of which arose at the end of the Middle Ages. Major social change occurred here, as elsewhere, in connection with the land redistribution reform (called laga skifte) of the mid-19th century. What is significant for the area is that many villages have retained their original character as nuclear or linear settlements, even if many farms have been moved out of the village centre. This, combined with the fact that the open land today covers about the same area as that on the oldest surveyor's map dating back to the 17th century, gives the area its special character. Often the villages lie right on the border between the forest and a large, cohesive open heritage landscape. The residential houses are mainly large chalet bungalows with a great-room floor plan, or smaller houses with a cross-shaped floor plan. These types of houses were built from the mid-19th century and into the 20th century. The construction style was common throughout central Sweden at this time, but another typical style for this region is the older two-storey mine owners' manors. The traditional iron-based red paint is the main surface coat on both residential buildings and outbuildings. Surprisingly few elements of modern construction that deviate from these traditions exist in the area.

### **Ironworks**

The works buildings surround the central manor, which is strategically located between the residential and industrial parts of the area. In the 18th century, the classicist town style with a regular layout and a central works street became popular, a structure that still exists today. Many of the works towns have plastered facades, with white and yellow as the most common colours. There are also works towns where the buildings are not plastered, but are still the old red-painted timber houses. Outbuildings and foundations are usually made of slag stone. Söderfors and Gysinge are examples of such works.

### **Cities/built-up areas**

The area is home to three cities with centuries-long histories. The oldest is Hedemora, dating back to the 15<sup>th</sup> century, while the other two, Säter and Avesta, were granted their city charters in the 17<sup>th</sup> century. Several other built-up areas with a long history, based mainly on agrarian activity and an administrative (via the church) role, include Stora Skedvi Church Village,

Hedesunda and Östervåla. In addition, several larger communities have developed in recent years around major power plants, wood industries, brickworks and so on.

### **10.5 Name(s) of nearest major town(s):**

Gävle, Uppsala, Västerås, Stockholm

### **10.6 Cultural significance**

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

#### **Earliest culture**

The earliest culture in the entire area can be traced primarily to the 70-metre curve above the current sea level where the first people settled after following the river and the shores of the bay to the region. The many north-south-running esker ridges tie the region together, and have always been crucial to humans for building roads and settlements. The boundary between the water and the esker ridges was an early site of human activity and settlements. At one such boundary lies an early Iron Age grave field, with 200 graves. This means that there was intensive boat traffic here and meetings between people from different places at a very early point in history.

#### **Importance of mining for local culture**

From the Middle Ages and into the 20<sup>th</sup> century, nearly all people in the area were involved in some way with the iron industry. All of the shipments, many of which covered quite long distances by the standards of the day, brought together people in various parts of the area and shaped the culture of the communities here.

Skilled German mining experts came to the area as early in the Middle Ages. They founded several of the ironworks that lived on into the modern day.

Even more important to the industry's development than the Germans were the Walloons from Belgium, who came in even greater numbers. They first came to the Uppland ironworks, and their expertise spread from there to other works: Gysinge, Horndal, Stjärnsund and others. All parts of the area have residents with Walloon-sounding names or Walloon blood in their veins. The meeting with these skilled professionals at various levels and over time has made deep and lasting changes in the area's culture.

#### **Folk music**

Folk music is an example of a cultural expression that has come to be tied more and more to the identity of the Nedre Dalälven area. The region has a treasure trove of folk music and dances of equal quality, but less fame than the music tradition in other parts of the country. A project supported by LEADER+ Nedre Dalälven in recent years established a network of 14 local history societies and other local organisers in eleven municipalities with the goal of creating a joint event: 'Folk Music Festival on the Nedre Dalälven', with folk music and dancing from the area. The festival has been held every August since 2004. The aim is to establish an annual event in which enthusiasts from throughout the country can partake of the rich cultural treasure of the

Nedre Dalälven area. Although the event is such a recent creation, it attracted 4,500 visitors in 2005, over half of them from other places.

The nyckelharpa is a string instrument invented in the 17<sup>th</sup> century, which lived on into the modern era solely in northern Uppland. One of the most famous nyckelharpa players was Byss-Kalle from Älvkarleby, born in 1783, who is said to have written most of the Uppland *polska* tunes that are played today. One currently active nyckelharpa player is Olov Johansson, born in 1966 in Tärnsjö.

### **Authors and artists**

The history and special characteristics of the region, resulting from historical events briefly described above, have also contributed to an unusual wealth of art and literature in the area.

### **Authors**

Some quotes from authors through the ages. All but the first two have strong ties to the area.

*“...where the water ... falls down from 12–15 ells’ height such that the water becomes white, surges as if in a rage, even throws the drops a few ells up in the air, such that they continuously fill the air like smoke.”*

*”... där vattnet ... faller till en 12 á 15 alnars höjd utför; varav sker att vattnet bliver vitt, brusar som i raseri, ja kastar dropparna ett par alnar i vädret, så att av detta kontinuerligen står som en rök.”*

From Carl Linnaeus’ Expedition to Lapland.

Meeting with the Älvkarleby Falls, 1732

*“Like a final glorious painting from the life and times of the Dalälven, before it runs out into the waves of the Baltic, rise the Älvkarleby Falls. A painter could never on his canvas create the true, living image of a waterfall, it lacks the movement. And how can one describe it with words, express this majestic greatness and arrow-swift speed?”*

*”Som avslutande prakttavla ur Dalälvens levnadslopp, innan den utgjuter sig i Östersjöns vågor, visar sig Älvkarlebyfallet. Målaren kan inte på sin duk ge oss den sanna levande bilden av ett vattenfall, rörelsen fattas. Och hur skall man kunna beskriva det med ord, få uttalt denna majestätiska storhet och pilsnabba fart?”*

Hans Christian Andersen, 1849

*“one of the loveliest places I have seen in Sweden, and royally built.”*

*”ett bland de vackraste ställen jag skådat i Sverige och kungligt byggt.”*

Poet Esaias Tegnér on his brother-in-law’s farm,

Öns Herrgård, outside of Avesta, 1820s

*“Flow proudly, flow gladly, Thou royal course!  
Throwing thyself into the depths with mighty force!  
Bursting out of thy flower bed!  
But fly, my song, instead! And affirm, that I once lay my head in Söderfors!”*

*"Flyt stolt, flyt glad, du kungaelf!  
I djupet snart dig störta sjelf!  
Den blomsterbädd blir dig för trång!  
Men flyg, min sång!  
Och vittna, att jag var en gång Vid Söderfors!"*  
Carl Wilhelm Böttiger, 1831

*"Yes, here in the old Ironbearer Land  
They till'd their fields on the river's strand  
and mined Ore beside."*

*"Ja, här i det gamla Järnbäraland  
de bröto åker på älvens strand  
och malm ur gruvan bredvid."*  
Nobel Prize-winner Erik Axel Karlfeldt,  
Fäderna (Our Fathers), 1895

*"She comes from the North,  
where the mountains rise  
in blue waves o'er river and town  
Her simple song she cannot disguise,  
though none can hear how to her it sounds"*

*"Hon kommer nordanfrån,  
där bergen stiga  
i blåa vågor över by och älv  
Sin enkla visa kan hon ej förtiga  
fast ej den klingar, som hon hört den själv"*  
Kerstin Hed: excerpt from 'Min Sångmo' (My Singing Maiden)  
in Från Stigarna (From the Paths), 1913

*"...It was on an old farm, high above a wide, rushing river. Under the house ran veins of spring water, so that it was always cold and draughty. The farm lay in solitude in a large field, and of the first years I remember only the winters, when the wind came howling and covered the whole world with snow. The drifts rose higher than the windows, and we almost never went outside."*

*"...Det var i en gammal bondgård högt ovanför en bred, strid älv. Under huset gick källådror, så att det alltid var kallt och drog. Gården låg ensam på ett stort gärde och de första åren minns jag bara vintrarna, när vinden kom ylande och täckte hela världen med snö. Drivorna steg över fönstren och man gick nästan aldrig ut."*  
Stig Dagerman: excerpt from  
Ett barns memoarer (A Child's Memoirs), 1948

*"I get up and follow the shore down to the river. The wind blows in the bulrushes, making the fat cigars wave back and forth like a group of metronomes. I feel the chill on my cheeks, forehead and down towards my throat. The backs of my hands are pink. The clouds spread like white quills over the blue sky."*

*”Jag reser mig och följer stranden ner mot älven. Det blåser bland kaveldunen så att de feta cigarrerna vaggar av och an som en mängd metronomer. Jag fryser om kinderna, pannan och ner mot halsen. Händernas översidor är skära. Molnen breder ut sig som vita vingpennor över den blå himlen.*

Bernt-Olov Andersson: excerpt from

Torsdag och tidig november (Thursday and Early November), 1987

*Black pines,*

*The osprey glides.*

*The sun strikes its fist into the water.*

*Postcards as reality, almost*

*unreal. Poorer colour print.*

*Svarta tallar,*

*Fiskgjusen glider.*

*Solen slår näven i vattnet.*

*Vykort som verklighet, nästan*

*overkligt. Sämre färstryck.*

Gunder Andersson: Exponerad sommar (Exposed Summer)

in Djävulen i Notre-Dame (The Devil in Notre-Dame), 1987

**The list of authors from the area is long:**

Samuel Columbus, 1642–1679, Dala Husby

Anders Schönberg, 1737–1811, Österfärnebo

Herman Sätherberg, 1812–1897, Säter

Erik Axel Karlfeldt, 1864–1931, Folkärna

Johan-Olov Johansson, 1874–1955, Horndal

Carl Larsson I By, 1877–1948

Frida Åslund, 1879–1937, Horndal

Martin Koch, 1882–1940, Hedemora

Bernt Hage, 1887–1937, Stora Skedvi

Kerstin Hed, 1890–1961, Hedemora

Paul Lundh, 1890–1967, Hedemora

Ragnar Casparsson, 1893–1978, Avesta

Elof, 1894–1970, Ingvar, b 1930 and Gunnar Persson b 1933, Torsåker

Annalisa Forssberger, 1906–1988, Älvkarleby

Svante Lundgren, 1913–1988, Älvkarleby

Stig Sjödin, 1917–1993, Sandviken

Stig Dagerman, 1923–1954, Älvkarleby

Bernt Bergström, 1924–2003, Långshyttan

Göran Norström, b 1928, Sandviken (Älvkarleby)

Stig Ericson, 1929–1986, Sala

Molly Jonsson, b 1931, Hofors

Lasse O’Månsson, 1931–1988, Sala

Barbro Widebäck, 1931–2003, Gävle

Pär Gunnar Evander, b 1933, Storvik

Per Agne Erkelius, b 1935, Hofors

Margareta Ekarv, b 1936, Heby

Peter Nilsson, 1937–1998, Tierp

Gunder Andersson, b 1943, Fors  
Per Helge, b 1945, Sala  
Magnus Lind, b 1945, Avesta  
Bernt-Olov Andersson, b 1947, Sandviken, Söderfors  
Sven Nordqvist, b 1947, Tierp  
Anna Westberg, b 1947, Sandviken

### **Artists**

Art plays a key role in the community. Artists who live or have lived in the area, or who have roots there, and also people from elsewhere, have depicted the many beautiful and exciting natural settings here. Here are some of the more prominent names:

Hans Wikström, painter, 1759–1833, Österfärnebo and Sevalbo in Hedesunda  
Olof Krans, painter, 1838–1916, born in Sälja By by the river, emigrated to the USA  
Victor Axelsson, painter, Folkärna, 1883–1954  
Bror Hjorth, painter, sculptor, 1894–1968, Marma, Älvkarleby  
Lars Andersson, sculptor, b 1910, Hedemora  
Birger Lundquist, sculptor, painter, cartoonist, 1910–1952, Storvik  
Sven Lundquist, sculptor, b 1918, Storvik  
K G Bejemark, sculptor, 1922–2000, Sandviken  
Birger Forsberg, painter, graphic artist (Hedesundavävarna, the Hedesunda Weavers), b 1922, Hedesunda  
Janne Dahl, painter, graphic artist, cartoonist, b 1924, Säter  
Ola Sandin, painter, b 1925, Dala Husby  
Hans Hedenström, painter, b 1928, Sandviken  
Jan Brunner, painter, b 1931, Östervåla  
Björn Melin, painter, b 1935, Hofors  
Sonja Pettersson, sculptor, b 1935, Heby  
Lars Givell, painter, cartoonist, woodworker, b 1936, Hofors  
Ingvil Stille, painter, b 1938, Tierp  
Björn Lövin, painter, b 1937, Folkärna  
Maj-Siri Österling, painter, b 1940, Rosshyttan, Sala  
Bo Åke Adamsson, painter, graphic artist, sculptor, b 1941, Sala  
Olle Kåks, painter, 1941–2003, Hedemora  
ÅC Danell, painter, cartoonist, sculptor, b 1944, Heby  
Lars Wikström, painter, b 1945, Säter  
Kristina Wikström Hedman, textile artist, glass artist b 1944, Säter  
Örjan Sandenor, painter, b 1946, Sandviken, Gävle  
Åsa Burman, graphic artist, b 1952, Avesta  
Lars Anderson, painter, b 1957, Avesta

Some selected non-local artists who have depicted the natural and cultural environment of Nedre Dalälven:

Edward Bergh, painter, 1828–1889  
Göran Brunius, painter, 1911–2005

Gunnar Brusewitz, painter, 1924–2004

and currently active:

Lennart Sand, painter, b 1946

Leif Liljeblad, painter, b 1950

Country painter, farmer and charcoal burner Hans Wikström was active in the late 18<sup>th</sup> and early 19<sup>th</sup> centuries. Wikström is now considered one of the most interesting practitioners of Swedish folk art thanks to the room interiors, murals and furniture he left behind.

### **Cultural environment values of national interest**

The Swedish National Heritage Board makes decisions on areas of national interest as regards cultural environment. There are 1,700 such areas in Sweden, ranging from tiny localities reflecting a specific era in history, to expansive landscapes that have developed over many years and are designated as areas of national interest according to the third chapter of the Environmental Code.

The purpose of this designation is that these national interests will be included in the physical planning of municipalities and other decisions about land use. The areas will be protected against measures that can significantly harm those values that are of national interest. The municipalities' comprehensive development plans will indicate how the national interest will be met.

Within the proposed biosphere reserve, the following cultural environment values are of national interest.

### **MUNICIPALITY OF GÄVLE**

#### **Hedesunda and Ön** (Hedesunda parish)

*Rationale:* *Agricultural landscape* in a prehistoric central community with ancient monuments and settlements tied to old transport routes. (*Monument site, Village site, Manor site*).

*Focus of national interest:* Stone Age settlements, grave fields from the early and late Iron Age, *low-tech iron production sites* on the ridge in the Dalälven, several late Iron Age grave fields near the villages, often combined with iron production, church and *parish centre*, village-style settlements and the 18<sup>th</sup> century Hadeholm manor. Remnants of wetland haymaking along the riverside.

### **MUNICIPALITY OF SANDVIKEN**

#### **Gysinge Bruk ironworks** (Österfärnebo parish)

*Rationale:* Extensive 18<sup>th</sup>-century *ironworks site* of architectural interest.

*Focus of national interest:* L-shaped floor plan, large manor with main building from the 1830s, uniform 18<sup>th</sup>-century construction along the central works street, dam system, ruins of a blast

furnace and other ironworks buildings, bridges over the Dalälven. Works community with *owner-occupied houses* and *small-scale farms* from the early 20<sup>th</sup> century.

### **Österfärnebo** (Österfärnebo parish)

*Rationale: Agricultural landscape* along an ancient transport route with significant historical monuments such as grave fields and iron production sites, linked to modern built-up areas. (*Monument site*).

*Focus of national interest:* Gästrikland's largest early Iron Age grave fields, late Iron Age grave field, extensive remains of *low-tech iron production* and connection to a ridge in the Dalälven, old road, 19<sup>th</sup>-century church and *village environments*.

*The area is also home to:* Pitted-Ware Stone Age settlements.

## **MUNICIPALITY OF AVESTA**

### **Avesta**

*Rationale: Industrial site*, ironworks with industrial buildings from the 19<sup>th</sup> century and various types of power plant buildings on site with roots in pre-industrial copper coin manufacture. (*Early industrial site, Manor site, Church site*).

*Focus of national interest:* The early industrial phase is illustrated by the Old Village, located on a man-made island, with a road and canal system, manor and church. The manor was built in the 1820s to replace an earlier one that burned down in 1803. The mid-17<sup>th</sup> century church (damaged in the same fire), with a church tower from the 1850s. Dating from the early days of the ironworks we have remains of the unusual blast furnace and kiln, built of slag stone between 1874 and 1915. Remains of the continuous expansion of the ironworks over the past century. The power supply is illustrated by two interesting, but later remodelled power plants: the 1898 plant in Lillforsen and the later, architecturally interesting plant in Storforsen, built in 1917.

### **The By community** (By parish)

*Rationale: Monument site*, Stone Age remains along the ancient Littorina shoreline, forming a specific propagation pattern. Finds of round stone axes in the area are among the most plentiful in the country.

*Focus of national interest:* Archaeological finds from the Stone Age, exposed in an open agricultural landscape. Most axes were found on agricultural sites, but further examination indicates that many of these find sites must be considered as settlements.

*The area is also home to:* Low-tech iron manufacturing sites and grave fields from the early Iron Age, including the one in Djupvik, which is one of the largest and best preserved such sites in the Folkare area. Well-preserved foundry ruin at Rosse.

### **Bäsinge – Bergshyttan** (Folkärna parish)

*Rationale: Mining district community* with two densely built-up areas and well-preserved *miner homestead villages*, where one can clearly experience the link between farming and mining. (*Road environment*).

*Focus of national interest:* Miner homestead villages with dense, well-preserved built-up areas. Well-preserved road network with medieval roots. Mines, of which the oldest came into use during the Middle Ages. Occasional piles of slag speak to the 18<sup>th</sup> century *foundry* and hammer operations in Bergshyttan.

### **Grytnäs Church Village and Östansbyn** (Grytnäs and Folkärna parishes)

*Rationale: Village environment* with large-scale farms and buildings from the 18<sup>th</sup> and 19<sup>th</sup> centuries, as well as a cohesive *church village*.

*Focus of national interest:* Church dating back to the 14<sup>th</sup> century, expanded in the 18<sup>th</sup> century. Closely built church village with well-preserved farms, clearly separate from the surrounding settlements.

### **Ingeborgsbo** (By parish)

*Rationale: Village environment* with well-preserved structure and clearly visible *agricultural landscape* from the 19<sup>th</sup> century.

*Focus of national interest:* Closely built *nuclear settlement*, fields, meadows, enclosures, ditches, farm tracks etc.

### **Näckenbäck** (By parish)

*Rationale: Village environment* with well-preserved 19<sup>th</sup>-century character.

*Focus of national interest:* *Linear village* in which certain buildings are good examples of large-scale farms from the latter half of the 19<sup>th</sup> century. Only insignificant changes occurred after the land reform of 1862.

## **MUNICIPALITY OF HEDEMORA**

### **Garpenberg** (Garpenberg parish)

*Rationale: Mining community environment*, originating in the late Middle Ages, with well-preserved manor from the turn of the 19<sup>th</sup> century surrounding the Garpenberg Ironworks, which has been known since the 16<sup>th</sup> century. (*Industrial site*).

*Focus of national interest:* Numerous monuments and artifacts from mining in the 16<sup>th</sup> and 17<sup>th</sup> centuries, such as a water system for foundry operation with three reservoirs and remains of the foundry between them, as well as mines with traces of the mining techniques of the age. Sweden's only preserved mine church from the 17<sup>th</sup> century. The manor has a main building from 1801 and four 18<sup>th</sup>-century wings.

## **Grådö – Hamre – Husby** (Husby and Hedemora parishes)

### *Area under evaluation*

Rationale: Central community on the Dalälven, which illustrates the concentration of interest during prehistoric and medieval times at an important crossing of the river, which highlights the early colonisation of the countryside and the later organisation of mining operations. (Monument site, Castle site).

Focus of national interest: The name of the medieval parish and royal demesne, Husby, indicates the central ruling powers' interest in the area. Parish church dating back to the 12th century. The Husby and Nås royal demesnes, the latter of which came about after the Middle Ages. The entire area has grave fields and traces of low-tech iron production, primarily from the late Iron Age. The Berga grave field in Husby even has a large tumulus. In the Grådö area, which was strategically important for shipments to the Lake Mälaren Valley, there are remains of two medieval fortified farms, harking back to the political complications of the union between Sweden and Norway, and sunken lanes leading down to old fords. Along the Lustån river valley are settlements originating from the medieval mining community, with characteristic names ending in -hytta and -benning. The village of Nås demonstrates a unique combination of agricultural village with grave fields, low-tech iron production and a foundry.

## **Hedemora City**

### *Area under evaluation.*

Rationale: City environment, small town with late medieval roots, mainly shaped by successive regulations in the 17th, 18th and 19th centuries and featuring small-scale wooden structures. Unique cultivation pattern in the city's farmlands.

Focus of national interest: The network of streets with remaining elements of the irregular medieval layout, old access roads and the grid system that was gradually built out in stages. The central square and the older wooden buildings. The city's farm, in which the field allotment originally done for the bourgeoisie and the 18th century still remains.

## **Hjulbacka – Kapellbo** (Hedemora parish)

Rationale: A monument site that is unique for the region, featuring grave fields, settlements and sunken lanes along Badelunda Ridge, with no direct contact with the historical settlement.

Focus of national interest: The graves include stone settings and mounds of the late Iron Age type. One grave is somewhat older and is dated to the era of the Germanic invasions. By the northeastern grave field are remnants of terraced land, which was probably used both for houses and for cultivation. Next to the southwest grave field is one of the area's sunken lane systems, which indicates the strategic position of the area in terms of transport.

## **Kloster** (Husby and Garpenbergs parishes)

Rationale: Uniquely arranged mining environment with remains of the late medieval Gudsberga monastery, the northernmost monastery in Sweden, and the historical industrial site of Klosters Bruk, which was, among other things, one of Sweden's largest gunpowder factories. (Monastery site, Industrial site).

Focus of national interest: Medieval foundries, remains of Gudsberga, a Cistercian monastery established in 1486. The buildings in Klosters Bruk represent primarily the 18th and 19th centuries, with a manor, wings and English park, workers' residences, stable and powder magazine. The works is of interest from the perspective of industrial history, as it reflects an 18th century gunpowder factory era; Sweden's first rolling mill for sheet metal manufacture was built here in 1809, and the de Laval smithy is preserved here.

#### **Norns Bruk and the Vikmanshyttan – Larsbo road** (the part in Hedemora parish)

Rationale: Industrial site, an unusual and well-preserved ironworks with elements of 17th and 18th-century construction, a foundry and Lancashire hearth, and a connecting road to the steel mill in Vikmanshyttan.

(Industrial site, Road environment).

Focus of national interest: Industrial buildings with manor, chapel and priest's quarters, central works street with workers' houses, ponds, Lancashire hearth, foundry and log chute. The old connecting road from Larsbo, following the terrain through Nom to Vikmanshyttan (where the steel mill was located), connects with the works here. The road environment continues into the Municipality of Smedjebacken.

#### **Silvhytteå** (Husby parish)

Rationale: Industrial site with one of the best-preserved charcoal-burning blast furnaces in the county, built in an excellent location for transport, on a lake system. (Transport environment).

Focus of national interest: Extremely well-preserved foundry from 1787, an unusual type of kiln and a sluice system from 1872.

#### **Stjärnsund** (Husby parish)

Rationale: Unique ironworks site including a well-preserved forging and metalware shop founded by G. Stierncrona and C. Polhem in 1699–1700. (Cognitive environment).

Focus of national interest: Industrial site with manor and industrial offices from the latter half of the 18th century, English park from the first half of the 19th century, late 19th-century church, works streets with workers' quarters and industrial buildings made of slag stone from the 19th century and the turn of the 20th. Stjärnsund has symbolic significance as one of the birthplaces of Swedish industry.

### **MUNICIPALITY OF SÄTER**

#### **Bispberg** (Säter parish)

Rationale: Mine site with well-preserved industrial facilities from the turn of the 20th century.

Focus of national interest: The mine area is dominated by the giant water-filled mine shaft and a shaft tower from 1875, as well as the patron's residence, 'the manor', with wooden storehouses and utility buildings. There is also a well-preserved powder house, a steam engine house, a smithy/workshop and more. Below the mine area lies the well-preserved miners' village, featuring small-scale workers' houses. The iron mines have been used since the Middle Ages.

### **Bobygden (Stora Skedevi parish)**

Rationale: Bo Sockenfjärding is a community whose name – meaning ‘parish that is one quarter of a 100 district in a county’ – indicates a calculated establishment of a settlement concurrent with others during the Middle Ages and the 16th century.

Focus of national interest: A grouping of about 20 single farms with names ending in -bo. The prefix in the place name indicates that several farms had some kind of handicraft specialty. Many have preserved the old-fashioned farm buildings, mainly from the 18th and 19th centuries.

### **Säter city centre (Säter parish)**

Rationale: City environment, small town laid out in the regular grid pattern of the 17th century, the transition to countryside in the southwest and the wooden buildings reflecting the 17th-century city-founding policies and the development of wooden structures until the time around the turn of the 20th century.

Focus of national interest: Street network and layout of properties. The character of the built-up area, with the main buildings of the courtyard houses facing the major streets and the utility buildings facing alleys and yard environments. City square with city hall and hotel. The area south and west of the church, which are the remains of the royal demesne and the vicar’s residence, has fewer buildings and serves as a transition to the countryside.

### **Östra Silvberg – Rishyttesjön – Jönshyttan (Silvberg parish)**

Rationale: Mine site with roots in the late Middle Ages, of great scientific and educational value as many quite old remains are preserved.

Focus of national interest: Numerous water-filled mine shafts, some sections of which showed traces of how the rocks were loosened by heating, large heaps of waste rock, kiln hovel, a kiln for making Falun red paint, building foundations and a derelict graveyard. Foundation of a late medieval farm at Jönshyttan. The silver mines had their heyday at the end of the 15th and beginning of the 16th century, and were used with minor interruptions until the 18th century. During the 19th century, sulphur was manufactured here, traces of which can still be seen.

## **MUNICIPALITY OF TIERP**

### **Söderfors Bruk (Söderfors parish)**

Rationale: Architecturally and industry historically interesting, expensively fitted out industrial site with an L-shaped floor plan in a similar character as the Walloon works. Uniform buildings primarily from the 18th century.

Focus of national interest: Works streets with workers’ residences, church, manor, utility buildings for agriculture, older-style industrial buildings and a modern steel mill, housed in part in 19th-century industrial buildings. 18th-century English park with Greek temple.

### **Tierpsslätten (Tierp parish)**

Rationale: Cohesive agricultural landscape in a central community, whose evolution can be traced back 4,000 years through clearly defined building sites from the Stone and Bronze Ages

and modern villages with roots in the Iron Age and Middle Ages, with one of the biggest country churches of the medieval period.  
(Monument site, Church site).

Focus of national interest: Torslunda Stone Age settlement, remains of settlements from the Bronze and Iron Ages. Iron Age grave field with large mounds along the Tämnrån River, the ruin of the medieval farm church in Husby and the 14th-century Tierp church. Old road system with stone arch bridges. Linear villages, including Yvre, Yttre and Munga, and a clearly visible landscape dating from the 19th-century 'Statutory Partition' (laga skifte) land redistribution reform at Rogarna, with many meadow barns.

The area is also home to: Ullfors Bruk, an ironworks owned by the Strömsberg works, featuring 18th and 19th-century buildings.

## **MUNICIPALITY OF ÄLVKARLEBY**

### **Marma Läger** (Älvkarleby parish)

Rationale: Military environment from the 1880s of architectural and technological interest.

Focus of national interest: Military camp with an axial plan and elegant buildings designed for the Svea artillery regiment next to a training ground for long-range artillery, which was a military innovation at the time it was built.

The area is also home to: The remains of the timber floating chute between Marmafjärden Bay and Karlholm.

### **Älvkarleby Falls** (Älvkarleby parish)

Rationale: Combined transport, power plant and military site at a rapid section of the Dalälven, with facilities from primarily the 19th and early 20th centuries.

(Tourist facility).

Focus of national interest: King Charles XIII's reconstructed bridge from the 1810s, featuring a bridge keeper's cottage, the Svealand Engineer Corps camp on Laxön Island from the 1880s, a tourist hotel from the 1890s and the Älvkarleby power plant from the 1910s – the largest of its era – with its employee residences.

## **11. PHYSICAL CHARACTERISTICS**

### **11.1. 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 western part of the proposed biosphere reserve lies in the easternmost outposts of the hilly Bergslagen terrain, defined by underlying fault zones. The region is characterized by a rolling, hilly landscape with peaks up to 300 m above sea level and valleys and lakes at a height of 70–80 m above sea level. The landscape is full of many small lakes and large marshy areas. Those located under the highest coastline (HC) were created by post-glacial rebound as they became cut off from the coastal zone of the Baltic. Most of the hilltops are forested and are used for timber production today. Some farming is still pursued in the valleys.

In the west lies Säterdalen Valley, which is the result of geological processes at the end of the last ice age. Large amounts of sediment, mainly in the form of silt but also sand and clay, were deposited on the sea bottom at the edge of the retreating ice sheet. Because these soils are easily eroded, the Ljusterån River and the Hyttbäcken Creek dug ever deeper channels as they flowed towards the Dalälven. When saturated with water, silt becomes unstable and can easily form ravines. The ravine is still growing and changing as it has done for many thousands of years, and is gradually being absorbed into the surrounding agricultural landscape. The ravine system of Säterdalen Valley is Sweden's prime example of a living ravine landscape.

Downstream of Avesta, the Dalälven flows out into fairly flat terrain, which covers most of the area. It passes through the sub-Cambrian peneplane, a flat, eroded area with only small topographical differences. In the western part, the average height is about 60 m, to then gradually descend towards where the river runs into the sea. Large parts of the river's surroundings are wooded and are used for forestry. In the flat terrain, the river channel splits into many smaller channels, winding through the landscape and creating a characteristic, mosaic-like appearance to much of the Nedre Dalälven area. Many of the slow-moving, lake-like water areas along the river's course contain a large number of islands of varying sizes, creating a unique landscape. Many sections of the river are used for hydropower production, which means that the natural fluctuations in water level that previously defined the area surrounding the river have largely ceased to exist.

Clearly visible delta landscapes are found where the river changes from a single channel to a fluvial lake, for example at the mouths of Bäringen, Färnebofjärden, Hedesundafjärden, downstream of Untra before and in the Marmafjärden Bay and where the river runs into the sea. Other parts of the river's landscape are also constantly changing due to erosion and sedimentation. This is clearly visible, for example, in Lakes Hovran and Bäringen.

As the river approaches the coast, it passes through the ancient glacial river delta areas that characterise the landscape. Huge amounts of fine-grained material, such as sand, have collected here, giving the terrain a different shape with softer edges, while making the soil layer increasingly dry. The river runs out into the Gulf of Bothnia at Skutskär, where a small delta region is continually being reshaped.

### **Esker ridges**

Several esker ridges cross through the area in a north-south or northwest-southeast direction (see map), a characteristic element of the landscape. The largest is a Badelundaåsen, which can be followed from Nyköping under Lake Mälaren, through the province of Västmanland and into our area southeast of Avesta. The Dalälven breaks through the ridge at Brunbäck just south of Avesta and in Grådö just south of Hedemora. In Västerby north of Hedemora, the Svärdsjöåsen Ridge joins up with the Badelundaåsen Ridge. All along the ridge are several small lakes, called kettle holes, which were created by glacial retreat. Kettle holes are created when blocks of ice calve from the front of the receding glacier and are buried by the glacial outwash of sand and stone. When these ice blocks melt they become holes in the ridge, which are now often lakes or peat bogs. A defining trait for these kettle hole lakes is that they have no tributaries or distributaries.

Another mighty ridge that passes the Nedre Dalälven is the Enköpingsåsen, which branches out into the Ockelboåsen Ridge from Tärnsjö through Färnebofjärden Bay, where it forms narrow islands and the long, narrow isthmus of Strångnäs. Others are Gäveleåsen and Uppsalaåsen. In several places the ridges create peninsulas and islands when they cross the lower reaches of the river, such as at Hedesunda.

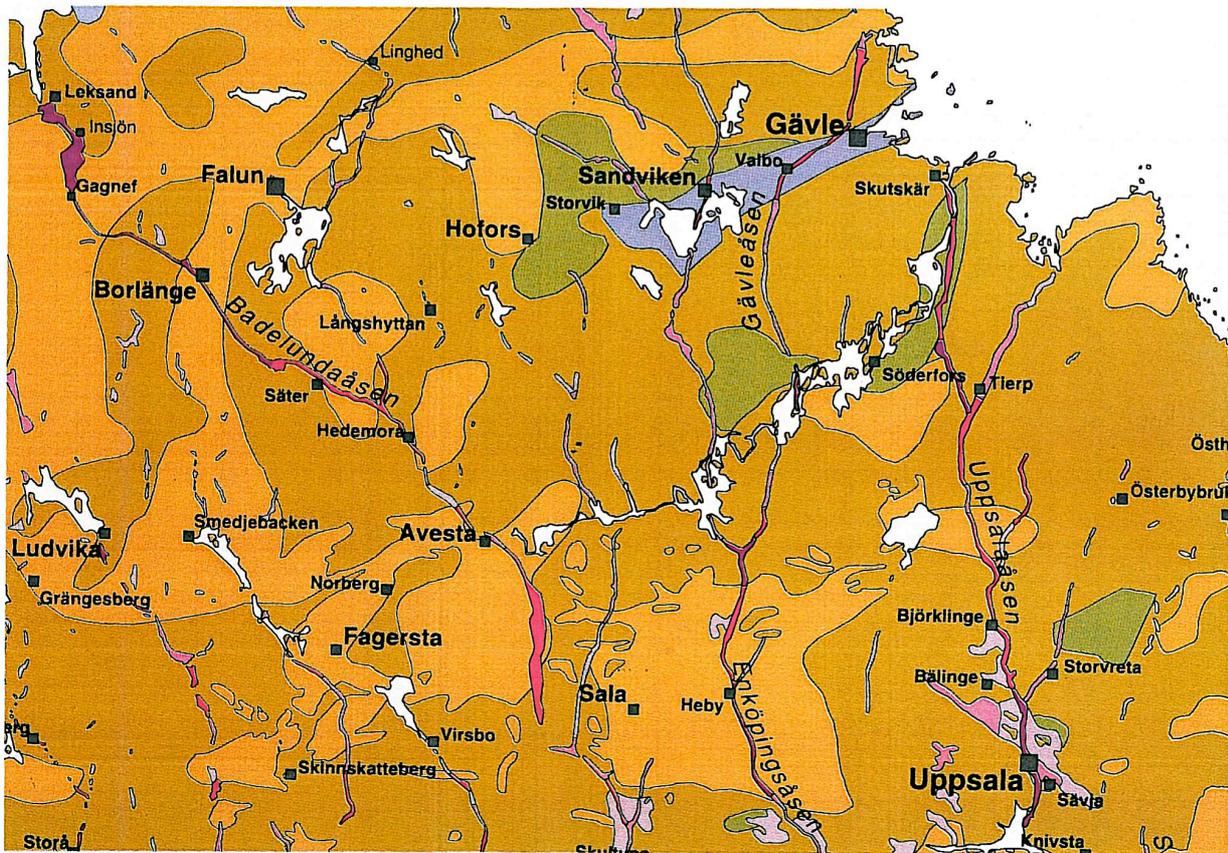
The northernmost part of the Uppsalaåsen Ridge forms a 3 km long peninsula – Billudden – into the sea just east of where the Dalälven runs out into the Gulf of Bothnia. Billudden is rich with fossil-bearing limestone, carried in by the inland ice sheet from a large limestone deposit in the Gulf of Bothnia. The high lime content also contributes to rich vegetation on Billudden, as in all of North Uppland, including many orchids.

The ridges are exceptional groundwater supplies and are widely used to provide the built-up areas in the region with high-quality drinking water. The cities of Avesta, Hedemora and Säter are all in the running for the distinction of Sweden's best drinking water.

Humans have long used these esker ridges as travel routes. The ancient roads from the Lake Mälaren Valley north followed the Badelundaåsen and Enköpingsåsen for long stretches. In Hedemora, the Bådelundaåsen meets up with the Dalälven. The ridge and the river were historically the two most important travel routes to Northern Dalarna.

Several national highways still run along the ridges. The eskers have also been used since ancient times for settlements and also to a great degree as sand and gravel quarries for construction and roads. To preserve the other important functions of the ridges – not least as groundwater supplies – Sweden now aims to replace its use of natural gravel like this with crushed material from rock quarries.

Figure 1: Several esker ridges cross through the Nedre Dalälven area, primarily in a north-south direction.



In addition to the Badelundaåsen Ridge, which forced the river to find a new course, the Möklintaåsen, Enköpingsåsen and Gävleåsen Ridges cross the river as long, narrow islands, occasionally broken by the flow of the river. Closer to the mouth of the river, the Dalälven connects with the Uppsalaåsen Ridge and moves parallel to it to Älvkarleby, where they cross each other twice. The ridge forms the northernmost tip of Billudden Cape in Uppland and continues far out into the Gulf of Bothnia under the surface of the water.

#### 11.1.1. Highest elevation above sea level:

Bispbergs klack, 315 metres

#### 11.1.2. Lowest elevation above sea level:

A few valleys and lakes below sea level in the Municipality of Älvkarleby.

#### 11.2. Climate:

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

The Nedre Dalälven region is in a temperate continental climate zone in which the average temperature varies from  $-5^{\circ}\text{C}$  in the winter to about  $+15^{\circ}\text{C}$  in the summer. Set in a wider European perspective, the area has relatively cold winters and warm summers. Typically, the largest amounts of precipitation fall in the summer, which contributes to maintaining rich, lush

vegetation. Due to the great topographical differences, the climate is significantly cooler and wetter in the more highland, rough terrain parts of the region to the north and northwest than in the flat, lowland peneplane area south of the Dalälven.

North of the Dalälven region is a sharply defined climate border that has ‘always’ affected living conditions throughout the area. This climate border is one of the most important factors behind the clear biogeographical zoning that is often called the *limes norrlandicus*. To the west and north, the west wind regime and the Atlantic climate have a clear impact, with higher levels of precipitation, more cloud cover and a cooler climate both in summer and winter. Towards the east, in the more lowland, seaside parts of the area, the climate is increasingly milder, with plenty of sunlight and little rain, as this is an area affected by a rain shadow from the higher terrain to the west. In addition, the air temperature is ‘buffered’ by the warm water in the river and sea, resulting in unusually warm summer and autumn nights alongside the Dalälven.

**11.2.1 Average temperature of the warmest month:**

15°C

**11.2.2 Average temperature of the coldest month:**

-5°C

**11.2.3 Mean annual precipitation:**

550 mm, recorded at an elevation of 80 metres.

**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:**

The Swedish Meteorological and Hygrological Institute (SMHI) has seven meteorological stations in the area that are still in use (all with automatic measuring from the stated start year): Säter (1963), Avesta (2003), Brovallen (1991), Österfärnebo (1999), Kerstinbo (1995) Hedesunda (1968) and Tärnsjö (1986).

**11.3 Geology, geomorphology, soils:**

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

**Bedrock**

The bedrock in the Nedre Dalälven area is a part of the Baltic Shield and consists almost completely of extremely old rock of about 1.9 billion years old. The western part of the area lies in the actual Bergslagen region, which is the ore belt of central Sweden. The bedrock here is varying, consisting largely of old volcanic rock such as meta-volcanic rock and granitic gneisses. The meta-volcanic rock contains the iron ore and sulphide ore (primarily copper, zinc and lead) that form the basis of the ore mining that has gone on here since prehistoric times. Sulphide ore is still mined in Garpenberg. Countless abandoned mine shafts in the woods speak of the small-scale mining operations of earlier eras, occasionally accompanied by mounds of waste rock and

foundry slag. In some places primary limestone is found, favouring the growth of plants that require alkaline soil.

In the eastern part of the area, the soil cover rests on bedrock that has eroded down to a flat, almost plane surface, called peneplane. The bedrock here consists primarily of granite, but has some elements of greenstone, primary limestone and sandstone.

### **Soils**

The melting of the inland ice sheet and the highest coast line

The latest inland ice sheet receded from the area 9,900–10,000 years ago. The landmass had been pressed down by the weight of the ice, so that most of it lay under the surface of the ice lakes and bays that existed before the Baltic Sea. Thus, most of the area is under the Highest Coastline (HC), which is now about 190 m above sea level. Only in the west were there a few heights that were not covered by water. In many places we currently see clear sea walls made of stones and boulders – rubble fields – marking various locations where the shoreline once lay.

### **Moraines**

Sandy till covers much of the area. For the most part the moraines are now covered with forest.

### **Sedimentary deposits**

Throughout the area are sedimentary deposits of various types and ages, such as esker ridges, glacial river deltas, distal deposits in the form of sand, silt and glacial varved clay, post-glacial fluvial sediments and levees, etc.

The sedimentary soils in the area are concentrated to the river valley in the western part of the river, where they consist mainly of silt and sandy soils, which are used for agriculture. The sediment close to the river channel was mainly deposited by the river current and its tributaries. One striking example of such deposits is the formation of the ravines in Säterdalen and Solvarbo.

At Avesta there is an outcropping of rock that has resisted erosion better than the mountains farther to the south and east. Because of this, there have been waterfalls and rapids in Avesta, while the river north of Avesta was dammed up and flows more slowly. Upstream of Avesta, much larger areas than now have been flooded by the river and previous sediment deposits have shifted in later floods (lamination). Closest to the river channel, where the water moves faster, sand was deposited, while finer particles sank to the bottom farther from the strongest current. These river sediments are all rich in nutrients, and the sandy soil closest to the river is particularly well suited for growing potatoes. Of the once-larger flooded area around the river, all that now remains is the fluvial Lake Hovran and a number of shallow, lagoon-type lakes rich in nutrients, such as Trollbosjön, Flinesjön, Fatburen, Svinesjön and Amungen. The river's lamination process continues on a regular basis as material is washed away from certain areas and deposited elsewhere to form reefs, levees and deposits on the islands, particularly visible in Lake Hovran.

Prior to the latest ice age the Dalälven went from modern-day Avesta south to what is now Lake Mälaren. But just south of Avesta, the old channel itself was filled with rocks and soil by the inland ice sheet, so the river's water had to carve a new path northeast over a flat area where no

river channel existed. This created the foundation for the river landscape we have today in the eastern part of the area, downstream from Avesta, featuring fluvial lakes, bays, deltas and brief stretches of rapids. During the brief period, geologically speaking, that the river has followed this new course it has not had time to erode a noticeable valley. Instead, the river is characterised by the creation of deltas and deltaic lobes. This distinguishes the Dalälven from other large rivers in Sweden where erosion is the dominant process.

To some degree the lower reaches of the Dalälven also experience repeated lamination. When water levels are low the river erodes the deposited sediment. The majority of the material – primarily the heavier particles – are deposited on the shores closest to the river channel, forming deltaic lobes. Of the finer particles, only small amounts are deposited in the flooded lands farther from the river channel. The deposits created are therefore highest closest to the river channel and slope away from it. For this reason, it is common that the edges of the river are drier than the surrounding lands, which can be very waterlogged. In addition to new deposits by the river, there are also existing landforms that are built up by sediment. Several of the moraine islands in the river have expanded due to deposition.

### **Peat bogs**

Peat is a common soil type in the area. It occurs in marshlands, in the form of raised bogs and fens. The most common type of marshland in the area occurs when lakes become overgrown with vegetation, forming a fen. Mud is deposited on the lakebed, while sphagnum mosses grow towards the shores. Once the lake is completely overgrown, a raised bog may form on the top. Raised bogs consist of sphagnum mosses, which require oligotrophic rainwater to grow. Peat can also develop via waterlogging of forest land.

Over the years humans have used peat bogs in many ways. Prior to the Second World War, they were mainly drained to create farmland. Draining forest land to achieve greater timber production continued from that period until the 1970s. In addition, peat was harvested in small and larger scale operations to use as litter for stables, fertilizer, soil improver and fuel. One example of large-scale peat harvesting operations still in use is Karinmossen northeast of Österfärnebo.

## **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.]

The Nedre Dalälven is a large, varied area, but it is bound together by many biological, social and cultural factors. To a great degree the area is the borderland between northern and southern Swedish conditions. This is reflected in several aspects, such as geological formations, climate and weather conditions, propagation patterns of species, building traditions in built-up areas, and other cultural and social conditions. The most significant habitats and land cover types are:

- Water 12.1
- Wetlands 12.2
- Forests 12.3
- Agricultural land 12.4
- Built-up areas 12.5

See sections 12.1 to 12.5 for more details. To provide a clearer understanding of the proposed biosphere reserve, we also provide a general description of the more significant ecosystems in each habitat or land cover type.

For each habitat, a list of species is given including some of the most common and all of the rarities. Species that are red listed according to the Swedish Species Information Centre are indicated with an asterisk (\*). For information on threat categories and more, consult: [www.artdata.slu.se](http://www.artdata.slu.se).

## **DISTRIBUTION**

### **12.1. First type of habitat/land cover:**

#### **Water**

The Dalälven River is the core of the proposed biosphere reserve, bringing together the different parts into one whole. Therefore, the aquatic environments themselves and their boundaries to the forests, agricultural lands and built-up areas are all significant. The lakes in the forested areas are usually oligotrophic, while those in the plains areas contain more nutrients – both naturally and as a result of human intervention.

#### **Ecosystem: Dalälven (regional)**

This area stretches from the Långhag power plant in the Municipality of Säter to the Gulf of Bothnia in the Municipality of Älvkarleby, with tributaries along these 170 km. A large number of larger and smaller lakes are found in the catchment area, particularly in the more upstream areas in the Municipalities of Hedemora and Säter, with small rivers and brooks flowing into the river.

From Långhag to downstream of Avesta, the river is comparable with the giant rivers of Norrland: a calm, steady flow in a channel that is relatively uniform in width. The river only passes through one major lake, Hovran (6.0 km<sup>2</sup>). From there and about 20 km upstream, the river passes through an area of loose soil and sand layers, which means that the course, shores and islands of the river change over time. This area features a series of lakes and lagoons that were previously part of the main river. Several of these lakes reunite with the river when water levels are very high. In Avesta the river drops nearly 10 m in a very short distance. Since the early 20<sup>th</sup> century, this waterfall has been expanded and is now home to the Lillforsen power plant.

Just downstream of Avesta, the river clearly changes character when it crosses the Badelundaåsen Ridge. After the ice age the river changed course towards the northeast through the flat landscape. In the remaining 120 km the river falls 68 m. This particular stretch of the river has a unique character, forming several large lake systems (bays), separated by rapids and

faster-moving stretches of water. At the top is Lake Bäsingen (12.6 km<sup>2</sup>), which is separated from Lake Bysjön (7.7 km<sup>2</sup>) by the developed rapids at the Näs power plant. From Näs the landscape drops about 10 m, alternating between rapids and bays for about 60 km with no intrusion of power plants. After Lake Bysjön come the rapids of Leknäsforsen and Forsboforsen on either side of Forsön Island. After this comes the lake-like stretch down to the Tyttboforsarna rapids. This is followed by the jagged Färnebofjärden Bay (49 km<sup>2</sup>) with its many islands, and then a section of several branches of the river and rapids in Gysinge, which reunite again in the bays called Hedesundafjärdarna.

Most of the river is regulated by power plants once it passes Söderfors before flowing into the Untrafjärden Bay (12.3 km<sup>2</sup>). Two primary river channels exit the Untrafjärden Bay: The largest one goes past the Untra power plant and the other goes past a smaller power plant (Storgysingen) and then turns into a branching system of small courses through the Båtfors area.

At the mouth of the Marmafjärden Bay are the Lanforsen rapids, which also have a power plant. After another 4 km are the mighty Älvkarleby Falls with the Älvkarleby power plant. A small part of the water passes through Kungsådran, which is not regulated by the plant. The vertical drop at Älvkarleby is 10 m. After this point the river flows in one channel the last 10 km out to the sea.

### **Water quality**

The Dalälven drains an area of land covering nearly 6.5% of Sweden's total area. The majority of this land – nearly 73% – is woodland. The water quality in the main channel of the river is highly affected by the soil water from the forests, which applies in practice all the way down to where the river runs into the sea. In general the water in the primary channel of the river can be described as pH-neutral with good buffering capacity against acidification, moderate colour and good oxygen levels. The river water has a low to medium trophic state and the concentration of most metals can be designated as low all the way down to the mouth of the river.

Some lakes, particularly in the upper drainage basins, are relatively oligotrophic and sensitive to acidification. Several lakes that drain agricultural land have a high phosphorous and nitrogen content and are well buffered. In some places where mining occurred over a long period, the water in lakes and waterways has a high metal content. The quality of the water changes in several aspects along the length of the river. For example the phosphorous content increases, particularly after Forshuvud at Borlänge, which has the highest population and the largest farms of the area. In addition, the content of certain metals, particularly zinc and cadmium, increases in the water downstream of the tributary from Runn, within the Nedre Dalälven.

### **Ecosystem: Waterways (regional)**

A large number of waterways of varying character feed the Dalälven. Ljusterån, Långshytteån, Lustån, Jularboån, Årängsån and Lillån/Storån are some of the larger tributaries. The area contains both oligotrophic forest waterways with mainly gravel/stone stream beds and more nutrient-rich waters from agricultural landscapes with finer material in the stream beds. A special type of waterway in the area is the kind that has cut through the silt soil to form deep ravines.

### Oligotrophic forest lakes (regional)

The lakes higher up in the water systems are generally located in more nutrient-poor till soils. This makes the lakes themselves oligotrophic as well. At the same time, they can vary from deep clearwater lakes to swamps heavily discoloured brown by dissolved humus. An interesting phenomenon in some deeper lakes under the highest coastline is the existence of glacial relict crustaceans.

### Eutrophic plains lakes (regional)

The lakes along the river valley are naturally more nutrient-rich, and are also affected by seepage from agricultural land and sewers. These eutrophication effects can naturally lead to undesired results, such as algal bloom and the risk of toxic phytoplanktons, deoxygenation and so on, as well as more physical problems as poorer navigability with boats and perceived loss of beauty when the open water surface disappears. At the same time, in less extreme cases these extra nutrients can create the conditions for rich flora and fauna, including vascular plants, insects and birds.

#### 12.1.1. Characteristic species:

\* Red-listed

Mammals	<i>Castor fiber</i>	Beaver
	<i>Myotis daubentonii</i>	Daubenton's bat
	<i>Arvicola terrestris</i>	Water vole
	<i>Lutra lutra</i>	European otter
Birds	<i>Gavia arctica</i>	Black-throated loon
	<i>Podiceps cristatus</i>	Great crested grebe
	<i>Cygnus olor</i>	Mute swan
	<i>Branta canadensis</i>	Canada goose
	<i>Anser anser</i>	Greylag goose
	<i>Anas platyrhynchos</i>	Mallard
	<i>Bucephala clangula</i>	Common goldeneye
	<i>Mergus merganser</i>	Goosander
*	<i>Pandion haliaetus</i>	Osprey
	<i>Grus grus</i>	Common crane
	<i>Fulica atra</i>	Eurasian coot
	<i>Larus canus</i>	Common gull
	<i>Larus ridibundus</i>	Black-headed gull
	<i>Cinclus cinclus</i>	White-throated dipper
	<i>Sterna hirundo</i>	Common tern
*	<i>Haliaeetus albicilla</i>	White-tailed eagle
	<i>Actitis hypoleucos</i>	Common sandpiper
Fish	<i>Perca fluviatilis</i>	European perch

	<i>Esox lucius</i>	Northern pike
	<i>Rutilus rutilus</i>	Roach
	<i>Lota lota</i>	Burbot
	<i>Thymallus thymallus</i>	Grayling
	<i>Sander luciperca</i>	Zander
	<i>Anguilla anguilla</i>	European eel
	<i>Cottus gobius</i>	European bullhead
Reptiles and amphibians	<i>Rana arvalis</i>	Moor frog
	<i>Bufo bufo</i>	Common toad
	<i>Natrix natrix</i>	Grass snake
Insects	<i>Aedes sticticus</i>	Mosquito
	<i>Chironomidae spp.</i>	Non-biting midges
	<i>Gerridae spp.</i>	Pond skaters
	<i>Notonectidae spp.</i>	Backswimmers
	<i>Corixidae spp.</i>	Lesser water boatmen
	<i>Tricoptera</i>	Caddisflies
	<i>Graphoderus bilinaetus</i>	No common English name found
	<i>Dytiscus latissimus</i>	No common English name found
Mollusks	<i>Pisidium spp.</i>	Pea clams
	<i>Anodonta anatina</i>	Duck mussel
	<i>Margaritifera margaritifera</i>	Freshwater pearl mussel
Vascular plants	<i>Carex aquatilis</i>	Water sedge
	<i>Equisetum fluviatile</i>	Water horsetail
	<i>Salix triandra</i>	Almond-leaved willow
	<i>Nymphaea alba spp. candida</i>	European white water lily
	<i>Nuphar lutea</i>	Yellow water lily
	<i>Ranunculus peltatus</i>	Pond water crowfoot
	<i>Myriophyllum alterniflorum</i>	Water milfoil
	<i>Menyanthes trifoliata</i>	Bogbean
	<i>Utricularia intermedia</i>	Flatleaf bladderwort
	<i>Alisma plantago aquatica</i>	European water plantain
	<i>Hippuris vulgaris</i>	Mare's tail
	<i>Cicuta virosa</i>	Cowbane
	<i>Peucedanum palustre</i>	Milk parsley
	<i>Lysimachia vulgaris</i>	Yellow loosestrife

	<i>Potamogeton natans</i>	Broad-leaved pondweed
	<i>Juncus filiformis</i>	Thread rush
	<i>Phragmites australis</i>	Common reed
	<i>Schoenoplectus lacustris</i>	Common club rush
	<i>Carex rostrata</i>	Bottle sedge
	<i>Carex vesicaria</i>	Blister sedge
	<i>Carex acuta</i>	Slender tufted sedge
Mosses	<i>Fontinalis antipyretica</i>	Common water moss
Lichen *	<i>Leptogium rivulare</i>	Flooded jellyskin

### 12.1.2. Key natural processes:

#### **Flooding**

Flooding, particularly during the spring thaw, has historically been a key factor that has shaped the area. The spring flood varies greatly from year to year depending on rainfall, snowfall and the rate of melting. Often the area has had two peak floods in the spring: the meltwater from the mountains in the more northerly areas down to our region comes after the high water at forest level starts to recede. On some occasions, such as the somewhat legendary flood year of 1916, these two floods can occur at the same time, creating gigantic floods.

The flora and fauna are generally well adapted to these regular floods. The high water in the spring combined with the movements of the ice promotes the growth of tree- and brush-free river meadows, an effect that is enhanced in areas with grazing animals. In the forest ecosystems as well, the floods can contribute to characteristic environments, such as the extremely valuable aspen-rich floodplain deciduous forests. Historically, the flood patterns have also played a part in the development of settlement patterns, with houses often being placed higher, outside the valuable arable land and areas subject to flooding.

#### **Erosion/meandering**

Some parts of the area, primarily the upper parts around Säter down towards Hedemora, are rich in fine-grained silt soils, which in combination with running water have led to erosion and the formation of ravines. A glance at the map shows clearly that the waterways have a winding/meandering flow as a result of erosion in the inner curves and deposition in the outer curves where the current slows down. In terms of biology, this leads to a local blend of various stages of succession, and an overall higher number of species.

#### **Encroaching vegetation**

The continuous encroachment of vegetation and infilling with sediment is a natural process in itself; lakes become more shallow, transform into wetlands and over time bushes and trees become established there. Many factors, both natural and human, affect this process – for example the nutrient content of the water, erosion in areas upstream, flood patterns, water regulation, draining of wetlands etc.

### **12.1.3. Main human impacts:**

#### **Eutrophication**

Studies of sediment cores from eutrophic lakes have shown, based on the presence of various pollens and remnants of diatoms, that the increase in nutrients in the water began soon after human colonisation of the area. However, this development did not begin in earnest until the modern era. Another important basis for comparison is the information on the occurrence of various aquatic plants noted by Gunnar Lohammar in the 1930s. Today inflow from agricultural land of both solute and particle-bound mineral nutrients and leaks from faulty sewers are the greatest sources of emissions to water. Thus the nutrient levels in the water are largely determined by the proportion of agricultural land and the amount of settlements in the drainage basin. Other factors of varying significance may be forestry, changes in or drainage of wetlands, and regulation of water current.

#### **Acidification**

Acidification is primarily a problem in the more oligotrophic forest waters, which have a low buffer content. In recent years, the precipitation of sulphur contaminants from combustion has dropped significantly.

#### **Regulation**

The Dalälven is subject to water regulation, an inevitable result of the early industrialisation of the Bergslagen region. The primary regulations of water levels in the river are far outside the proposed biosphere reserve, for example the Trängslet Dam and Lake Siljan. The smaller waterways also have a large number of dams, which of course obstruct the migration of fish and other animals. On the local level, even a poorly positioned road culvert can create an obstacle to migration for fish and demersal animals. From the human perspective, this is most important as regards local trout populations. The fish are also affected by the clearing of the waterways and changed riverbed conditions in their breeding grounds.

The natural values in the Nedre Dalälven area are very closely tied to natural fluctuations in water levels. The construction of hydropower plants has caused losses of natural values. More natural seasonal water level variations and reduced short-term regulation would benefit conservation.

#### **Drainage**

Various drainage efforts have been made in both agricultural and forest landscapes in order to expand the amount of arable land and the yield. Shallow, nutrient-rich waters in agricultural regions have been most heavily subject to drainage, as well as some wooded wetlands. The loss of these habitats has affected the flora and fauna dependent on them. Drainage can also lead to a loss of nature's 'sponge effect', so that melting snow or heavy rain contribute more directly to rising rivers and lakes. Changes in sedimentation conditions can also lead to secondary effects, such as changes in the structure of the river- or lakebed, and in the long run may affect the breeding grounds of fish or the nutrient level of the water through a greater inflow of particle-bound nutrients.

### **Chemical impact**

Historically and in the modern day, certain business activities have led to the existence of various environmental toxins in the water systems. Metal contaminants from the mining and metal industry are widespread and have a major ecological impact. In certain places, waste from the pulp and paper industry and sawmills also have great impact. Remnants of pesticides from agricultural activities have been found in a few instances. Similarly, remnants of medicines and chemicals from household products have been traced in the effluent from sewage treatment plants. The extent and the ecological significance of these latter contaminants is unclear as yet, however, as only limited analyses have been conducted. Felling of forests increases the leaching of mercury, particularly in wetland areas. Atmospheric fallout of primarily mercury is also important, because the natural amounts of this heavy metal in the region are thought to be relatively high.

### **Clearing of channels for timber floating**

Timber floating in the Dalälven was extensive. The amounts of timber transported this way decreased in the 1960s and ceased in 1970, but until then extensive measures had been undertaken locally to facilitate log transport. In particular, large stones were removed, outcrops of bedrock were blasted away and the water flow was concentrated by blocking side channels. All this means that the riverbeds along these stretches have become more similar and that hollows that could provide protected resting places for demersal creatures have been eliminated to some degree.

### **Foreign species**

The presence of humans brings new species to new areas, whether consciously or unconsciously. In many cases the effect on the local ecosystems has been minimal; the new arrivals have been able to coexist relatively peacefully with the extant species. In other cases, however, the indigenous species are severely hampered by competition from and/or predation by the encroaching species. New contagions among existing species are another potential threat. The spread of crayfish plague on the indigenous signal crayfish has practically decimated the domestic species.

In many cases salmon and trout have had locally adapted populations with a unique gene pool. When fast-growing foreign species are planted out, this element of diversity may be lost. The foreign species that have become most widespread are probably brook trout (competing with the indigenous brown trout) and mink (harmful above all to local bird colonies). Plants such as Canadian waterweed, reed mannagrass and Himalayan balsam, which can spread rapidly and squeeze out other vegetation, can also be a great threat in sensitive environments. Even species that are not foreign to the region can have a very negative effect on sensitive living environments; for example, planting out fish in waters that normally have no fish population at all has a huge effect on water-living insects and salamanders.

### **Fishing**

Fishing in itself affects the aquatic environments, of course, because it focuses only on certain species and mainly on the larger individuals.

### **Climate influence**

Climate change naturally leads to a change in the propagation of many species. As the proposed biosphere reserve is so clearly a borderland, it is also the boundary of many species' propagation areas, and a climate change can therefore be expected to have significant impact. However, in individual cases it is often difficult to distinguish climate effects from, for example, ecological interactions between species.

### **Physical disturbances/outdoor sports**

A human presence can to some degree be called a part of nature, so it is not easy to draw a clear line as to when our presence in the countryside becomes an unacceptable external influence that must be regulated. However, it is clear that certain water-related environments, such as bird lakes with a large number of birds mating and feeding in shore grasslands, wetlands and reeds, contain many species that cannot tolerate having people too close. Many moist environments are also sensitive to wear.

#### **12.1.4. Relevant management practices:**

### **Reduced leaching of nutrients**

The most effective measures for reducing the nutrient content of the water and restoring the ecosystems are improving the function of private sewage systems and making allowances in the use of agricultural land (protection zones along watercourses, choice of right crop, reduced autumn ploughing etc.). However, as the current situation is a result of leaching over many, many years, there are no guarantees that these measures would yield fast results. Re-creating or creating new wetlands is another measure that could have significant effect. These environments can serve as sedimentation basins for particles with bound nutrients, and environments where denitrifying bacteria can convert parts of the freed nitrogen to gaseous form.

### **Reduction of acidifying emissions**

Acidifying emissions have been reduced by a relatively large amount compared with the levels in the 1980s. This has yielded highly visible results in the environment, as the effects of liming have lasted longer and the intervals between liming have lengthened. Although this is a positive trend and the Nedre Dalälven area is not as vulnerable as the more westerly parts of the country, acidification still continues to have a great effect on water-related ecosystems.

### **Fishery conservation (removal of obstacles to migration, etc.)**

Nearly everyone involved agrees with the decision to try to maintain or recreate the natural conditions of the waterways. To achieve this in the Nedre Dalälven, fishery conservation would strive to achieve the conditions that existed before humans began significantly changing the environment. The measures that can be carried out in the river itself may have local effects, establishing and restoring/improving what are already quite good conditions. Further possible improvements that might be achieved as regards habitat measures may have lasting effect locally. In tributaries, lasting effects may be achieved through habitat measures, which may also have a local effect in the river.

It may be necessary to eliminate obstacles to migration (by, for example, repositioning poorly located road culverts and removing unnecessary dams or creating fish bypasses at hydropower

plants) to allow fish to migrate and spawn, as well as to allow recolonisation of species after episodic acidification or other temporary negative-impact events. Creating wetlands and this type of activity can also have a positive effect on the area, because wetlands trap particles that would otherwise be transported out into the waterways and harm fish breeding grounds.

### Preservation of ecosystems/habitat conservation

To a great degree, the health of the water is a symptom of how we treat and use nearby habitats – in particular our forests and agricultural lands. Many of the water-living species also live in the border zones to other environments. This makes the responsible use of forests and agricultural lands close to shorelines more or less a necessity to ensure the survival of water-living species, as well as to preserve and develop cultural environments and last but not least, to preserve the aesthetic value of the countryside.

#### 12.1.1.1 Sea environments (local)

The Dalälven flows into the sea at the Gävlebukten Bay in Northern Uppland. The fresh water of the river meets the salty water of the sea, making this part of the Baltic brackish at a salinity of about 5 parts per thousand. Few species are specialists at living in brackish water, and both marine and freshwater species live under strain. The northernmost reach of the Uppsalaåsen Ridge is still above the water's surface here, creating Sweden's only north coast. The area has many habitats, from kilometre-long sandy beaches, to large coherent patches of sea buckthorn, to bare rocks exposed to northern storms. Parts of the coastal area are flat, and post-glacial rebound has made a clear mark in the formation of flads (shallow bays created by land uplift) and gloe lakes (flads that have become fully separated from the sea). The post-glacial rebound here progresses at a rate of about 6 mm per year. The coastal area does not have a large archipelago, but leads quickly out to open sea.

#### 12.1.1.2 Characteristic species:

\* Red-listed

Mammals	<i>Halichoerus grypus</i>	Grey seal
Birds	<i>Phalacrocorax carbo</i>	Great cormorant
	<i>Ardea cinerea</i>	Grey heron
	<i>Larus argentatus</i>	Herring gull
	<i>Larus marinus</i>	Great black-backed gull
	<i>Cephus grylle</i>	Black guillemot
	<i>Cygnus cygnus</i>	Whooper swan
	<i>Sterna hirundo</i>	Common tern
	<i>Stercorarius parasiticus</i>	Parasitic jaeger
*	<i>Haliaeetus albicilla</i>	White-tailed eagle
*	<i>Pernis apivorus</i>	Honey buzzard
*	<i>Alcedo atthis</i>	Common kingfisher
*	<i>Larus fuscus</i>	Lesser black-backed gull
*	<i>Sterna caspia</i>	Caspian tern
*	<i>Podiceps auritus</i>	Horned grebe
*	<i>Riparia riparia</i>	Sand martin

Fish	*	<i>Salmo salar</i>	Atlantic salmon
	*	<i>Salmo trutta</i>	Brown trout
	*	<i>Lampetra fluviatilis</i>	European river lamprey
		<i>Anguilla anguilla</i>	European eel
		<i>Coregonus lavaretus</i>	Common whitefish
		<i>Vimba vimba</i>	Vimba
		<i>Clupea harengus</i>	Atlantic herring
Vascular plants		<i>Hippophaë rhamnoides</i>	Sea buckthorn
		<i>Linum catharticum</i>	Fairy flax
		<i>Gentianella uliginosa</i>	Dune gentian
		<i>Dactylorhiza maculata</i> <i>spp.</i>	Heath spotted orchid
		<i>Listera ovata</i>	European common twayblade
		<i>Neottia nidus-avis</i>	Bird's nest orchid
		<i>Goodyera repens</i>	Creeping lady's tresses
		<i>Dactylorhiza incarnata</i>	Early marsh orchid
		<i>Epipactis palustris</i>	Marsh helleborine
		<i>Platanthera bifolia</i>	Lesser butterfly orchid
	*	<i>Liparis loeselii</i>	Yellow wide-lip orchid
		<i>Epipactis helleborine</i>	Broadleaf helleborine
Frogs	*	<i>Rana lessonae</i>	Pool frog
Mosses			
		<i>Scorpidium turgescens</i>	No English common name found

### 12.1.1.3 Key natural processes:

#### Post-glacial rebound

The flatter parts of the coastal area are rising rapidly, about 6 mm per year, creating flads and gloe lakes. This creates areas of primary succession.

### 12.1.1.3 Main human impacts:

The coastal waters are primarily affected by organic environmental toxins. The human activities that have the greatest effect on the waters are hydropower production and the cellulose industry.

### 12.1.1.4 Relevant management practices:

Preservation of ecosystems and fishery conservation.

Reduction of sources that lead to nutrient loading. Eutrophication leads to an increase in algae and aquatic plants in the sea.

For the coastal region, there is a proposal to create a nature reserve.

## 12.2. Second type of habitat/land cover: Wetlands/regional

In Sweden, the most common definition of wetlands was established by Löfroth in 1991:

“Wetlands are lands in which water is close under, at or over the surface of the ground for a large portion of the year, as well as water areas that are covered with vegetation. At least 50% of the vegetation should be hydrophilic – i.e. moisture-loving – for the area to be called wetlands. One exception is periodically dry beds of lakes, seas and waterways. These are counted as wetlands despite the lack of vegetation.”

Wetlands are categorised in a hierarchical structure based on, among other things, their ecological significance. They are a key natural resource for a rich flora and fauna.

In anaerobic conditions, dead plants do not fully decay. This can lead to the plant remnants accumulating on the spot as peat. Peat-forming wetlands are called peatlands if the peat depth is at least 30 cm. Peatlands consist of two main types, bogs and fens.

The primary types of wetlands in the Nedre Dalälven area are bogs and fens. Large wetlands with high natural values are located in the lower, flat areas of the Dalälven.

### Bogs (regional)

Bogs are peatlands where the peat has grown so thick that the ground surface no longer has contact with the groundwater, which means that the only nutrients come from precipitation. This results in extremely low nutrient levels, naturally low pH and characteristic plant colonies with very few species. The area around the Dalälven is rich in bogs, with some of the biggest in the County of Gävleborg.

### Fens (regional)

Fens are minerotrophic peatlands, which means that they are in constant contact with the groundwater and therefore receive nutrients from the mineral soil. Minerotrophic fens are further divided into topogenic and soligenic fens depending on the slope of the ground. Soligenic fens are situated on a slope and are therefore subject to through-flowing surface water. The majority of the fens in the Nedre Dalälven area, and a characteristic part of the landscape, are limnogenic fens. Limnogenic fens are flat and characterised by regular flooding, formed on the banks of both lakes and running water.

#### 12.2.1. Characteristic species:

<i>Vascular plants</i>		
	<i>Andromeda polifolia</i>	Bog rosemary
	<i>Carex canescens</i>	Short sedge
	<i>Carex rostrata</i>	Bottle sedge
	<i>Carex dioica</i>	Dioecious sedge
	<i>Carex nigra</i>	Black-blooming sedge
	<i>Rhododendron tomentosum</i>	Marsh labrador tea

	<i>Menyanthes trifoliata</i>	Bogbean
	<i>Eriophorum vaginatum</i>	Hare's tail cottongrass
	<i>Calla palustris</i>	Wild calla
	<i>Iris pseudacorus</i>	Yellow iris
	<i>Lysimachia thyrsiflora</i>	Tufted loosestrife
	<i>Peucedanum palustre</i>	Milk parsley
	<i>Empetrum sp</i>	Crowberry
	<i>Myrica gale</i>	Myrica gale
*	<i>Viola uliginosa</i>	No English common name found
<i>Birds</i>	<i>Grus grus</i>	Common crane
	<i>Gallinago gallinago</i>	Common snipe
	<i>Tringa glareola</i>	Wood sandpiper
	<i>Tetrao tetrix</i>	Black grouse
<i>Mosses</i>	<i>Sphagnum spp</i>	Sphagnum mosses
*	<i>Myrinia pulvinata</i>	Myrinia moss
*	<i>Scapania apiculata</i>	No English common name found
	<i>Dichelyma capillaceum</i>	Dichelyma moss
	<i>Cephaloziella dentata</i>	No English common name found
<i>Mollusks</i>	<i>Perforatella bidentata</i>	No English common name found
<i>Insects</i>	<i>Setema cereola</i>	No English common name found

### 12.2.2. Key natural processes:

#### Continuous peat formation

A basic condition for peat formation is high levels of low-oxygen groundwater. The presence of peatlands is mainly controlled by the quantity of: precipitation, inflow, runoff and evaporation. Peat formation can occur through encroaching vegetation, flooding or the prevention of rainwater runoff. Peat formation in bogs and fens is a relatively slow process.

#### Encroaching vegetation

When haymaking ceases, the once-open lands become overgrown, and the light-dependent plants are squeezed out. Competitive plants take over and the species diversity declines.

### 12.2.3. Main human impacts:

#### Draining and dewatering

Draining and dewatering change the hydrology of the peatlands and the basic conditions of that habitat (see below). Dewatering of peatlands in order to create more or better agricultural land is not a common occurrence today.

### **Peat harvesting**

Bogs are to some extent used to harvest peat, which is then used as an energy source. In peat harvesting, the bog is dewatered and the peat is removed. This changes the environment for a very long time in the future; in fact, this type of measure is probably irreversible. In Sweden as a whole, peat harvesting corresponds to about 25% of annual growth, and the same proportion is true in the proposed biosphere reserve. Peat is harvested in Karinmossen north of Österfärnebo. Some 20,000 m<sup>3</sup> of peat is harvested there annually, which corresponds to about 25% of the estimated growth of all peatlands in the area.

### **Water regulation**

The Dalälven is regulated, which changes the natural fluctuations in water levels. Limnogenic fens are dependent on regular flooding, so regulation changes their properties, creating a peat-forming process that did not exist previously, which in turn changes the vegetation and so on.

### **Haymaking**

Haymaking to provide winter fodder for cattle was a common activity on shore grasslands and marshes in the past.

#### **12.2.4. Relevant management practices:**

##### **Avoid dewatering**

Avoid further dewatering. Limit peat harvesting.

##### **Haymaking**

Limnogenic fens and shore grasslands should be managed via haymaking to preserve the culturally influenced habitat of earlier days and to reduce the encroachment of vegetation.

##### **Grazing**

As above, grazing should be reinstated in limnogenic fens and shore grasslands. Grazing should be adapted to prevent the encroachment of vegetation.

##### **Filling in ditches**

Older drainage ditches that have not produced the intended effect should be filled in to recreate wetlands.

#### **12.3. Third type of habitat/land cover: Forest/regional**

The region is located on the border between the boreal and temperate coniferous forests, making the area extremely diverse, as both northern and southern species coexist here. In the southern coniferous forest region (the boreonemoral region), spruce and pine forests abound. Deciduous trees grow in richer soils, and locally even hardwood trees. The northern coniferous forest region (the boreal region) is a part of a worldwide belt of coniferous forest with large marshy areas that defines the northern landscape around the globe.

All the forest in the area is more or less affected by the local culture; there are no virgin forests that have never been touched by human intervention. This is mainly due to the vast needs of the mining industry for wood and charcoal over the centuries. In addition, a significant part of the

forest land is owned by companies and the government, and forestry has been pursued rationally for many years.

## **Ecosystems: Description**

### **Coniferous forests**

#### **Coniferous forests (regional)**

More than 50% of these forests consist of spruce and pine. This habitat is an umbrella term including dry to moist needleleaf forests.

#### **Natural coniferous forest (local)**

This forest evolved through natural regeneration. It shows long continuity with large amounts of deadwood, and it contains many valuable environments and species. Natural forests have often been affected in some way by human activity, but there has been no systematic forest management here.

#### **Calcareous coniferous forest (local)**

The landscape along the coast is flat and characterised by a mosaic of shallow clay bottoms; long, narrow bays; and small islets. Post-glacial rebound also has a significant effect on forest land. The new land rising out of the sea is rich in lime that has not yet leached out like the soils farther from the coast. The lime content has contributed to rich coniferous forest environments with many species worthy of protection, including many sorts of orchids (heath spotted orchids, twayblade, bird's nest orchids, creeping lady's tresses, early marsh orchid, marsh helleborine, lesser butterfly orchids, yellow wide-lip orchids) and rare soil fungi. Most of the valuable coniferous forest environments consist mainly of older spruce populations, but some pine forests also have high values, such as the sandy pine forest on the Långsandsörarna islands and the calcareous pine forest at Brämsand.

#### **Pine heaths/coniferous ridge forest (local)**

Coniferous-dominated population on sandy or gravelly soils or on esker ridges. Often at least 50% of the land area is covered by pine. High natural values with species tied to sandy soil and sun-exposed pine trunks.

### **Deciduous forests**

#### **Deciduous broadleaf forest (regional)**

Forest on solid ground where more than 50% of the area is covered by deciduous broadleaf trees. Often found in richer soils, sometimes on disused infields – previously open lands used for haymaking, cultivation or grazing.

The water level of the Dalälven is regulated, which has led in many places to deciduous broadleaf ecosystems turning into spruce forests. Previously the immediate surroundings were heavily affected by the river – large areas were directly affected by regular ice and water disruptions, while other parts were indirectly affected by the humid climate. The cultural

influences from communities of old were similar to the river's own influence, so they preserved the deciduous, semi-open landscape with a large element of hardwood trees.

### **Hardwood (local)**

Hardwood trees generally do not grow north of the boundary to Norrland and often grow in mixed forests with other deciduous trees (primarily alder, aspen, birch and hazel) and spruce. In our region, hardwood trees occur locally, as a rule in populations smaller than 0.5 hectares. Hardwood forests are the most species-rich type of forest in Sweden, especially if they have long-term continuity. Many insects thrive in old hardwood trees, especially oak. In particular wood-living beetles are important to biodiversity.

### **Shoreline deciduous broadleaf forest (local)**

Before the river was regulated, the shoreline forests consisted almost solely of deciduous trees. Hardwood trees like oak, ash, lime and hazel grow side-by-side with aspen, black alder and birch. In contrast to most broadleaf trees, spruce cannot stand in water very long. With the decrease in flooding, the proportion of spruce is increasing and the species risks outcompeting oak, hazel and other light-dependent types of trees if they are not thinned out.

### **Ravine forests (local)**

The largest continuous area of ravine forest is Säterdalen, where the trees are mainly grey alder. The area is characterised by mixed broadleaf forest that has remained untouched and the trunks are becoming quite large. The ageing broadleaf forest is home to a rich array of birds. The great number of hollow trees promotes woodpeckers and other cavity nesters. Hardwood trees are also found in the ravines, including a few stands of elms. The vegetation is luxuriant and greatly varied due to the moist, nutrient-rich ravine bottoms, with several unusual plant species. In addition, the valley is a northern outpost of several southerly species. The area has extensive birdlife, which is typical for this type of broadleaf forest, and the insect fauna is rich, with a southern character.

### **Freshwater swamp forests**

Freshwater swamp forests grow in damp to wet soil. The vegetation has developed through natural regeneration and the groundwater reaches roughly ground level. Freshwater swamp forests are often relatively dense, with large amounts of deadwood, and contain many valuable environments and species.

### **Conifer swamp forests (local)**

The landscape is often marsh or fen, but is not subject to regular flooding. The canopy cover is normally 30–70%, and is often dominated by pine or spruce with buttresses. The natural values of conifer swamp forests are dependent on long-term continuity of the forest, creating a natural age differentiation, species composition and deadwood in various stages of decay.

### **Deciduous swamp forests (local)**

The landscape is often marsh or fen, but is not subject to regular flooding. The canopy cover is normally 30–70%, and is often dominated by birch and alder with buttresses. The natural values of deciduous swamp forests are dependent on long-term continuity of the forest, creating a natural age differentiation, species composition and deadwood in various stages of decay.

### Floodplain forests (local)

This habitat is found frequently in the area, primarily in the form of small, narrow and usually aspen-dominated populations. They are located beside waterways on soils that are well drained at low water, but are regularly flooded at high water. Fine sediment is continuously deposited here in connection with the floods. The canopy cover is 30–100%. The percentage of aspen forests with thick old trees is characteristic for the Nedre Dalälven region and is unparalleled in Sweden. Combined with the large percentage of birch and oak, the deciduous forest that frames the waters is quite unique, which was one of the reasons for the formation of the national park.

#### 12.3.1 Characteristic species:

<i>Group</i>	<i>Latin name</i>	<i>Common name</i>
Vascular plants	<i>Anemone nemorosa</i>	European wood anemone
	<i>Caltha palustris</i>	Marsh marigold
	<i>Convallaria majalis</i>	Lily of the valley
	<i>Deschampsia flexuosa</i>	Wavy-hair grass
	<i>Equisetum sylvaticum</i>	Wood horsetail
	<i>Filipendula ulmaria</i>	Meadowsweet
	<i>Gymnocarpium dryopteris</i>	Common oak fern
	<i>Hepatica nobilis</i>	Common hepatica
	<i>Linnaea borealis</i>	Twinflower
	<i>Maianthemum bifolium</i>	May lily
	<i>Pteridium aquilinum</i>	Common bracken
	<i>Melampyrum spp</i>	Cow wheat
	<i>Oxalis acetosella</i>	Common wood sorrel
	<i>Paris quadrifolia</i>	Herb paris
	<i>Trientalis europaea</i>	Arctic starflower
	<i>Vaccinium myrtillus</i>	Common bilberry
	<i>Vaccinium vitis-idaea</i>	Cowberry (lingonberry)
	<i>Pinus sylvestris</i>	Scots pine
	<i>Picea abies</i>	Norway spruce
	<i>Betula pendula</i>	Silver birch
	<i>Betula pubescens</i>	Downy birch
	<i>Alnus incana</i>	Grey alder
	<i>Alnus glutinosa</i>	Black alder
	<i>Sorbus aucuparia</i>	European rowan
	<i>Juniperus communis</i>	Common juniper
*	<i>Viola uliginosa</i>	No English common name, but one Swedish name is Dalälven violet
Mosses	<i>Dicranum scoparium</i>	Dicranum moss
	<i>Mnium spp.</i>	Carpet moss
	<i>Pleurozium schreberi</i>	Big red stem moss
	<i>Polytrichum commune</i>	Common haircap moss
	<i>Sphagnum spp.</i>	Sphagnum mosses

*	<i>Anastrophyllum hellerianum</i>	Heller's notchwort
*	<i>Dichelyma capillaceum</i>	Dichelyma moss
*	<i>Tritomaria exsecta</i>	Cut notchwort
	<i>Neckera pennata</i>	Neckera moss
	<i>Neckera besseri</i>	No English common name found
Fungi	<i>Albatrellus ovinus</i>	No English common name found
	<i>Armillaria mellea</i>	Honey mushroom
	<i>Cantharellus tubaeformis</i>	Funnel chanterelle
	<i>Fomes fomentarius</i>	Tinder fungus
	<i>Leccinum aurantiacum</i>	Red aspen bolete
	<i>Leccinum scabrum</i>	Birch bolete
Lichen	<i>Cladina stellaris</i>	Star-tipped reindeer lichen
	<i>Usnea filipendula</i>	Beard lichen
*	<i>Letharia vulpina</i>	Wolf lichen
*	<i>Lobaria pulmonaria</i>	Lung lichen
	<i>Sclerophora peronella</i>	Frosted glass-whiskers
*	<i>Collema subnigrescens</i>	No English common name found
	<i>Lecanora flavoleprosa</i>	No English common name found ( <i>new species for Sweden</i> )
Mammals	<i>Alces alces</i>	Elk
	<i>Apodemus flavicollis</i>	Yellow-necked mouse
	<i>Capreolus capreolus</i>	European roe deer
	<i>Castor fiber</i>	Beaver
*	<i>Lynx lynx</i>	Eurasian lynx
	<i>Lepus europaeus</i>	European brown hare
	<i>Lepus timidus</i>	Mountain hare
	<i>Vulpes vulpes</i>	Red fox
	<i>Sciurus vulgaris</i>	Eurasian red squirrel
Birds	<i>Accipiter nisus</i>	Eurasian sparrowhawk
	<i>Buteo buteo</i>	Common buzzard
	<i>Glaucidium passerinum</i>	Eurasian pygmy owl
	<i>Strix uralensis</i>	Ural owl
	<i>Dendrocopus major</i>	Great spotted woodpecker
	<i>Dendrocopus minor</i>	Lesser spotted woodpecker
*	<i>Dendrocopus leucotos</i>	White-backed woodpecker
*	<i>Picoides tridactylus</i>	Eurasian three-toed woodpecker
	<i>Jynx torquilla</i>	Eurasian wryneck
	<i>Picus canus</i>	Grey-headed woodpecker
	<i>Dryocopus martius</i>	Black woodpecker

	<i>Picus viridis</i>	Green woodpecker
	<i>Erithacus rubecula</i>	European robin
	<i>Fringilla coelebs</i>	Chaffinch
	<i>Carduelis spinus</i>	Eurasian siskin
	<i>Aegithalos caudatus</i>	Long-tailed tit
	<i>Garrulus glaniarius</i>	Eurasian jay
	<i>Loxia curvirostra</i>	Common crossbill
	<i>Parus ater</i>	Coal tit
	<i>Parus caeruleus</i>	Blue tit
	<i>Parus major</i>	Great tit
	<i>Parus montanus</i>	Willow tit
	<i>Parus palustris</i>	Marsh tit
	<i>Phylloscopus sibilatrix</i>	Wood warbler
	<i>Phylloscopus trochilus</i>	Willow warbler
	<i>Pyrrhula pyrrhula</i>	Eurasian bullfinch
	<i>Regulus regulus</i>	Goldcrest
	<i>Scolopax rusticola</i>	Eurasian woodcock
	<i>Sitta europaea</i>	Eurasian nuthatch
	<i>Tetrao tetrix</i>	Black grouse
	<i>Tetrao urogallus</i>	Western capercaillie
	<i>Tringa ochropus</i>	Green sandpiper
	<i>Troglodytes troglodytes</i>	Winter wren
	<i>Turdus merula</i>	Common blackbird
	<i>Turdus philomelos</i>	Song thrush
Insects	<i>Aedes sticticus</i>	Mosquito
	<i>Aedes communis</i>	Woodland floodwater mosquito
	<i>Bothrioderes contractus</i>	No English common name found
	<i>Nothorhina muricata</i>	No English common name found
*	<i>Ceruchus chrysomelinus</i>	No English common name found
*	<i>Cucujus cinnaberinus</i>	Cinnabar-red flat bark beetle
*	<i>Stephanopachys linearis</i>	No English common name found
*	<i>Tragosoma depsarius</i>	Hairy pine borer

### 12.3.2. Key natural processes:

Internal forest dynamics – changes in the forest over time, in the age and species differentiation. Trees occur in all stages, from seedlings to old trees and deadwood in various states of decay.

Climatic variations

Ecological disturbances, such as high winds, floods, fires and so on are sudden changes that are normal for the ecosystem.

Flooding in connection with the spring thaw has decreased due to the water regulation, which has led to spruce encroaching in the floodplain deciduous forests.

Encroaching vegetation in river meadows

Grazing by wild ruminants

Fires

### **12.3.3. Main human impacts:**

Water regulation in the Dalälven

Grazing, haymaking and gathering winter fodder for domestic animals.

Forestry

Due to the burning of gigantic amounts charcoal for the ironworks, the forests in the area were used intensively for several centuries. Modern forestry and energy production also require extensive raw materials from the forests, resulting in only a very small part of the woods being left untouched.

### **12.3.4. Relevant management practices:**

Conservation-adapted forestry. Because large parts of the forest are certified under the Forest Stewardship Council Sweden (FSC) or the Programme for the Endorsement of Forest Certification schemes (PEFC), the forestry conducted here is adapted to nature conservation. All actions taken in forestry must be in accordance with the environmental quality goal Living Forests: “the value of forests and forest lands for biological production must be protected, while biodiversity is preserved and both social and cultural environment values are observed”, and also in accordance with the Swedish Forestry Act: “The forest is a national asset and a renewable resource that must be managed so that it sustainably produces good yield while maintaining biodiversity.”

Targeted measures are implemented in certain places to promote threatened species; for example:

- Thinning of spruce to promote deciduous trees
- Clearing of brushwood to keep certain lands open
- Grazing and haymaking
- Controlled burns
- The white-backed woodpecker is a species that requires extensive areas of deciduous trees, with many old trees and a large element of dead and dying deciduous trees, mainly aspen, birch, willow and alder.

An action plan has been established for the preservation of the white-backed woodpecker. This action plan is also expected to significantly benefit over 200 other red-listed species, above all lichen, mosses, fungi, beetles and birds.

## **12.4. Fourth type of habitat/land cover: Agricultural land/regional**

Agricultural lands were created by humans and animals over several millennia. The four cereals have been grown here since the Iron Age. For a long time raising livestock was the most important element of farming, and meadows were more important than fields. Because meadow hay was vital winter fodder, the animals spent their summers grazing in the more barren woods. This is the background of the shieling culture in the area.

A common trait for the whole region was the extensive management of wet meadows, dating back to prehistoric times. This was particularly true closest to the river, but also occurred in other areas. Haymaking in the river meadows, which were often far from the farms, provided an essential contribution to the farms and sometimes a surplus that could be sold to the cities. These managed meadows were a feature of the landscape until a bit into the 20th century, and some are now being managed again as a way to preserve the landscape and the traditional farming culture. Alongside this blend of mining and agriculture, the area also has a very typical meadow culture.

Major social change occurred here, as elsewhere, in connection with the land reform of the mid-19th-century. However, the redistribution of land occurred to different degrees in different parts of the country. What is significant for this area is that the majority of villages were able to retain their old character as nuclear or linear settlements. This, combined with the fact that the open land today covers about the same area as that on the oldest surveyor's map dating back to the 17th century, gives the area its special character.

### **12.4.1 Grazing lands/local**

#### **Meadowlands**

The vegetation on the meadows consists primarily of grasses and herbaceous plants. Many boast a rich diversity of species, in particular traditionally managed meadows with haymaking in late summer and grazing afterwards. When the grass is removed from the meadow, the soil becomes poor in nutrients, creating a unique flora with flowers from a range of environments. Trees and bushes sometimes occur, creating instead a forest meadow. Nordic meadows are created by humans and their grazing animals, and covered the most area in the 17<sup>th</sup> and 18<sup>th</sup> centuries. Meadowlands were the most important part of infields. In the early 19<sup>th</sup> century there were about two million hectares of meadowlands in Sweden; today only 6,500 hectares remain.

#### **Hay meadows**

A hay meadow is one that has long been used solely for haymaking. The hay is cut in the late summer once the flowers have spread all their seeds. Hay meadows are few and small, but important for biodiversity and for Swedish cultural history.

**Natural grazing lands and hay meadows** contain specific flora and fauna that benefit from this traditional land use. The presence of such flora and fauna indicates long continuity and non-use of fertiliser.

#### **Natural grazing lands**

Natural grazing lands are defined as lands that activities in order to improve production, or improved using tools, or fertilised, limed, cleared of stones, drained or sown with hay-field plants in the modern era.

Because these lands are not fertilised, there is a paucity of nutrients for plants, particularly nitrogen. This, combined with continuous grazing, is precisely what allows so many plant species to survive here.

The openness and sunlight are crucial not only for plant life but also for animals. The mostly sunny herbaceous grasslands allow for a rich diversity of insects. This provides food for birds, which is important during breeding in particular. Many butterflies also thrive here.



### **River meadows**

In the Nedre Dalälven region, the transition between open water and forest often consists of wide, regularly flooded river meadows. They are a species-rich environment hosting many rare and threatened plants and animals. The management of wet meadows was a feature of the landscape from prehistoric times until a bit into the 20<sup>th</sup> century, and some are now being managed again as a way to preserve the landscape and the traditional farming culture.

The northernmost (known) calcareous wet meadow is near Hedesunda.

### **12.4.2 Agricultural land**

Cohesive agricultural lands are found mainly in the southern parts of the region, where it joins up with the flatlands of the Lake Mälaren valley and in the areas along the river in Southern Dalarna. The primarily forested landscape is interspersed with occasional agricultural lands, in particular around Österfärnebo and Hedesunda north of the river.

Agricultural lands are rich and varied, created by humans and animals for several millennia. The transformation of farming in the post-war era has had consequences for the landscape, creating larger farms and spruce plantations, eliminating obstacles to farming and so on. The result is a more homogenous agricultural landscape.

### **Fields and pastures**

Field crops: oat, barley, wheat, rye and turnip rape.

Hay field production: meadow fescue, Timothy grass and red clover. Protein crops such as peas and fava beans.

Cattle for milk and meat production.

The proportion of horses is increasing, which is important to the open landscape.

### Microhabitats in the agricultural landscape

Microhabitats in the agricultural landscape are important for many species of plants and animals, as they serve as refuges in an altered landscape. This is particularly true for certain insects, such as butterflies, as well as birds, bats and some larger mammals. If the microhabitats are close enough to each other they can also have an exchange of individuals, which is often enough to ensure the survival of the species in the area. Older trees and bacciferous bushes are often of particular importance, offering shelter and food.

#### 12.4.3 Characteristic species:

<b>Group</b>	<b>Latin name</b>	<b>Common name</b>
Vascular plants	<i>Secale cereale</i>	Rye
	<i>Phleum pratense</i>	Timothy grass
	<i>Avena sativa</i>	Common oat
	<i>Triticum aestivum</i>	Wheat
	<i>Solanum tuberosum</i>	White potato
*	<i>Stachys arvensis</i>	Staggerweed
	<i>Persicaria lapathifolia</i>	Pale persicaria
Fungi	<i>Panaeolus</i> spp.	Panaeolus
Mammals	<i>Vulpes vulpes</i>	Red fox
	<i>Capreolus capreolus</i>	European roe deer
	<i>Lepus europaeus</i>	European brown hare
	<i>Microtus agrestis</i>	Field vole
Birds	<i>Alauda arvensis</i>	Skylark
	<i>Anser anser</i>	Greylag goose
	<i>Vanellus vanellus</i>	Northern lapwing
*	<i>Crex crex</i>	Corn crake
Reptiles and amphibians	<i>Bufo bufo</i>	Common toad
Insects	<i>Rhopalosiphum padi</i>	Bird cherry oat aphid
	<i>Coccinella septempunctata</i>	Seven-spot ladybird
	<i>Agrotis exclamationis</i>	Dart and heart moth
	<i>Meligethes aeneus</i>	Common pollen beetle
	<i>Pieris brassicae</i>	Large white butterfly
	<i>Pieris napi</i>	Green-veined white butterfly

#### 12.4.4 Key natural processes:

##### Encroaching vegetation

When grazing or haymaking ceases, the open lands become overgrown, first into brushwood and later into forest. As the vegetation grows denser, the light-dependent plants become shaded and disappear. More competitive plants take over. Bit by bit, the meadow and grazing land flora disappear and the species diversity is reduced. In just a few decades, pasture land can merge with forest.

### **Climatic variations**

The local climate is crucial to species diversity.

### **Grazing wild animals**

Primarily elk and roe deer.

## **12.4.5 Relevant management practices:**

### **Haymaking**

Lands that are currently managed through haymaking, often in combination with grazing afterwards, should continue to be so.

### **Conservation-focused grazing**

In contrast to cultivated grazing lands, natural grazing lands have not been fertilised, ploughed, drained or sown with hay-field plants. They often have a long history as grazing land. Typically, the plant species in grazing lands withstand grazing well, often sending out new shoots from the base. With the vegetation grazed low, the plants get plenty of light and can grow densely without shading each other.

The natural grazing lands in the area should be preserved through traditional grazing in combination with clearing of bushes and brush where needed. In pastures with old trees, continuity should be preserved by selecting and promoting new trees.

### **Restoration**

Older, non-managed natural meadows should be restored and managed, unless they have transitioned into other valuable habitats, such as hardwood groves. Haymaking should be reinstated in old hayfields that are currently managed through grazing. The restoration must always be followed by continuous maintenance.

### **Agriculture with environmental and conservation focus**

When managing fields, we leave cultural traces such as open ditches, clearance cairns, meadow barns, stone walls, prehistoric graves and settlements. Protection zones around sensitive environments such as waterways, wetlands and natural meadows are desirable.

## **12.4.6 Main human impacts**

### **Management via haymaking and grazing**

Many of the area's natural fodder lands have been shaped for centuries by traditional haymaking or grazing. A large number of species are completely dependent on the continuance of this meadow management. If grazing and haymaking cease, these species will be squeezed out by other, more competitive species, leading to a decrease in biodiversity.

### **Production-improving measures**

Adding fertiliser, sowing new, fast-growing species, draining and cultivation are measures that decrease biodiversity. Sorting of planting seed and the use of chemical herbicides and pesticides have decimated several weed and insect species.

### **Forest planting**

The planting of forests on previously managed meadow and pasture lands leads to increased fragmentation of the natural fodder lands and a greater risk of extinction for threatened species with low propagation.

### **Airborne impurities**

Fallout of acidifying substances and nitrogen affects the species diversity in plant colonies. Ground-level ozone has a negative effect on vegetation.

### **Other influences**

Introduction of foreign species, exploitation of land for buildings and infrastructure, closing of farms, hunting.

## **12.5. Fifth type of habitat/land cover: Built-up areas/Regional**

### **Cities and towns**

The area is home to three relatively old cities of 5,000–10,000 people, and several towns and small works communities.

The landscape here is dominated by buildings, roads, other hardened surfaces and planted green spaces. Parks, gardens and so on serve as living environments for many plant and animal species. These environments benefit some species but not others.

### **Villages**

There are many villages with very long histories. While major social change occurred here in connection with the land reform of the mid-19<sup>th</sup> century, many villages were able to remain traditional nuclear or linear settlements, even if many farms were moved from the central village. The open lands cover about the same area as they did back in the 17<sup>th</sup> century. The villages often lie at the border between woods and open agricultural landscape.

### **Ironworks**

Ironworks buildings are clustered around a central manor, with workers' residences on one side and industrial buildings on the other. The regular works village layout with works streets and parks came about in the 18<sup>th</sup> century. Stjärnsund, Kloster, Garpenberg, Söderfors and Gysinge are examples of such works.

### **Industrial and mining environments**

Large industrial areas are found in Söderfors, Långshyttan, Vikmanshyttan, Horndal and Avesta. The only site where a mine is still operating is Garpenberg, but many places in the area show traces of the historical mining. There are problems with seepage of heavy metals from discontinued mines.

### **Roads and railways**

Several large roads pass through the area, including the E4 motorway, Roads 56, 68, 70, 76 and 80 and several county roads. There is also a network of smaller roads and forest access roads. Several railway routes also pass through the area. Roads and railways fragment the landscape

and form barriers, which are a negative influence on many species. The traffic is also a danger to animals in the area.

### 12.5.1 Characteristic species:

<b>Group</b>		
Vascular plants	<b>Latin name</b>	<b>Common name</b>
	<i>Acer platanoides</i>	Norway maple
	<i>Anthriscus sylvestris</i>	Cow parsley
	<i>Bellis perennis</i>	Daisy
	<i>Betula pendula</i>	Silver birch
	<i>Fraxinus excelsior</i>	European ash
	<i>Quercus robur</i>	English oak
	<i>Taraxacum</i>	Dandelion
	<i>Tilia cordata</i>	Small-leaved lime
	<i>Trifolium pratense</i>	Red clover
	<i>Trifolium repens</i>	White clover
	<i>Tussilago farfara</i>	Coltsfoot
	<i>Ulmus glabra</i>	Scots elm
	<i>Urtica dioica</i>	Stinging nettle
	<i>Veronica chamaedrys</i>	Germander speedwell
Lichen	<i>Xanthoria parietina</i>	Maritime sunburst lichen
Mammals	<i>Capreolus capreolus</i>	European roe deer
	<i>Erinaceus europaeus</i>	European hedgehog
	<i>Eptesicus nilssonii</i>	Northern bat
	<i>Meles meles</i>	European badger
	<i>Plecotus auritus</i>	Brown long-eared bat
	<i>Rattus norvegicus</i>	Brown rat
	<i>Sciurus vulgaris</i>	Eurasian red squirrel
Birds	<i>Anas platyrhynchos</i>	Mallard
	<i>Carduelis spinus</i>	Eurasian siskin
	<i>Columba palumbus</i>	Wood pigeon
	<i>Corvus monedula</i>	Jackdaw
	<i>Ficedula hypoleuca</i>	European pied flycatcher
	<i>Sitta europaea</i>	Eurasian nuthatch
	<i>Sturnus vulgaris</i>	European starling
	<i>Turdus merula</i>	Common blackbird
	<i>Turdus pilaris</i>	Fieldfare
	* <i>Riparia riparia</i>	Sand martin
Reptiles and amphibians	<i>Bufo bufo</i>	Common toad
	<i>Natrix natrix</i>	Grass snake
	<i>Rana temporaria</i>	Common frog
	<i>Vipera berus</i>	European adder

	<i>Tegenaria domestica</i>	Domestic house spider
Insects	<i>Aglais urticae</i>	Small tortoiseshell butterfly
	<i>Gonepteryx rhamni</i>	Brimstone butterfly
	<i>Inachis io</i>	European peacock
	<i>Tineola bisselliella</i>	Common clothes moth

### 12.5.2 Key natural processes:

These environments are largely lacking in key natural processes. It is possible that the effect of flooding is exacerbated by e.g. climate change causing higher water levels.

### 12.5.3 Main human impacts:

#### Land use

The expansion of built-up areas and roads claims increasing amounts of land and encroaches on microhabitats.

#### Management of green spaces

How parks and green spaces are managed is crucial to the species that are promoted in built-up areas.

#### Air, water and soil pollutants

Traffic and other human activities emit pollutants to the soil, air and water. This has been beneficial to some species at the cost of others, thus changing the ecosystems.

#### Noise from industry and traffic

### 12.5.4 Relevant management practices:

- General plans for land use
- Maintain and re-create microhabitats
- Manage green spaces to preserve biologically valuable environments
- Reduce emissions of pollutants
- Water conservation

## 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 Dalälven

The Dalälven and its tributaries have fast-flowing water and sections with rapids and falls that offer oxygen-rich environments that are favourable for many species of water insects and demersal animals. The supply of food and oxygen makes them important spawning grounds for several species of fish.

Flooding creates favourable conditions for mosquitoes to develop, which is a problem for residents and tourists in some years.

From Avesta, the river falls 68 m on its way to the sea (120 km). The river forms several large lake systems (bays) here. These are separated by rapids and faster moving stretches of water. From Näs the landscape drops about 10 m, alternating between rapids and bays for about 60 km with no intrusion of power plants. After Lake Bysjön come the rapids of Leknäsforsen and Forsboforsen on either side of Forsön Island. After this comes a lake-like stretch down to the Tyttboforsarna rapids. This is followed by the jagged Färnebofjärden Bay (49 km<sup>2</sup>) with its many islands, then a section of several branches of the river and rapids in Gysinge, to reunite again in the bays called Hedesundafjärdarna.

At the outlet of Marmafjärden Bay are the Lanforsen rapids, which have been developed. After approximately another 4 km are the mighty Älvkarlebyfallen falls with Älvkarleby power plant. The vertical drop at Älvkarleby is 10 m. From Älvkarleby, the river flows mostly in one course approximately 10 km out to the sea.

The Dalälven drains an area of land covering nearly 6.5% of Sweden's total area. The majority of this land – nearly 73% – is woodland. The water quality in the main channel of the river is highly affected by the soil water from the forests, which applies in practice all the way down to where the river runs into the sea. In general the water in the primary channel of the river can be described as pH-neutral with good buffering capacity against acidification, moderate colour and good oxygen levels. The river water has a low to medium trophic state and the concentration of most metals can be designated as low all the way down to the mouth of the river.

### **Shore grasslands/river meadows**

In the Nedre Dalälven region, the transition between open water and forest often consists of wide, regularly flooded river meadows. They are a species-rich environment hosting many rare and threatened plants and animals. Many species require wet shores to grow and benefit from grazing and varied water levels. The area of water between the shore grassland and the reed belt is very valuable for many birds, insects and amphibians. In the warm, insect-rich water, fry develop fast. To ensure that the land is kept open, shore grassland needs to be grazed or cut.

Wet meadows have been managed since prehistoric times. Managed wet meadows were a feature of the landscape until a bit into the 20<sup>th</sup> century, and some are now being managed again as a way to preserve the landscape and the traditional farming culture. The northernmost (known) calcareous wet meadow is near Hedesunda.

### **Old-growth forests**

Ancient, virgin, natural forest that is allowed to develop free of human impact is very rich in species and has significant natural assets. A wealth of different plants and animals thrive in such forests, contributing to their biodiversity. Virgin forest contains windfalls and standing and fallen deadwood, which provides a diversity of habitats for flora and fauna. Deadwood is an important resource for a very large number of the plants and animals in the forest. It provides food, shelter, protection and building materials for a number of more or less uncommon species. Polypore

fungi, wood fungi, resupinate fungi and insects are some of the species that thrive in such environments.

### **Freshwater swamp forest**

Freshwater swamp forests grow in damp to wet soil. The vegetation has developed through natural regeneration and the groundwater reaches roughly ground level. Freshwater swamp forests are often relatively dense, with large amounts of deadwood, and contain many valuable environments and species.

### **Conifer swamp forest**

The tree layer is often dominated by pine or spruce with buttresses. The natural values of conifer swamp forests are dependent on long-term continuity of the forest, creating a natural age differentiation, species composition and deadwood in various stages of decay.

### **Deciduous swamp forest**

The forest is often dominated by birch and alder with buttresses. The natural values of deciduous swamp forests are dependent on long-term continuity of the forest, creating a natural age differentiation, species composition and deadwood in various stages of decay.

### **Floodplain forest**

This habitat is found frequently in the area, primarily in the form of small, narrow and usually aspen-dominated populations. They are located beside waterways on soils that are well drained at low water, but are regularly flooded at high water. Aspen forests with thick old trees are characteristic for the Nedre Dalälven area. Combined with the large percentage of birch and oak, the deciduous forest that frames the waters is quite unique, which was one of the reasons for the formation of the national park.

### **Hardwood forest**

Noble hardwoods include elm, ash, hornbeam, beech, oak, lime and maple. Hardwood forest is forest that mainly consists of these trees. 7,000 years ago, hardwood forests covered a large part of southern Sweden, but they have since decreased due to both cultivation and a colder climate. In our area, noble hardwood trees are mixed with populations of conifers or 'soft hardwoods'. They only form independent populations very locally, usually covering no more than 0.5 hectares. Hardwood forests are the most species-rich type of forest in Sweden, especially if they have long-term continuity. Many insects thrive in old hardwood trees, especially oak. In particular wood-living beetles are important to biodiversity.

### **Rich fens**

Rich fens are the swamps with the richest variety of species, including many specialist species of vascular plants, bryophytes, land molluscs and fungi. 2–3% of total swamp area in Sweden consists of rich fens. In the past, these wetlands were often managed via haymaking or grazing, which prevented them from becoming overgrown and favoured biodiversity. Today this type of management is uncommon and many rich fens have been drained to create cultivable land and forest.

### **Meadows/hay meadows**

Meadowlands covered the greatest area in the 17<sup>th</sup>–18<sup>th</sup> centuries, when they were the most important type of agricultural land. In the early 19<sup>th</sup> century there were about two million hectares of meadowlands in Sweden; today only 6,500 hectares remain due to the rationalisation of agriculture.

Meadows and pastoral land contain a large part of the natural and cultural values of the farmland. This land requires management in the form of haymaking or grazing to retain its values. There is a lack of grazing livestock and active users to keep this land open.

Numerous hay barns or remains of barns testify to the major importance of river meadows as hay meadows in the old peasant society.

### **Natural pastures**

contain specific flora and fauna that indicate long continuity and non-use of fertiliser. Hay meadows are few and small, but important for biodiversity and for Swedish cultural history. The openness and sunlight are crucial not only for plant life but also for animals. The mostly sunny herbaceous grasslands allow for a rich diversity of insects. This provides food for birds, which is important during breeding in particular. Many butterflies also thrive here.

### **Microhabitats in the agricultural landscape**

Farming districts exist mainly in the southern parts of the area, along the river in southern Dalarna and in some places north of the river in the landscape otherwise dominated by forest. Microhabitats in the agricultural landscape are important for many species of plants and animals, as they serve as refuges in an altered landscape. This is particularly true for certain insects, such as butterflies, as well as birds, bats and some larger mammals. If the microhabitats are close enough to each other they can also have an exchange of individuals, which is often enough to ensure the survival of the species in the area. Older trees and bushes are often of particular importance, offering shelter and food.

General habitat protection applies to tree-lined avenues, springs, clearance cairns, ponds and wetlands on agricultural land, stone walls on agricultural land and non-arable outcrops.

## **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.]

The Nedre Dalälven area is probably one of the most biologically valuable areas still extant on the Swedish mainland. It contains incredibly rich, varied biodiversity. The area contains a large number of habitats of national interest, the majority of which are known for their very high level of biodiversity. The constellation of land and water and different landscape types, from hilly terrain to sea, produces unique conditions. The combination of different water conditions, from running, cold freshwater to warm, stationary water to brackish water, also produces particularly special, rich biological potential. Overall, this has created the conditions for the richest bird, mammal and fish fauna that can be found anywhere in the Nordic region. A significant proportion of these species are organisms that are now red-listed because they have been forced

out of many previous habitats. The area also has particularly rich insect fauna due to the very special conditions, a combination of several individually beneficial factors that are unique in Sweden and just happen to coincide in the Dalälven area. The soil is comparatively rich in lime compared with Sweden as a whole, due to the proximity to Cambro-Silurian limestone deposits in Gävlebukten Bay. This produces rich, varied host flora that favours a very large number of insect species. In some locations with a slight gradient, the ample supply of water has led to large areas of mobile soil water, which is extremely favourable for both flora and insect fauna. In the same way, areas that are temporarily flooded with a certain regularity, have very characteristic flora and fauna. The relatively warm, sunny climate is a prerequisite for the many species meriting protection that otherwise have a southerly or easterly distribution and exist here in more or less isolated populations. This means that easterly, southerly and northerly fauna elements meet in the region in a remarkable, particularly exclusive mixture. Overall, these conditions have created conditions for an unparalleled insect diversity at this latitude in Europe and the rest of the world.

### **Mammals**

All four of Sweden's large predators have been observed in the area in recent years: wolves, brown bears, wolverines and lynxes. Otters are returning to the area.

### **Birds**

Parts of the area contain many species of breeding and migrating birds. Examples of nationally red-listed species: three-toed woodpecker, lesser spotted woodpecker, white-backed woodpecker, curlew, partridge, bittern, white-tailed eagle, lesser black-backed gull, kingfisher and great grey owl.

### **Fish**

There are approximately 30 species of fish in the area. A great many large pike, perch, zander and various white fish species are found throughout the river. The faster-moving stretches of the river are home to grayling and brown trout. There are salmon and sea trout in the lowest part of the river near Älvkarleby. Every year, salmon weighing over 20 kg are caught. The largest to date weighed 27.97 kg, a Swedish record in running water. Eel is a species that is nationally red-listed as critically endangered.

### **Insects**

Examples of nationally red-listed species: *Cucujus chrysomelinus* beetle, *Plagionotus detritus* beetle, *Platynus longiventris* beetle, *Nothorhina muricata* beetle, hairy pine borer (*Tragosoma depsarius*) and *Bothrioderes contractus* beetle.

### **Reptiles and amphibians**

The nationally red-listed species pool frog (*Rana lessonae*) exists in a few locations near the coast.

### **Vascular plants**

Examples of nationally red-listed species: Spring Pasque flower (*Pulsatilla vernalis*), bog violet (*Viola uliginosa*), *Persicaria foliosa*, umbellate wintergreen (*Chimaphila umbellata*) and oxlip (*Primula elatior*).

## **Mosses and lichen**

Examples of nationally red-listed species: neckera moss (*Neckera pennata*), dichelyma moss (*Dichelyma capillaceum*), wolf lichen (*Letharia vulpina*) and lung lichen (*Lobaria pulmonaria*). Several threatened species have their strongest base in Sweden – and in at least one case in all of Northern Europe – in the Nedre Dalälven region (for example *Platynus longiventris*, classed as endangered, EN). Among the most threatened species are several requiring targeted measures to ensure their survival in Sweden, for which the Swedish Environmental Protection Agency has requested funding in the coming years for species-specific action programmes. The following action programmes (established by the Swedish Environmental Protection Agency or being formulated) are directly or indirectly affected by the water regime:

- White-backed woodpecker (*Dendrocopos leucotos*)
- Flooded jellyskin lichen (*Leptogium rivulare*)
- Dichelyma moss (*Dichelyma capillaceum*)
- Cinnabar-red flat bark beetle (*Cucujus cinnaberinus*)
- *Ceruchus chrysomelinus* beetle
- *Platynus longiventris* beetle
- *Plagionotus detritus* beetle

Of the above species, the white-backed woodpecker, dichelyma moss and the cinnabar-red flat bark beetle are included in the EU Habitats Directive. The same is true of the *Xyletinus tremulicola* and *Phryganophilus ruficollis* (false darkling) beetles.

### *Annex 3: Nationally red-listed species*

#### **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.]

There are several programmes for the conservation of biodiversity. Examples include the county administrative boards' action programme for threatened species, the Swedish Forest Agency's Life projects and the signing of silviculture agreements, forest certification, area protection, fishery conservation plans, etc.

Species that are of importance in different areas of activity:

#### Fishing

Salmon, sea trout, Baltic herring, pike, perch, zander, grayling and crayfish.

Salmon fishing was very important historically and remains important for tourism today.

Large pike, perch, zander, grayling and brown trout are important for angling and tourism.

#### Hunting

Elk and roe deer are the most common types of game that can be hunted.

#### Agriculture

Oats, wheat, rye, barley, potatoes and turnip rape are some of the most important agricultural crops.

#### Livestock farming

Cattle, pigs, chickens and horses are the most common. Hedemora hens are a local breed that has been conserved.

#### Forest gathering and domestic agriculture

Lingonberries, blueberries, mushrooms (chanterelles, ceps), apples, currants and raspberries have traditionally been picked and collected and are important for the household economy. Picking berries and collecting mushrooms also fulfils a social function.

#### Forestry

Pine, spruce and birch are the economically most important species for forestry.

Forest nursery trees (primarily pine and spruce) are cultivated on a large scale at Nässja Plantskola, which is owned by Bergvik Skog.

The human community benefits from the forest in several ways:

- \* Production of timber for use as a building material, packaging, paper, fuel, etc.
- \* Production of food (primarily game, berries and mushrooms)
- \* Recreation, exercise, experiencing the beauty of nature
- \* Resource for the tourism industry
- \* Purification of water and air

A wealth of organisms also live in the forest in their own right. The forest housing these organisms can also be seen as a gene bank for the future for possible human requirements.

As a sun-driven production system for environmentally friendly products, the forest can be the cornerstone of a sustainable society. In both solid and cut form, trees are an extraordinarily versatile material that can be reused, recycled and ultimately used as an energy source. The production of trees for building purposes is energy-efficient and climate-efficient and has less impact on the environment than many competing materials. Forestry products that are not contaminated with environmentally hazardous substances are also environmentally friendly in use and biodegradable. The residual product, ash, can also beneficially be returned to the forest in areas in which biomass extraction is more intensive.

With forestry on normal soil, where growth is balanced by felling, there is neither net absorption nor net emission of carbon dioxide in the forest as a whole or the soil. However, the forest in itself is a permanent carbon store, which is valuable in its own right. This also applies to the store in the form of wood products, although this is small in the context. However, biofuels are valuable in climate protection work as they help us avoid the use of fossil fuels. Carbon dioxide is, of course, emitted in connection with both incineration and decay, but this is balanced by corresponding absorption from the atmosphere during the growth of the tree. Biofuels are therefore usually regarded as being carbon dioxide neutral. The greater part of biofuels used in

Sweden, almost a third of total energy consumption, originate in the forest, either directly or via other use in society.

Developing and promoting the use of wood and wood-based products to meet various needs in society is an important part of the work towards sustainable development, in particular in those cases in which it is possible to replace other materials or energy carriers that have a high impact on the environment, such as (fossil) oil, concrete or steel. Wood is also an excellent raw material for processing in the chemicals industry, for example into textiles and vehicle fuel.

High forest growth is a valuable asset in a sustainable society from both economic and environmental points of view. Forest management, felling, utilisation and processing provide key jobs and are very important to the self-sufficiency of rural districts. High forest growth on solid ground is potentially advantageous from an environmental point of view as well, as it produces raw materials for many environmentally favourable applications. However, when deciding which production-enhancing measures are suitable, it is necessary to compare the potential advantages of increased timber production with each measure's disadvantages and risks in relation to the other assets of the forest. It often comes down to weighing different environmental aspects. One tool that can be used when comparing different interests is FSC and PEFC certification, which most forest owners have adopted.

## **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']

For many years, stakeholders throughout the Nedre Dalälven area have collaborated to conserve and use the area's high-quality natural and cultural values as resources for the community's economic development in a way that is sustainable in the long term.

In the early 1970s, the Nedre Dalälven area came into the public awareness when the Nordic Council designated 'the wilderness areas at the limes norrlandicus at the Nedre Dalälven' as one of eleven Swedish objects of common Nordic nature conservation interest. Thus began a development process that focused from the beginning primarily on conservation issues and tourism related to natural and cultural values. Issues associated with sustainable development have gradually become more explicit, been given greater financial priority and acquired greater organisational affiliation.

In 1975, the Nedre Dalälven area was designated one of Sweden's 25 most important recreation areas, a 'primary recreation area', following an initiative by a group of municipalities in the region. The group's work ended in the early 1980s with a common municipal plan for the primary recreation area. This came to have a great impact on the subsequent municipal general planning, among other things.

To further enhance the collaboration in the area, the Nedre Dalälven Special Interest Association was founded in 1986, consisting of the municipalities and companies with interests in the area.

All nine municipalities in the proposed biosphere reserve are members of the association and have contributed financially and personally to the work of preparing for the creation of a biosphere reserve. Land-based industries are highly represented among member companies. A large majority of the land and water owners in the area are members of the association. The association's policy statement is in principle unchanged since its formation:

Based on the Nedre Dalälven's unique, high-quality natural and cultural values and its strategic, central position in the country, NeDa works to:

- promote the region overall with a positive profile
- benefit its members
- develop tourism
- contribute to households and businesses moving into the region

This development work must take into consideration the interests of the land-based industries, natural, cultural and environmental interests and the members' other interests.

In 1987, the major importance of the Nedre Dalälven area in this connection was reconfirmed when the Swedish Natural Resources Act entered into force, since 1999 in Chapter 4 of the Swedish Environmental Code. The Nedre Dalälven area is designated in the Act as being of national interest due to its collective natural and cultural values. This is one of 24 areas in which the interests of active outdoor recreation and tourism are to be given special consideration (Chapter 4, Section 2). Under Chapter 4, Section 6, there may be no water treatment works, water regulation or water diversion for power generation purposes.

In 1998 the Färnebofjärden National Park was founded in a central part of the area. In addition to the national park, a large number of nature reserves and Natura 2000 sites have been designated, mainly in the river landscape. Several Ramsar sites are also designated here.

After extensive preliminary work, the Nedre Dalälven area was chosen in 2000 from 32 applicants as one of 12 areas within Leader+, which was then a community initiative in the EU. The activity plan for LEADER+ Nedre Dalälven focused primarily on developing the local economy by using the area's rich natural and cultural resources in a long-term sustainable manner. To be granted subsidies from Leader+, applicants had to be able to show that the project for which they sought funding had good chances of directly or indirectly contributing to new job opportunities or permanent residents moving into the area. Another focus area was providing support to youth projects initiated and run by the young people themselves. However, for all types of project, no subsidies could be granted for activities that risked reducing the value of the area's fundamental natural and cultural environment, including the ecological balance and diversity.

Between 2001 and the end of 2008, when the Leader+ project ended, subsidies amounting to SEK 50.9 million had been paid out by Leader+ to 133 projects, 108 of them local and 25 of them network projects involving the entire Leader area. In addition, young people in the area have carried out over 40 small projects with a simplified application procedure, called 'youth cheques'. The total resources invested in these 133 projects amounted to at least SEK 130

million. Sustainable development was a more or less key element in most of the projects. A grant from Leader+ allowed NeDa to begin its work with the biosphere reserve Nomination Form.

According to information provided by the project groups, the projects have contributed to:

- the creation of over 200 new jobs
- the preservation of over 200 jobs
- the creation of over 500 new networks

In an earlier assessment, 90 project teams were surveyed about the effects of their projects as of February 2006 (roughly 5/7 of the programme period). Of these 90 projects, 77% reported improved business acumen, 94% reported an improved climate for collaboration, 93% reported greater faith in the future, 85% reported improvements in entrepreneurship and 87% reported improved skills.

In 2008, LEADER+ Nedre Dalälven was replaced by Leader Nedre Dalälven, whose activities are expected to continue until the end of 2014. In Leader Nedre Dalälven, the importance of ecologically sustainable development has been further accentuated compared with Leader+. Leader Nedre Dalälven and the Nedre Dalälven Special Interest Association are separate legal entities, but share an office and staff, including the working party for the Nomination Form.

In the past eight years, several thousand people have been involved in one way or another in the Leader-subsidised efforts to develop the rural district in the Nedre Dalälven area towards a higher degree of sustainability. With few exceptions, this has given the participants new knowledge and contacts, plus positive experience of local problem-solving and cooperation across traditional boundaries. This is particularly well supported by the tri-partite partnership on which the Leader method itself is based and which involves associations working with business and the public sector to achieve joint goals.

Within the Leader projects, a large number of material resources have been built up for the continued development of the area, for example visitor attractions, small-scale infrastructure, business plans and marketing material. However, there is definitely even greater value in the immaterial resources created at the same time in the form of networks, power of initiative and a positive attitude to cooperation for the development of one's own district.

An example of an area within ecological sustainability in which Nedre Dalälven is leading the field is the university course in sustainable construction and accommodation offered by Högskolan Dalarna in Stjärnsund in the Municipality of Hedemora. The course was launched in 2004 as the result of a Leader project, and has been full-booked every year. Homes and accommodation are a key part the environmental impact of our daily lives, so we can expect the topic to remain of great interest, in particular now that society is on the cusp of a change in which energy costs are increasing while we break our dependence on fossil fuels. The current university course, with its network contacts, has the potential to develop into a hub for ecological construction in a geographical region larger than the biosphere reserve itself.

In summary, the Nedre Dalälven area comprises unique, significant natural, cultural and environmental values, which have been attended to and looked after by public bodies at local, regional and central levels, by the non-profit sector and by the private sector at an undiminished level of activity. The opportunities to finance the various initiatives vary from time to time. There is nothing today to indicate anything other than that the focus will continue to be on promoting these opportunities in the future. On this basis, the Nedre Dalälven River Landscape is well worth continued work and investment.

#### **14.2 If tourism is a major activity:**

In their physical national planning, the Swedish Government and Parliament have designated the Nedre Dalälven area as one in which the interests of tourism and outdoor recreation should be given special consideration. One of the many attraction factors for tourism, new businesses and new residents is the area's strategic, central location. More than one third of the population of Sweden, including that of Greater Stockholm, can reach the area by car or train within two hours. Arlanda Airport is even closer, just an hour's drive.

Visitors come from Greater Stockholm/Lake Mälaren Valley, and also to an increasing extent from the rest of Europe. The proportion of foreign visitors in parts of the area is now over 10%.

The tourism industry is important for the self-sufficiency of the area now and in the future, and its externally oriented activities are vital in creating and marketing an attractive district with good residential environments and a high level of environmental friendliness. The environmental friendliness of facilities and products represents an important quality aspect and is highlighted in the marketing. Thanks to the natural environment, with the water, cultural environments and a living heritage landscape, the tourism industry has great potential for development in the area.

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

In 2007, there were just under 1.1 million day visitors and 268,500 commercial overnight stays (the numbers of people staying in holiday homes or with relatives and friends are not included but are considerably higher than those indicated here).

- is there a trend towards increasing numbers of visitors? (Give some figures if possible)

The number of commercial overnight stays increased by 22.8% in the five-year period 2002 to 2007 (the national average for the corresponding period is 13.8%).

The number of visitors to Gysinge Bruk has increased from 50,000 to 200,000 per annum in fifteen years.

##### **14.2.1 Type(s) of tourism**

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

The Nedre Dalälven area is characterised by high natural values, well-preserved industrial sites, a living heritage landscape and naturally good conditions for angling and outdoor recreation.

The area has several well-preserved industrial sites, for example Gysinge Bruk, one of Sweden's best-preserved Walloon ironworks, going back to the 17<sup>th</sup> century. This was one of Sweden's leading ironworks with the world's first electric steel furnace. Today it has historic buildings and a manor park. The works are located near the river's rapids and fast-flowing water, which are excellent fishing waters. The works site houses an inn, cafés, a museum, a works shop, a folk high school, crafts and art exhibitions. A Naturum nature centre is located close to Färnebofjärden National Park.

Söderfors is another well-preserved ironworks and one of the largest listed sites in Sweden.

Koppardalen in Avesta is right next to the river, where the largest copper works in Europe was once located. This valuable heritage site is now being utilised again for cultural activities, tourism and companies.

The most common types of tourism are: fishing, hiking, day trips by car and coach, staying in holiday villages, in hotels near the river and on farms, cycling, riding, boating, canoeing, botany and birdwatching. Group activities offered at the area's various residential facilities are particularly important.

As parts of the area contain many species of breeding and migrating birds, it is of great value for bird-related tourism. Lake Hovran, one of the largest birdwatching areas, is easily accessible as it is near a town and has ramps to viewing points.

The area has excellent fishing waters and is very popular among anglers. In 2007, anglers bought around 120,000 fishing days, making it one of the best visited continuous fishing areas in the country. Anglers fish mainly for pike, perch and zander throughout the area, and salmon and sea trout in Älvkarleby. It is important to note that it is primarily the pike that attract Europeans to the area.

There is a cluster of local artisan food makers and local production of meat, sausage, bread, eggs, mustard, vegetables, beer, chocolate, spices, etc. The products are sold in local markets, among other places. There are also a number of farm shops and some high-end restaurants that focus on local, seasonal, organic produce and have received national and international awards.

#### **14.2.2 Tourist facilities and description of where these are located and in which zone of the proposed biosphere reserve:**

##### **Core area**

In the National Park and the nature reserves, there are picnic areas, information boards, birdwatching towers, hiking trails and, in some places, simple cabins in which to spend the night.

##### **In the buffer zone:**

Board and lodging near the river: Dala-Husby Hotell & Restaurang, Husby Wårdshus, Husby kungsgård

Bed&breakfast Rensbo: Bed & breakfast

Bengtsbo: Youth Hostel

Näs: camping and cabins, boat hire, local history museum  
Ingbo Gård: Live on a Farm with canoe hire  
Färnebofjärdens camping: swimming area, holiday village, caravan pitches and a boat ramp  
Älvkarleby Turist och Konferenshotell: hotel and restaurant  
Söderfors Herrgård: hotel, conference centre and restaurant

#### Activities and culture:

Säterdalen with a people's park, café, shieling, playground and hiking trails  
Fäggeby, bonfires, lighthouse, shop, information on the river, visitors' jetty  
Hovran: visitors' area with three birdwatching towers, one of which has a ramp to a lookout point. Fishing and guided fishing  
Grådö: Marina, community centre, bakery, Grådö Skans archaeological remains, equestrian activities at IA:s Stall, hire of boats and canoes  
Koppardalen and Gamla Byn in Avesta. Old iron foundry with exhibitions and other events, works tours, Karl Jularbo museum, restaurant, coin museum, visitors' jetty  
Dalahästen and Åsbo area: shops, restaurant, holiday village, slalom slope, golf course  
Bengtsgård: Live on a Farm with boating and fishing  
Tyttbo Forsfiske (rapids fishing), with accommodation and boat hire  
Östa: cabin hire, caravan pitches, camping, boat hire, restaurant, convenience store, the Green House of Knowledge, exhibitions, canoeing, guided tours and swimming with miles of sandy beaches

There are several well-preserved industrial sites, for example Gysinge Bruk, one of Sweden's best-preserved Walloon ironworks, going back to the 17<sup>th</sup> century. This was one of Sweden's leading ironworks with the world's first electric steel furnace. Today it has historic buildings and a manor park. The works are located near the river's rapids and fast-flowing water, which are excellent fishing waters. The works site houses an inn, cafés, a museum, a works shop, a folk high school, crafts and art exhibitions. A Naturum nature centre is located close to Färnebofjärden National Park.

Hedesunda Ön: with open-air dancing, fishing, holiday village and camp site with a restaurant, sauna raft and boat hire, Skaparbyn (creative village) with accommodation and courses  
Östveda: cabin and boat hire  
Söderfors swimming and camping: 50 m heated pool, caravan pitches, cabins, craft production and sales, forge open to the public, guided tours of the heritage site  
Söderfors: Hjällsjön, fishing in a well-kept put & take lake  
Älvkarleby Fiskecamp (fishing camp): with a holiday village and caravan pitches  
Älvkarlby Laxön: with a youth hostel, restaurant, craftspeople  
Älvkarleby Sportfiskeforum, Europe's largest exhibition of fishing tackle, etc.  
Rullsand: Camping and cabin hire, large swimming area on a long sandy beach in the sea with facilities

#### Transition zone, for example:

Ljusterns camping with cabins  
Sätters Stadshotell  
The Skönvik area with a conference centre, restaurant and golf course

Hedemora Stadshotell  
 Hedemora Vandrarhem (youth hostel)  
 1915 homestead museum. Summer café, bakery  
 Genuine Dalarna market with local products  
 Oppigårds öl (beer) with a visitors' centre  
 Hyttbäckens gård. Bed & breakfast  
 Klosters Herrgård. Accommodation  
 Husbyringen. Sweden's oldest ecomuseum with museums and information sites  
 Husy Kungsgård. Bed and breakfast  
 Långshyttans Brukshotell  
 Modellkammaren (model collection). Museum of the iron industry  
 Älgparken with café and elk  
 Pråmleden. Canoeing, cycling, hiking, touring skating  
 Långmora Gård. Live on a Farm  
 Stjärnsund: 18<sup>th</sup> century industrial site of national interest with Polhemsmuseet and Stora Herrgården  
 Restaurang Krubban (restaurant)  
 Nickbergets Jakt och Fiskecamp (hunting and fishing camp)  
 Flinsberget. Rambling paths, cabin for hire for daytime activities  
 Garpenberg Herrgård. Conference centre  
 Ingelsbo. Live on a Farm. Farm shop  
 Fors: Dalkarlshyttans gård  
 Swimming, camping and youth hostel in Horndal  
 Fornbyklint ski slope  
 By Kyrkby: UWX-Laxfiske (salmon fishing)

### **14.2.3 Indicate positive and/or negative impacts of tourism at present or foreseen:**

Tourism is one of the world's biggest, most important industries for growth and employment. At the same time, the global tourism industry's biggest challenge in the future is how to achieve development that is sustainable for the environment. The Nedre Dalälven area has excellent potential for continued sustainable development of tourism. Sustainable development of tourism means that natural assets are conserved, while the local economy and social development are boosted.

#### **Expected positive effects:**

- Using without consuming
- Increased total number of jobs
- Improved service for year-round residents
- Greater awareness of the area's natural, cultural and environmental values
- Higher earnings for local business owners
- Greater awareness of the Nedre Dalälven region, nationally and internationally
- Good PR for the municipalities concerned
- Greater commitment to local and organic food and gastro-tourism

## Negative effects of increasing tourism:

The development of tourism is based on it taking place in a sustainable manner. It can therefore increase without major negative effects.

### 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]

#### Sales broken down by sector

Accommodation (hotels, camping, youth hostels, Live on a Farm, cabins)	SEK	86.3 million	16%
Food (food shops, growers, livestock farmers, etc.)		32.0	6%
Restaurants		116.6	21%
Transport (petrol stations, bus and coach companies, taxis)		63.2	11%
Shopping (shops, crafts)		211.8	38%
Activity		<u>46.2</u>	8%
Total		556.0	

#### Employment

Food	13
Restaurants	128
Transport	20
Shopping	114
Activity	63
Accommodation	<u>138</u>
Total number of FTEs	477

In 2007, day visitors and overnight guests in the area spent SEK 556 million, providing full-time jobs for 477 people.

Tax revenue from the companies directly affected by visitor spending:

Municipalities:	SEK 50.0 million
County Council:	SEK 24.1 million

## 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.)

## **Projects or plans for management questions:**

- White-tailed eagle project with feeding places
- Osprey project: annual inventory of the number of ospreys
- Ringing of birds, the Bird Ringing Centre, the Swedish Museum of Natural History
- White-backed woodpecker project, Kristoffer Stighäll, the Swedish Society for Nature Conservation
- Forestry plans – forest owners in the area (private individuals, companies and Sveaskog) have green plans for forest management in accordance with FSC and PFSC
- Overall fishery conservation plan for the Nedre Dalälven; Kalle Hedin, NeDa
- The plan gives recommendations for fishery conservation areas' and other affected parties' activities related to the species to which fishing interests are primarily linked. Fishing is an example of how it is possible to carry out sustainable social and economic development with conservation of biological assets
- Biological mosquito control project; Jan Lundström and Martina Schäfer, Uppsala University and NeDa
- The research and monitoring programme for the Biological Mosquito Control Project was designed specifically to use environmentally friendly methods to reduce the recurring mosquito problems that affect parts of the area in certain years. Studies of mosquito populations focus specifically on monitoring volumes and species distribution. The biological pesticide Bti is used for the management/control of the occasionally very troublesome volumes of the floodwater mosquito *Aedes sticticus*. Since 2002, a structured programme has been implemented for self-monitoring of any ecological effects in the temporarily flooded areas in which this mosquito's larvae develop
- Since 2002, an inventory has been conducted of the breeding of five bird species that are sensitive to disturbance
- Nature conservation genetics. Jacob Höglund, Uppsala University
- Management plans for the National Park and nature reserves
- The county administrative boards' action plans for threatened species
- Regional landscape strategies; Dalarna County Administrative Board, etc.

The focus of one sub-project was to find a method for discussion about heritage landscapes, interrelationships in the natural environment and how issues related to use and conservation can interact. Cooperation between the municipality, the NeDa proposed Biosphere Reserve and the Dalarna County Administrative Board was important to ensure that the project gained widespread acceptance. Mellanskog, the Swedish Forest Agency, LRF and other landowner organisations were involved at a later stage.

The work was carried out via a seminar and a field trip. Experts described the historical dimension of the landscape, the multifaceted landscape, etc. The knowledge communicated formed the basis of a discussion on the sustainable use of transition zones. A field trip to the same landowners' land aimed to look at the overall assets of the landscape in situ. Both the geography and biology departments at Högskolan Dalarna were asked to describe the assets of the landscape and give examples of phenomena on landowners' land.

### 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.]
- Biotic research and monitoring [flora, fauna]

#### **Skogshögskolan (forestry college) in Garpenberg**

Parts of Sweden's university courses in forestry were relocated to the forestry college in Garpenberg in 1915. From 1977 to 1997 the forestry college was part of the faculty of forestry science at the Swedish University of Agricultural Sciences (SLU) in Uppsala. In addition to the Master of Science in Forestry course, there were over 200 employees with around 100 active researchers and 9 professorships with an extensive international contact network. In 1997, parts of these activities were transferred to Högskolan Dalarna, while other parts moved to SLU Uppsala, Alnarp and Umeå.

#### **Salmon research in Älvkarleby**

The Swedish Salmon Research Institute in Älvkarleby was founded in 1959. The institute has followed up on the effects of compensatory stocking of salmon, prepared facts and data for negotiations and decisions by the Swedish Board of Fisheries and the Swedish Ministry of Agriculture, estimated stocks, etc. It has worked to solve various problems associated with salmon conservation, including conservation of the genetic diversity of salmon. The Swedish Salmon Research Institute has bred salmon and sea trout for research purposes and has worked with several universities. One example was research on the salmon disease M/74.

#### **Entomology**

Extensive entomological studies have been carried out in the Nedre Dalälven area. Some examples:

Baranowski, R. 1977. Natur vid Nedre Dalälven. Insektsinventering (Nature in the Nedre Dalälven area. Insect Inventory). Swedish Environmental Protection Agency.

Baranowski, R. 1982. Några bidrag till kännedomen om coleopterfaunan vid nedre Dalälven (Contributions to the Knowledge about Coleoptera Fauna in the Nedre Dalälven area).

Eriksson, P. 2000. Populationsutvecklingen för några trädlevande skalbaggar vid nedre Dalälven (Population Trends for Some Tree-living Coleoptera in the Nedre Dalälven area).

Jonsell, M. and Eriksson, P. 2001. Jämförelse av vedskalbaggsfaunan på gran och björkhögstubbar mellan naturreservatet Båtfors och dess omgivning (Comparison of Wood Coleoptera Fauna on Spruce and Birch Standing Deadwood between the Båtfors Nature Reserve and its Surroundings).

Isaksson, D. 2004. Inventering av aspınsekter i Gävleborgs län 2004 (Inventory of Aspen Insects in the County of Gävleborg in 2004).

Wanntorp, H.-E. 2005. Inventering av svämskogslöpare vid nedre Dalälven i Gävleborgs län 2005 (Inventory of *Platynus longiventris* Beetles in the Nedre Dalälven area in the County of Gävleborg in 2005).

#### **Mosquitoes**

Mosquito fauna were studied on one occasion in 1995 (Lundström et al. 1996), and have been studied continuously since 2000 (Schäfer 2004, Schäfer et al. 2004, 2006, 2008, Schäfer & Lundström 2006, 2009). Since 2002 extensive studies have been carried out of midge fauna

(Brodin et al. 2008, Lundström et al. 2009, 2010), of other wetland insects (Persson Vinnersten et al. 2010) and of diving Coleoptera and other predatory insects in water (Persson Vinnersten et al. 2009). Water-living protozoa and their interaction with mosquito larvae have also been studied (Östman et al. 2008).

The incidence of mosquito-borne virus has been studied in mosquitoes in the Nedre Dalälven area since 2000 and increased activity of Sindbis virus (Togaviridae; Alphavirus) was demonstrated in 2002. The spread of this virus among birds has been studied since 2002 and a large number of species have been shown to be infected. Human cases of joint problems and skin rashes caused by mosquito-borne Sindbis virus occurred in 2002 and 2009. The strains of Sindbis virus that occur in the Nedre Dalälven area have their closest genetic relatives in Norway, Sweden, Finland and Russia, as well as in South Africa, which indicates intercontinental virus transport by migratory birds (Lundström & Pfeffer 2009).

Inventories of breeding birds of five large, charismatic species were carried out in 2002–2009 in wetlands and forests close to wetlands (Engström & Petersson 2009). Many of the more extensive studies were designed to investigate whether the *Bti*-based control of mosquito larvae caused any direct or indirect ecological effects on other organisms in the wetland areas. However, no negative effects could be demonstrated in connection with the extent and dose used (Lundström et al. 2009, 2010, Persson Vinnersten et al. 2009, 2010, Östman et al. 2008). Nor did studies of sensitive bird species demonstrate any negative effects of the insect control measures introduced (Engström & Petersson 2009).

Based on laser scanning of the entire Nedre Dalälven area, a very advanced, detailed digital terrain model (DTM) has been produced and is used primarily as an aid to quickly map flooded areas prior to mosquito control measures. This DTM was also used as the basis for a degree project in the engineering programme at Uppsala University. The project involved building a hydrological model to simulate flooding (Antti Vähäkari, Simulering av översvämningar i Nedre Dalälven (Simulation of Flooding in the Nedre Dalälven area), Uppsala University, September 2006).

The Swedish Environmental Protection Agency commissioned Professor Christer Nilsson of the Department of Ecology and Environmental Science at Umeå University to examine the scientific follow-up of the mosquito control programme in the Nedre Dalälven area. The report recommends detailed investigation of how the river's regulated water flow can be modified to permanently reduce volumes of mosquitoes. Pending such a change, the report recommends that general control with *Bti* should be permitted.

- Socio-economic research [demography, economics, traditional knowledge, etc.]

### **15.1.3 Brief description of ongoing research and/or monitoring activities**

Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]

#### **Bothnian Sea River Basin District Authority**

The River Basin District Authorities have the overall responsibility for ensuring that the EU Water Framework Directive is implemented in Sweden. Sweden is divided into five River Basin

Districts with one River Basin District Authority in each district. A County Administrative Board in each River Basin District has been appointed the River Basin District Authority responsible for the administration of the quality of the aquatic environment in the district. The Nedre Dalälven area belongs to the Bothnian Sea District with the County Administrative Board of Västernorrland as the River Basin District Authority.

### **Vattenfall Utveckling AB**

The research focuses primarily on improving the environmental properties of the resources that are already in use. The company also participates in international research programmes working on new energy technology:

- Vattenfall's CCS project
- Production technology of the future
- Intelligent networks
- Thermal technology
- Wind power
- Energy from the sea
- Biotic research and monitoring [flora, fauna]

### **The 'Water Flow in the Nedre Dalälven' (Vattenföringen i Nedre Dalälven) project**

The 'Water Flow in the Nedre Dalälven' project was created to counteract environmental changes. The County Administrative Boards of Gävleborg, Västmanland, Uppsala and Dalarna, along with the Nedre Dalälven Special Interest Association and the Upland Foundation (Upplandsstiftelsen), received funds from the Swedish Environmental Protection Agency for the project. The aim is to compile knowledge about the habitats, species and natural assets that are affected and to evaluate the problems. The objective of the project is make specific proposals to the power generation industry on how they can adapt the water flow to minimise the negative impact on water assets, floodplain forests and river meadows. The possibility of retaining a favourable conservation status is considered today to be virtually non-existent unless the water flow is changed to a more natural regime,

### **Mosquitoes**

There are plans to intensify studies of the spread of the floodwater mosquito *Aedes sticticus* within and outside the Nedre Dalälven area. See also 15.1.10.

### **Dalälvens vattenvårdsförening (Dalälven Water Protection Association)**

Measurements have been taken in lakes and waterways by DVVF since 1990. At various intervals, concentrations of substances including the nutrients phosphorus and nitrogen, oxygen, metals and other ions in the water are sampled and analysed. The volumes transported are also derived from these concentrations. The composition of flora and fauna communities is also

studied; plankton, demersal animals and fish. Concentrations of metals and certain other substances are studied in fish and sediment at regular intervals.

### **Air pollution control associations' urban air monitoring programme**

The monitoring programme primarily comprises measurements and analyses of volatile organic compounds (VOC) and nitrogen dioxide. These substances represent the most common air pollutants (in addition to carbon dioxide) from transport, heating and industry.

### **Nature conservation genetics research in and around Färnebofjärden National Park.**

The research focuses primarily on game birds: black grouse, capercaillie and hazel grouse.

The research, conducted by Jacob Höglund, Professor at the Department of Ecology and Evolution (EBC) at Uppsala University, aims to understand how the structure and use of the landscape affect the incidence, population changes and genetic structure of wild species. The method is studying DNA from feathers. .

### **Miniplant**

A new plant type for forestry has been developed at Högskolan Dalarna in Garpenberg (Lindström et al. 2004). It has been tested in the field for 5 years, and the results are promising. The objective of the system is to minimise the risk of pine weevil damage and reduce the costs of cultivation and planting. The Miniplant, like small naturally regenerating plants, is not attractive to pine weevils. Miniplants can offer a number of advantages in terms of the environment and future forest stocks.

### **University of Gävle**

Nils Ryrholm, one of Sweden's leading butterfly experts, has studied how the climate affects the distribution of butterflies. He is one of the principal authors of a book on Swedish butterflies that was published in 2009 as the first volume of the *Encyclopaedia of Swedish Flora and Fauna* (Nationalnyckeln till Sveriges Flora och Fauna), which will be the biggest series of books ever printed in Sweden. All multicellular species in Sweden will be described in more than 130 volumes in the next twenty years.

### **Flora Guards (Floraväktarna)**

Floraväktarna is a national programme aiming to monitor the incidence of threatened vascular plants and cryptogams in Sweden. The project began in 1987 and is currently in operation in all the provinces of Sweden. Distribution and population trends of threatened species are recorded via regular inventories. The inventories are carried out mainly by botanists and conservationists and reported to the ArtDatabanken species database at the Swedish University of Agricultural Sciences (SLU). The World Wide Fund for Nature, WWF, is responsible for the programme.

### **Swedish bird survey (Svensk fågeltaxering)**

A programme monitoring changes in the size of the Swedish bird population carried out by volunteers, most of whom are members of the Swedish Ornithological Society (Sveriges Ornitologiska Förening). The project is managed by the Department of Ecology at Lund University and is part of the Swedish Environmental Protection Agency national monitoring programme. Annual inventories of birds have been carried out at several hundred locations in

Sweden in the past 30 years. The programme consists of three different inventories: a survey of breeding birds using point counts and transects, carried out during the breeding season, and a count of winter birds carried out once or more every winter.

- Socio-economic research [demography, economics, traditional knowledge, etc.]

**Mälardalen University** Barbro Torseld

#### **15.1.4 Brief description of planned research and/or monitoring activities**

- Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]

River current power. Researchers want to install a test plant for current power in the channel downstream of the hydropower plant in Söderfors. The idea is to make use of the kinetic energy in running water. A five-metre shaft is placed on the bed of the channel with a turbine at the top. The entire plant will be one to two metres below the surface of the water. PhD candidate Emilia Lalander of the Division for Electricity at Uppsala University found that the Dalälven is a suitable test river.

- Biotic research and monitoring [flora, fauna]

Nature conservation genetics. Jacob Höglund, Uppsala University

The BIOBILITY project: evaluation of the ecological and socioeconomic consequences of the process of introducing and implementing biosphere reserve functions in areas similar to the Nedre Dalälven around the world. Mälardalen University, University of Gävle, etc.

Mosquito control

There are plans to intensify studies of the spread of the floodwater mosquito *Aedes sticticus* within and outside the Nedre Dalälven area. See also 15.1.10.

- Socio-economic research [demography, economics, traditional knowledge, etc.]

The BIOBILITY project: evaluation of the ecological and socioeconomic consequences of the process of introducing and implementing biosphere reserve functions in areas similar to the Nedre Dalälven around the world. Mälardalen University, University of Gävle, etc.

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

- a permanent basis: 6
- an occasional basis: 12

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

- a permanent basis:
- an occasional basis: 2

### **15.1.7 Estimated number of masters and/or doctoral theses carried out on the proposed biosphere reserve each year: 5**

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

[1] = permanent [...] = temporary

The principal task of the Swedish Board of Fisheries' test station in Älvkarleby is to produce salmon and brown trout for the Dalälven, a total of approximately 140,000 two-year-old salmon and brown trout a year. The aim is for the fish bred for compensatory stocking to cope as well as possible when they are introduced into the river as *smolt*. To achieve this, continuous development, breeding and testing activities are carried out in connection with the fish farming. Extensive research service is also provided for the Swedish Board of Fisheries' own researchers and for external researchers at various institutions at universities and other higher education institutions.

The test station also has one of Sweden's best inspection facilities for migrating salmon, brown trout and eel, via a capture system on Laxön Island on Kungsådran (a branch of the Dalälven). The migrating yellow eel caught in this Central Fishery are then introduced upstream in various parts of the Dalälven's water system. The hope is to help the red-listed eel reach its nursery grounds and improve its status in the long term.

In 2006, the test station started a project to catch and release lampern, another red-listed species, past the dams in Älvkarleby. The hope is to improve the spawning results of this extraordinary species in the Dalälven. The salmon and brown trout needed for breeding are taken from the catch in the Central Fishery. The roe from these fish is distributed to the test station, Västanå fish farm (Älvkarleby), various research projects and the Gavleån and Testeboån Rivers. This involves roughly one million salmon roe and 800,000 brown trout roe a year.

The Swedish Board of Fisheries' activities in Älvkarleby are also important for sustainability. Aquaculture is a growing industry in Sweden and the world and an increasing number of consumers want farmed fish as a supplement to those caught in the wild. Environmentally friendly, ethically sound aquaculture depends on research and the breeding of farmed fish.

### **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]

Grimsö Wildlife Research Station, Swedish University of Agricultural Sciences 730 91 Riddarhyttan	85 km
Swedish Board of Fisheries Institute of Coastal Research Skolg. 6, Box 109, 742 22 Öregrund	65 km
Norr Malma limnology field station Uppsala University	165 km

761 73 Norrtälje

Tovetorp zoological research station 180 km  
Stockholm University  
646 94 Björnlunda

Askö Laboratory  
Stockholm University 235 km  
619 92 Trosa

#### **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-MAB MAPMON protocol for monitoring forest biodiversity]:

##### **Permanent monitoring plots for mosquito control**

Examples of permanent monitoring include monitoring of the size and species composition of the mosquito population with CDC traps in around 30 measuring points around Nedre Dalälven since 2001 and catching insects with 24 hatching traps in six wetlands around Färnebofjärden since 2002. Both of these collection methods are implemented by the Department of Ecology and Evolution at Uppsala University and represent self-monitoring of mosquito larvae control activities.

##### **National Inventory of Landscapes in Sweden (NILS)**

The Department of Forest Resource Management at the Swedish University of Agricultural Sciences (SLU) in Umeå. NILS inventories Sweden and follows changes in the landscape. NILS started in 2003 and has a permanent grid of plots throughout Sweden's land area that are monitored via field inventory and interpretation of aerial photographs. NILS collaborates with a number of different public authorities, universities and other organisations on various development projects and applications.

The results and analyses are used to monitor and follow up on environmental targets.

##### **Swedish National Forest Inventory (RIS)**

RIS is implemented by the Department of Forest Resource Management at the Swedish University of Agricultural Sciences (SLU) in Umeå. The first Swedish National Forest Inventory was conducted in 1923.

The primary aim of the Swedish National Forest Inventory is to describe the condition of and growth and felling in Sweden's forests. However, there are many areas of application. For instance, the inventory is a means of environmental monitoring. The Swedish National Forest Inventory is part of Sweden's official statistics.

The inventory comprises 13,500 test plots, of which 10,400 are visited and inventoried every year when the ground is free of snow. It includes all types of land. However, the most comprehensive description is of forest land.

### **Lantmäteriet (the Swedish mapping, cadastral and land registration authority), Gävle**

Aerial and satellite photos provide important information on the landscape. The photos are used to produce maps, plan road construction, conduct environmental monitoring and so on. Comparing photos taken at different times reveals changes in the landscape.

### **Swedish Board of Fisheries, Gothenburg**

State fisheries officials first collected information on 'Sweden's fisheries' at the end of the 19<sup>th</sup> century. Statistics Sweden (SCB) has helped the Board generate statistics since 1910. The Swedish Board of Fisheries today produces all official statistics related to fishing in Sweden.

The collection of data and statistics is important to all of the Swedish Board of Fishery's activities. It provides references and makes it possible to make forecasts and see trends, ensuring good quality in the wide range of work the Board carries out in many different fields.

The Swedish Board of Fisheries will be replaced by a new marine and aquatic environment authority in 2011.

### **Institute of Freshwater Research**

The Swedish Board of Fisheries' Institute of Freshwater Research in Drottningholm is responsible for research and development activities on fish and fishing in lakes and waterways.

The Institute of Freshwater Research has local offices in Örebro and Älvkarleby and maintains databases of net and electric fishing results, an extensive library, an age analysis laboratory and a flowing water ecology laboratory in Älvkarleby.

The Institute of Freshwater Research is part of the Swedish Board of Fisheries and will also be part of the new marine and aquatic environment authority in 2011.

### **Dalälvens vattenvårdsförening (Dalälven Water Protection Association)**

Since 1990, Dalälvens vattenvårdsförening has been taking samples in lakes, waterways and the adjacent part of the Gulf of Bothnia within the Dalälven's drainage basin.

Samples are taken 6 or 12 times a year in 34 waterway stations. The stations are strategically located in the Dalälven's main channels, in the major tributaries and in some waterways in which monitoring is considered to be particularly important. Samples are taken 2 or 6 times a year in 34 lake stations. In addition to these recipient lakes, a number of reference lakes that are relatively unaffected are included. Samples are taken 6 times a year in 4 stations in the Gulf of Bothnia. These are located within a radius of 5 km from the mouth of the Dalälven.

The sampling intervals applied and measurement variables analysed follow a monitoring programme adopted by the County Administrative Board in 2000. The physical variables temperature, colour and conductivity (salinity) are studied at all stations. The visual depth and oxygen content are also measured in the lakes and the Gulf of Bothnia. The water chemical variables measured always include pH, alkalinity/acidity, TOC (total organic carbon), total nitrogen and total phosphorus, and the fractions of nitrate nitrogen, ammoniacal nitrogen and phosphate phosphorus. In addition, a varying number of the metals copper, zinc, lead, cadmium,

iron, manganese, chromium, nickel, calcium, magnesium, sodium, potassium and molybdenum are measured, plus chloride and sulphate.

The incidence of phytoplankton is also checked once a year in all lakes, and the metal concentration in perch and pike from some of the lakes is analysed.

Every five years, fish are caught to study both the species structure of communities and the metal content in their tissues. Every ten years, sediment and demersal animal communities are also studied.

#### **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.]

All of the above facilities are available.

There are a number of meteorological stations in the national monitoring system. The County Administrative Board and municipalities have databases on a number of social sectors and inventories. Reports from environmental monitoring and nature inventories are also available from the respective public authority/administration. The Swedish Forest Agency has corresponding information on forests.

#### **15.1.12 Other facilities**

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

Accommodation in hotels, youth hostels, etc. (see question 14.2).

#### **15.1.13 Does the proposed biosphere reserve have an Internet connection?**

Yes. Fibre network in towns and cities, ADSL in other urban areas and mobile broadband elsewhere.

### **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]

The institutes of higher education and the Green House of Knowledge provide education in sustainable development (see 15.2.1).

There are continual information campaigns by public authorities to create sustainable social development. There are campaigns for energy efficiency, waste sorting, climate smart choices, etc. The municipalities have energy advisors for property owners, private individuals and companies.

Knowledge about the environmental impact of driving is now part of driver training and all driving schools teach their pupils to drive in an energy-efficient manner.

To save money and the environment, companies take various initiatives to become more energy-efficient and environmentally friendly. For example, FSC certification for forestry.

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

#### Biological control of mosquitoes

The activities for biological control of mosquitoes in the Nedre Dalälven area require a continuous exchange of information with politicians, decision makers and the population in the area, plus contacts with the media. This means that environmental education and public awareness activities have been ongoing since summer 2000, with a total of around 1,000 attendees at meetings, plus all those who read/watch/listen to media, ranging from national media to trade journals.

#### Green Flag:

A large number of preschools and schools in the proposed biosphere reserve have Green Flag certification. They are part of an international network, Eco-Schools, that exists in 40 countries. The certification is based on the participation of children/pupils, recurring reports and continuous improvements. Topics: Consumption, Climate and Energy, Water Resources, Lifestyle and Health, Ecocycle and Local Environment.

Energy and climate advisors are available in every municipality. Target group: households and companies.

Agenda 21 coordinators or similar are available in several municipalities. Environmental information for the municipality's activities, population and small companies.

Green House of Knowledge (GKh), a resource centre for sustainable development in practice. GKh is close to Färnebofjärden National Park and Östa nature reserve, Municipality of Heby. Since the early 1990s, the area has been used for field studies of nature and culture, from primary school to university level. In cooperation with Gävle University and Mälardalen University, plus the Uppsala district of the Swedish Forest Agency and Mellanskog, an exhibition called 'Living Landscape' opened in June 2009. The exhibition is about the relationship between man and the cultivated landscape. Further training is also provided for teachers in cooperation with the universities. One of the objectives of GKh is to become a Nature School.

In addition to seeing exhibitions, visitors can take guided tours, hire canoes, hike on nature and culture trails and visit the butterfly garden. [www.gkh.se](http://www.gkh.se)

Hyttö Nature School Älvkarleby. Outdoor education for pupils up to year 9.

Vattenfall Science Center On Laxön Island in Älvkarleby is for all ages and is housed in buildings constructed in 1880, when Laxön was a military facility. It is now an experimental workshop where you can see how hydropower works, among other things.

The Naturum nature centre in Gysinge is an experience for all the senses for all ages. It teaches visitors about the natural and cultural environment in Färnebofjärden National Park. Naturum opened in 2005 and serves as the gateway to the national park. The County Administrative Board in Gävleborg is the authority responsible for it. Visitors can learn more about the animals, plants, geology and cultural history that have shaped the area. In addition to exhibitions, there are guided tours, themed evenings and nature trails.

Nature information at all nature reserves under the control of the county administrative boards. Often the start of self-guided nature trails.

The upper-secondary schools in Säter, Hedemora and Avesta that are located within the proposed biosphere reserve have courses on the environment and social issues. The upper-secondary school in Sala has field teaching in the area. Naturbruksgymnasiet Ösby (natural resource upper-secondary school) in the Municipality of Sala, which specialises in soil, forestry, horses and animal keeping, is located a few kilometres outside the biosphere reserve.

There are folk high schools in Sjövik and Österfärnebo. Sjövik has courses in outdoor recreation and Färnebo has courses in ‘Climate and Change’ and ‘South Africa and Democracy’.

The Swedish Forest Agency and forestry companies arrange courses such as ‘Forest at School’ directed at teachers.

Study associations and non-profit associations have courses and excursions located in the area.

The universities of Uppsala, Gävle, Dalarna and Mälardalen and SLU carry out excursions and field studies here, often with participants from abroad.

Högskolan Dalarna offers courses for entrepreneurs and forest owners in the premises of the former forestry college in Garpenberg, and on ecological construction and living in Stjärnsund.

### **Target groups:**

- Students and pupils of all ages, from pre-school to basic university courses
- Teachers
- Tourists and other visitors from Sweden and other countries
- Company training courses
- Public organisations, for example municipalities and county administrative boards

### **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]

Biological mosquito control: The resources that exist for environmental education and public awareness activities are primarily human, i.e. researchers and other staff with training in biology who work in the Nedre Dalälven area.

Green House of Knowledge: training, further training for teachers, exhibitions.

Naturum: in Gysinge, with exhibitions, information and guided tours.

Nature information at Billudden.

Älvkarleby: Swedish Board of Fisheries, salmon fishing, fishing museum.

Husbyringen ecomuseum.

Tyttbo: angling centre with exhibition.

Skaparbyn (creative village): with houses by Ralph Erskine on Hedesunda Island.

Båtfors: Uppland foundation exhibition.

Nedre Dalälven Collaboration (NeDa): marketing, fairs, guided tours and other events for tourists and other visitors.

Swedish Forest Agency: training, forest days, excursions.

Mellanskog: training for forest owners, excursions.

Guided nature tours are held in several locations in connection with the national park and nature reserves, provided by both entrepreneurs and non-profit associations such as the Swedish Society for Nature Conservation.

Museums and exhibitions: Timber floating museum (Flottarmuseet) in Gysinge, Polhemsmuseet in Stjärnsund.

Information boards: in a large number of locations in connection with nature reserves and urban areas.

### **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]

Students in higher education, doctoral students, masters students, including international participants.

Research programmes, for example the Department of Population Biology at Uppsala University.

The Department of Ecology and Evolution at Uppsala University has been working since 2000 on research, development and monitoring relating to animal populations in the Nedre Dalälven area. This has led to one doctoral thesis (Dr Martina Schäfer, Mosquitoes as a part of wetland biodiversity, Uppsala University, December 2004), and another two doctoral students (Thomas Persson Vinnersten and Jenny Hesson at Uppsala University) are writing their doctoral theses

based on material collected fully or partially in the Nedre Dalälven area. Further training for teachers.

#### **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.]

The Nedre Dalälven River Landscape contributes to the World Network of Biosphere Reserves via its unique habitats and cultural and environmental values.

There are good conditions for collaborating with other biosphere reserves. This may involve various topics such as sustainable tourism, research projects, teaching, monitoring and sustainable social planning.

The knowledge and skills relating to biological control of floodwater mosquitoes acquired in the Nedre Dalälven area may also be applicable in other biosphere reserves. The advanced techniques for mapping temporary wetlands are of particular interest.

Sweden's work with national and regional environmental quality targets is also a working method that may be applicable in other countries.

Forms of collaboration between public, private and non-profit interests on the Leader project and also some environmental monitoring.

Leader-subsidised partnerships are a good example. Several thousands of people have worked together to develop the rural district in the Nedre Dalälven area to achieve a higher degree of sustainability. This has given the participants new knowledge and contacts, plus positive experience of local problem-solving and cooperation across traditional boundaries. The tri-partite partnership of associations working with business and the public sector to achieve joint goals contributes to this in particular.

##### **15.4.1 Collaboration with existing biosphere reserves at the national level**

(indicate ongoing or planned activities)

##### **Biosphere days in Stockholm in March 2007**

Around ten people with a connection to the Nedre Dalälven attended the meeting for the Swedish MAB programme in 2007. The topic was 'Research and Practice in Swedish Biosphere Reserves'.

##### **Biosphere days in Gysinge on 27–28 May 2008**

The annual meeting for the Swedish MAB programme was held in Gysinge on 27–28 May. The Nedre Dalälven biosphere reserve candidate hosted the meeting. Other biosphere reserves, candidates and the Swedish MAB committee met there. The topic of the meeting was the development potential a biosphere reserve can produce. The programme also involved seminars and excursions with biosphere-related themes.

### **Biosphere days, 27–28 September 2009**

The biosphere days were held in the proposed Östra Vätterbranterna reserve with zoning as the topic. Six people attended from the Nedre Dalälven area.

#### **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.]

There are good conditions for collaborating with other biosphere reserves. This may involve various topics such as sustainable tourism, research projects, teaching, monitoring and sustainable social planning.

Exchange of facts via Biosphere Reserve Integrated Monitoring (BRIM).

#### **15.4.3 Collaboration with existing biosphere reserves in thematic networks at the regional or international levels**

(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.]

#### **Archipelago biosphere reserve in Finland**

In September 2007, we undertook a three-day study trip to the Archipelago biosphere reserve in Turku, Finland. Those invited included the municipal contacts, the research group, landowners and representatives of LRF. The aim of the visit was to make contact with our closest biosphere reserve and have the opportunity to study the administration and management of an established biosphere reserve with many similarities to our own area.

#### **15.4.4 Collaboration with existing biosphere reserves at the international level**

(indicate ongoing and planned activities [Notably through Internet connections, twinning arrangements, bilateral collaborative research activities, etc.]

**International contacts** have been established in the form of exchanges with biosphere reserves in France and Australia at an MAB meeting in Stockholm in August 2007.

#### **EuroMAB 2007 in Turkey**

The project coordinator attended EuroMAB 2007 in Turkey.

#### **EuroMAB 2009 in Slovakia**

The research group’s Anders Telenius attended.

## **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]

Examples of land use in the core areas are haymaking, grazing, nature conservation felling, clearance, construction of picnic areas and hiking trails, fishing, hunting, teaching, 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)

There is a certain adverse effect even though these areas enjoy legal protection. Examples of this may be:

- Fragmentation of biotopes.
- Regulation of the river, development of hydropower. The high natural values in the Nedre Dalälven area are closely linked to natural fluctuations in water level. Water regulation has caused a severe loss of natural values. More natural seasonal water level variations and reduced short-term regulation would benefit conservation.
- Eutrophication can lead to waterways becoming choked with vegetation and changes in species composition.
- Overgrown land due to a reduced number of grazing livestock and reduced haymaking.

### **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 is largely the same as the boundary for shoreline protection. These are areas in which special consideration is shown for natural and cultural environments. Agriculture and forestry take place in the buffer zones. There is also nature tourism, fishing and hunting.

#### **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:**

The adverse effect on the buffer zones is largely the same as for the core area, i.e. it may be:

- Fragmentation of biotopes.
  
- Regulation of the river, development of hydropower. The high natural values in the Nedre Dalälven area are closely linked to natural fluctuations in water level. Water regulation has caused losses of natural values. More natural seasonal water level variations and reduced short-term regulation would benefit conservation.
  
- Eutrophication can lead to waterways becoming choked with vegetation and changes in species composition.
  
- Overgrown land due to a reduced number of grazing livestock and reduced haymaking. If agriculture ceases and arable land is planted so that it becomes overgrown, there are major negative consequences.

### **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 main land uses and major economic activities in the transition area (s):**

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

The activities and land use that take place there vary greatly. Land is used for building primarily in connection with the towns and cities and the communities in the area. There are industrial plants, primarily in the steel, engineering and paper industries, in Långshyttan, Vikmanshyttan, Fors, Avesta, Söderfors and Skutskär. Dairy: Milko in Grådö. There is active mining in Garpenberg. Hydropower plants: Långhag, Fäggeby, Avesta, Näs, Untra and Älvkarleby.

Forestry and agriculture are widely practised in the transition area. The largest forest owners are Sveaskog and Bergvik Skog AB. Both forestry companies have environmental certification and operate long-term sustainable forestry, compatible with the objective of the biosphere reserve.

Bergvik Skog AB's environmental policy:

Bergvik Skog's objectives are to be achieved via a high level of profitable, sustainable forest production. Bergvik Skog's nature conservation work must contribute to the conservation of biodiversity. The company's work is characterised by openness with information and a constructive dialogue with the representatives of the local community.

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

Pollution from industry, old mining areas that leak heavy metals, water regulation, gravel pits and intensive forestry and agriculture are examples of what may have an adverse effect on the area.

If agriculture ceases and arable land is planted so that it becomes overgrown, there are major negative consequences.

Other infrastructure such as roads, railways and power lines uses land and contributes to the fragmentation of the natural environment.

## **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)]

Counties: Dalarna County, Västmanland County, Uppsala County and Gävleborg County  
Municipalities: Säter, Hedemora, Avesta, Sala, Heby, Sandviken, Gävle, Tierp and Älvkarleby

### **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.]

The core areas consist of a national park and nature reserves.

The buffer zones consist of areas of national interest for nature conservation, preservation of ancient monuments, outdoor recreation, Natura 2000 areas, Ramsar sites, nature conservation areas and shoreline protection areas.

The transition area consists of other land.

#### **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 primarily surrounded by buffer zones, which often coincide with shoreline protection areas. The buffer zones are surrounded by the transition area.

### **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)]

## **Färnebofjärden National Park**

Area: 1,100 hectares (of which 5,990 hectares are land and 4,110 hectares are water), founded in 1998.

Färnebofjärden is one of 28 national parks in Sweden.

The flora and fauna of the national park are strongly influenced by the periodic flooding. Natural river meadows and deciduous forests with many very large trees are characteristic for the region. Due to its location in a biological borderland, the area demonstrates a multi-faceted blend of southern and northern Swedish wildlife. Marshlands and coniferous forests with a northern Swedish character meet southern deciduous forests with elements of oak and lime. The jagged shores of the river embrace more than 200 islands and skerries.



*Spring ice in Färnebofjärden Bay. Photo: Anna Jansson*

The fauna is rich in species and few places in Sweden can compare in the diversity of forest and wetland birds. A large number of species of wood-living insects benefit from the extensive deciduous forests with many dead and dying trees. The area is home to 270 vascular plants and 205 species of bird, of which 107 regularly mate in the area. Some 20 fish species and about 70 red-listed insect species live side by side with elk, roe deer, hare, fox, marten, beaver, wood lemming and lynx.

Färnebofjärden Bay is the part of the Nedre Dalälven that is least affected by water regulation, forestry and development. The natural character and the high biological and aesthetic values of the bay made the area well worthy of protection in the form of a national park. Färnebofjärden is also a Ramsar Convention on Wetlands site and a Natura 2000 site.

### **Nature reserves making up the core area in addition to the national park**

(per county and municipality, beginning in Säter and going downstream to Älvkarleby)

## Dalarna County

### Municipality of Säter

#### Säterdalen Valley

Area: 82 hectares, established in 2005



*The deep ravine creates a warmer, more protected environment that promotes southerly species. Photo: Maria Jons, Dalarna County Council.*

Large, coherent deciduous broadleaf forests are unusual in these parts of the country. The broadleaf forest creates nutrient-rich soil, which in turn promotes herb-rich flora. Some typical shade-loving plants in the area are lily of the valley, wood anemone, alternate-leaved golden saxifrage, touch-me-not balsam, herb Paris and baneberry. An inventory of vascular plants in the area found nearly 350 species. In addition to the rich flora, the area is also home to a great many species of birds, insects and fungi.

After the last ice age, large amounts of fine-grained material were deposited at the bottom of the valley in which the Dalälven flows today. The Ljusterån and Hyttbäcken Rivers have carved ever deeper in these easily-eroded soils. As the courses reached below ground-water level, erosion increased rapidly. What we see today is the result of thousands of years of the water's influence. The agricultural lands next to the ravine are gradually being swallowed up by the widening valley. Currently Säterdalen Valley has about 35 side ravines, and at the deepest points the river has cut through the soil to 50 metres below its surroundings.

Once home to expansive grazing and meadowlands with shielings and barns, the valley has become overgrown with vegetation in the past century.

The Ljusterån River has long been used as a source of power. Several smithies and plants have operated in the river valley, including Sweden's first copper coin mint. The remains of dams and foundations are still visible, even signs of all the ancient watermills of the past.

### Outdoor recreation

Säterdalen Valley is probably by far the best-known ravine formation among the Swedish public. It was written about as early as the 18<sup>th</sup> century for its striking, compelling scenery. Around the turn of the 20<sup>th</sup> century, public interest in Säterdalen began to grow, and the valley became, along with the Lake Siljan area, one of the most popular tourist attractions in Dalarna County.



The shifting landscape of Säterdalen Valley, with its steep ravines, bubbling meadow brooks and a luxuriant, almost southern flora, brought about its great fame. In addition to hiking trails along the river and up and down the steep ravines, there is a public park with a café and a large playground, and further down the river a shieling, which has grazing animals in the summer.



### **Municipality of Hedemora**

#### **Kloster**

Area: 228 hectares, established in 1992



*Riverside grazing lands in the Kloster nature reserve. Photo: Fredrik Lundin, Dalarna County Council.*

Kloster is an open, green nature reserve in the summer. From the birdwatching tower in the southern part of the area you can see how the great shore grasslands transform from pure grasslands, to wetter meadows and belts of sedge, to colonies of floating-leaf plants with islands of blooming bogbean. Rare plants like fen violets and sweetgrass grow along the shore, and reeds, club rushes, horsetails, water sedge and slender-tufted sedge form tall banks of vegetation.

Among the aspens you might catch sight of the poplar admiral butterfly, but it is perhaps easier to study one of the world's richest populations of the extremely rare flooded jellyskin lichen, which grows at the base of the aspen trunks.

The area is also home to a wealth of bird species, including no less than six woodpecker species. Owls, stock pigeons, dabbling ducks, waders, greylag geese and whooper swans are other interesting local species. You can even see an osprey hovering over the water, searching for prey.

### **Lilla Älvgången**

Area: 65 hectares, established in 1998

Lilla Älvgången is a valuable wetland area with hay meadows and shore grasslands that are grazed by livestock. The unique, preservation-worthy aspect of Lilla Älvgången is its value for breeding and resting wetland birds. Several rare plants grow in the area, such as curly pondweed and early meadow-rue.



*A new, disabled-friendly birdwatching tower has been built in Lilla Älvgången. Ramps and gravel paths allow people in wheelchairs to access the tower, which opened on Birdwatchers' Day, Sunday 9 May 2004. Photo: Fredrik Lundin, Dalarna County Council*

## **Stackharen**

Area: 55 hectares, formed in 1959 (under reorganisation)

This reservation is an island in Lake Hovran, which has been set aside as a bird sanctuary. Hovran is one of Dalarna's most species-rich bird lakes, and has regular breeders such as yellow wagtail, common rosefinch, Eurasian reed warbler, icterine warbler, mallard, northern shoveler and garganey.



*Stackharen has an old birdwatching tower overlooking the island. The once quite open grazing lands are now becoming overgrown with trees, mainly deciduous but some spruces.*

*Photo: Maria Jons, Dalarna County Council.*

## **Municipality of Avesta**

### **Åsboholmen and Isaksboholmen**

Area: 7 hectares, established in 1986

The reservation consists of two moraine islets in the Dalälven, covered with old-growth mixed forest. The islands are home to many species of fauna and are located in the national-interest site the Dead Falls.

### **Bysjöholmarna**

Area: 35 hectares, established in 1984

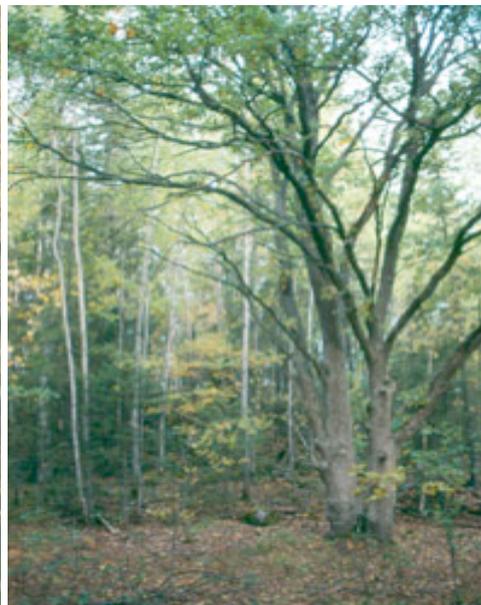
Parts of these islands belong to an esker ridge. They are home to naturally regenerating oaks and a rich flora of wood fungi and lichen. Woodpeckers thrive here and there are many traces of human use of the islands.



*The waters of the Dalälven flow peacefully between these islands in the Bysjöholmarna nature reserve. Photo: Lennart Bratt, Dalarna County Administrative Board.*

The reservation consists of several islands. Bysjöholmarna are in the fluvial Lake Bysjön, a part of the Dalälven, just over 10 km upstream of the Tyttboforsarna rapids where the river leaves Dalarna. The western islands, Lammön and Långholmen, are parts of the Möklintaåsen Ridge, which continues north to form the Byåsen ridge. Thus, the islands consist of sand, gravel and pebbles. The islands to the east – Arnön, Vidön, Lillön and Drällsholmen, consist of till and plateaus of exposed bedrock.

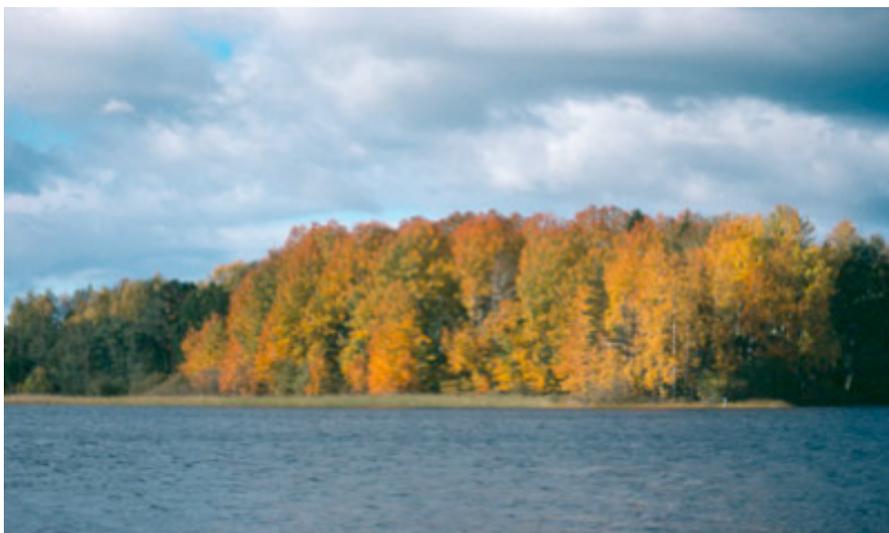
The vegetation on the islands is interesting, in part due to their location along the biological border of Norrland, where oak and lime can naturally regenerate. The flora on the open sedge meadows is noteworthy: Among the wide expanses of *Calamagrostis canescens* grass and slender tufted sedge or water sedge you can spot the rare marsh pea, *Lathyrus palustris*. Rushes of the species *Scirpus radicans* and small water pepper, *Persicaria minor*, grow at the waterline. The forest consists of spruce trees mixed with broadleaf deciduous trees, except for the esker-stone islands, which are covered with pine forest. The wealth of deciduous trees can probably be explained by a combination of natural factors. The regular flooding is a key element, as well as human influence in the form of haymaking and livestock grazing. Aspen and birch are the dominant species, but here and there are significant populations of oak and lime. The forest varies widely from old, near-virgin to very young forest.



*Both on the shores and on the islands you can see some of the big, old broadleaf trees that thrive here.*

Many of the specific values of the Bysjöholmarna Islands are linked to their special type of forest cover. It is home to many rare lichen and wood fungi, which are favoured by the amount of deadwood. The islands are also home to an extremely rich insect fauna. The rare wood-living beetles have been mentioned in particular. Of all species, those favoured by regular flooding are particularly important here: the *Platynus longiventris* beetle, flooded jellyskin lichen and dichelyma moss. The extensive number of aspen trees favour many species of insect, bird, moss and lichen. The oak mosaic fungus is so rare that Vidön Island is the only site in Dalarna where it can be found. There are many species and individuals in the bird world here. Woodpeckers have made a clear mark on the area, building nests and searching for food in the old trees.

There are no buildings on Bysjöholmarna, but they have been used extensively for haymaking and grazing for a long time.



*Autumn colours glow in the deciduous trees on the islands.*

### **Fullsta**

Area: 53 hectares, established in 2000



*Photo: Fredrik Lundin, Dalarna County Council.*

The beautiful Fullsta area offers a wide range of natural settings: wet meadows, juniper hills, birch meadows and deciduous groves with occasional old oaks. This varied landscape is located

in the Nedre Dalälven area and is home to a huge flora, including many rare species such as *Scirpus radicans* rushes, purple loosestrife and garden loosestrife.

The area is very beautiful and houses a wealth of birds and animals.



*Photo: Fredrik Lundin, Dalarna County Council.*

## **Herrön**

Area: 26 hectares, established in 1990

This reservation is an island in the Dalälven covered with broadleaf deciduous forest of predominantly alder, willow, bird cherry, rowan and birch. It is an important environment for woodpeckers and other birds. Quite a few beaver-felled trees lie along the shores.

## **Gävleborg County**

### **Municipality of Sandviken**

#### **Ista**



*Photo: Gävleborg County Administrative Board.*

Size: 770 hectares, founded in 2000

In the flat landscape around Färnebofjärden Bay in the Dalälven lies the Ista nature reserve, through which the Enköpingsåsen Ridge passes and continues out into the river. Along the lowland shores around Hamrefjärden Bay and Lake Istaön are valuable river meadows and floodplain forests. The low-lying shore zones are regularly flooded, creating valuable natural assets. Many threatened species are dependent on recurring flooding, for example several red-listed lichen and mosses, are found in the Ista nature reserve.

The Enköpingsåsen Ridge passes through the reserve, and its flood sediment forms a tongue of land stretching into Färnebofjärden Bay. Road 272 from Sandviken follows the ridge before turning off towards Gysinge. The ridge continues on south, crosses the Dalälven and joins up with Road 67 on the other side. Much of the ridge stands above the water's surface as islands or continuous land in the river. It has always been common practice to build roads along esker ridges, in part because they are among the first areas of land to rise over the surface when land uplift occurs.

## **Gysinge**



*Photo: Gävleborg County Administrative Board.*

Size: 463 hectares, established in 1975

The Gysinge nature reserve at the Nedre Dalälven features typical Dalälven flora and fauna. The shores are edged with broadleaf deciduous forest and flat river meadows that are regularly flooded. There is also a nature park with a disabled-accessible nature trail. Much of the original nature reserve is now a part of the Färnebofjärden National Park.

## **Municipality of Gävle**

### **Jordbärsmuren – Ålbo**

Size: 950 hectares, established in 1995

Downstream of the Färnebofjärden National Park, northeast of Gysinge, lies the Jordbärsmuren – Ålbo nature reserve. The area is characterised by the Dalälven delta landscape and the well-

developed raised bog, Jordbärsmuren. Large and round, Jordbärsmuren is a concentric, clearly arching raised bog with few parallels in the country. North of Jordbärsmuren, the Ålboån and Finnbäcken Rivers flow into the Dalälven. These tributaries are surrounded by broad river meadows, which are flooded at high water. Up until the 1950s these meadows were used for haymaking.

The area is highly interesting, with northerly and southerly species living side by side. It has rich deciduous forests with oak, hazel and lime, and several species in the area – such as *Phellinus ferrugineofuscus*, *Oxyporus corticola* (bark bracket) and *Phellinus pini* (red ring rot) fungi – indicate that the forest here is worth protecting. Many insects are favoured by the many broadleaf trees. Birds in the nature reserve include woodpeckers, golden plover, curlew and black-tailed godwit.

## Landa



*Masur birch. Photo: Gävleborg County Administrative Board.*

Size: 3 hectares, established in 1971

The Landa nature reserve contains a unique area with brown masur birches. An old pasture once lay in the northwestern part of the reserve, and this is where most of the masur birches are. Masur birch is a variation of the silver birch with a special pattern in the wood, caused by a disruption in the area where the tree grows. Masur birches are usually short and knotty, with a crooked trunk and thick, cracked bark.

Other deciduous trees in the reserve include aspen, oak and maple.

### **Kvillanudden**

Size: 2 hectares, established in 1973

The Kvillanudden nature reserve consists of a wooded gravel ridge forming a cape in the Dalälven. The area is very popular and offers a beautiful view of Hedesundafjärden Bay. Most of the reserve is old pastoral land, and the area is still relatively open today.

The reserve was formed to preserve the cape's population of masur birch.

It has plenty of deadwood, both birch and aspen. Dead birch wood is an ideal environment for fungi such as chaga, tinder fungus and mossy maze polypore.

### **Spjutholmen**

Size: 154 hectares, established in 1992

Most of the boulder-filled till soils are dominated by old-growth spruce forest. Closest to the river are floodplain forests with elements of oak, lime and ash. Several populations of the rare, threatened bog violet are found in the area.

### **Bredforsen**



*Photo: Gävleborg County Administrative Board.*

Size: 222 hectares, founded in 2000

The Bredforsen nature reserve is characterised by its proximity to the Nedre Dalälven. Near the shores are excellent forest lands with many noble hardwoods, as well as aspen and birch. Many of the populations have an untouched character, with many dead and dying trees. The northern part of the reserve consists of an ancient heritage landscape of pastoral land, meadows, barns and traditional wooden fences.

**Uppsala County**  
**Municipality of Heby**  
**Östa**



Area: 597 hectares

Östa is a peninsula in the Dalälven, where the Enköpingsåsen Ridge stretches into the water. It is home to open raised bogs, wooded peatlands and old-growth forests, as well as long sandy beaches and flowering meadows. Located in the *limes norrlandicus* – the border to northern Sweden – the area demonstrates a clear difference in vegetation between the north and south sides of the river.

The Stormossen and Joksmossen marshlands in the eastern part of the reservation have a wilderness feel about them. Stormossen has a nearly treeless expanse of bog surrounded by up to 400-year old pines. The calls of black grouse echo over the bog on early spring mornings, and other wetland birds such as curlew and wood sandpiper can be seen here.

Up on the esker ridge, the woods are pleasant to walk in and rich in berries and mushrooms. The location, on a ridge jutting into the water, with excellent hunting and fishing opportunities, has brought people to Östa for many years. The ridge and the river were both natural transport routes. The area is rife with archaeological finds from past eras, from Stone Age settlements to remnants of iron production, shielings and even a strange rune carving.

## Municipality of Älvkarleby

### Hedesundafjärden



Area: 1338 hectares, established in 1998

This flat wetland area by the Nedre Dalälven has been clearly shaped by recurring floods. Its rich, varied flora and fauna and the extensive insect populations make this a popular site for many species of birds.

The regular flooding of the Dalälven has shaped the landscape, forming river meadows and shore grasslands, alluvial fens, floodplain forests with many species, and expansive freshwater swamp forests. The water is currently regulated, but the wetlands are still top class.

The alluvial fen and shore grasslands spread over the lowland areas, often in a mosaic with swamp forests and moraine islands covered by lush groves of trees. Expansive swamp forests with a large element of aspen grow in the transition to firmer ground. Above the high-water boundary the woods are mainly spruce and mixed forest. There is also a rich bog in the area. Trees of all ages, dying and dead trees and plenty of wood gradually decaying into soil create an excellent habitat for many species. The freshwater swamp forest is home to several interesting mosses, including the sub-alpine species fragile leaf dicranum moss, which grows here in one of its southernmost locations in Sweden.

The forest is also home to many bird species including black grouse and capercaillie, and white-tailed eagle and osprey can be seen flying over the water.

## **Båtfors**



Area: 1567 hectares, established in 1990

The Båtfors nature reserve is a mosaic of islets, bays and stony river channels. It is trailless wilderness with fast-flowing waters and virgin forests. The terrain is flat and full of boulders, and it is often difficult to get your bearings. But you may see woodpeckers, rare insects and perhaps a lynx.

The landscape is young and the river has not yet carved a clear channel in the soil, but has spread out instead. The islets are difficult to access, and the forest has never been profitable. Regular flooding has provided nutrients and moisture to the trees. The deciduous broadleaf forest, including big old oaks, is very rich in flora and fauna.

The old forest, with its excellent blend of healthy, dying and dead trees and its stable climate, has created an ideal environment for wood-living insects. Of the more than 200 red-listed species observed in Båtfors, over half of them are beetles, including the provincial insect of Uppland, the cinnabar-red flat bark beetle.

## **Gropholmarna**

17 hectares, established in 1997

Gropholmarna are islets in a part of the Dalälven where the landscape is broken up with several smaller river channels. These channels are mainly dry, except at high water levels, when the river invades them again.

In contrast to the islands, the mainland is easily accessible and ideal for walking. The Upplandsleden Trail follows the riverbank through the whole reserve, and several picnic areas have been set up in picturesque settings.

The setting is a combination of coniferous and deciduous forest. Here, as everywhere in the province of Uppland, local farmers have used the forest as grazing land, and haymaking has been done in the very south.

The riverbanks are three to five metres high and show clear signs of erosion. Grasses and herbs such as spring vetchling, lily of the valley, rough horsetail and wood small reed grow here.

## Billudden



Area: 1898 hectares, established in 1972

Billudden is a part of the Uppsalaåsen Ridge, which dips down into the sea here, just east of the mouth of the Dalälven. There are plenty of trails around the cape, two of them nature trails where children and grown-ups alike can learn more about the singular flora and fauna here.

An old fishing village is located at Billhamn Harbour. The harbour was formed by a giant block of ice that melted here at the end of the ice age, leaving a hole that formed a perfect harbour basin. As late as the 1930s, six fishing families lived in the village, but now the old cottages are used solely as holiday homes.

Billudden rises like a dragon's back out of the sea. And it is still rising, thanks to post-glacial rebound – up to 70 cm per century! This means that new land is constantly being uncovered, and these 'new' shores are home to Europe's largest population of sea buckthorn.

Brämsand has Uppland's biggest aeolian sand field, with dunes towering at over three metres' height. The shore is open, but farther in from the sea is a semi-open pine forest. The sand is calcareous, which leads to many unusual soil fungi among the trees.

Stentorget, 'Stone Square', is a rubble field full of rocks that have been worn smooth by the waves of the sea. Now, due to post-glacial rebound, they are well inland.

The northernmost tip of the cape is called Billskatan. It is often windswept with big waves. In the sea are treacherous shallows that have spelled disaster for many ships. A beacon fire was kept alive on the cape for many years to warn ships away. In later years a lighthouse was built.

**Further reservations are in the process of being established:** Hedesundafjärden (in Gävleborg County), just over 600 hectares; about 5 km downstream from the Brämsöfjärden nature reserve (in Gävleborg County), over 1800 hectares; Lake Stadssjön municipal reserve in the Lake

Hovran area in the Municipality of Hedemora, 50 hectares; and Kerstinbomyran in the Municipality of Heby.

Annex 5: Justifying documents and management plans for the nature reserves and national park

### **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.]

The **buffer zones** have an area of 19,350 hectares. They largely coincide with the boundaries for shoreline protection (in some places there are waterfront areas with detailed local plans). Parts of the buffer zones are also classified as being of national interest for conservation and outdoor recreation.

### **Areas with shoreline protection**

Shoreline protection applies along all waterways in Sweden, including sea, lakes, rivers and brooks. This is set out in chapter 7 of the Environmental Code. The purpose of shoreline protection is to secure the general public's access to shore areas for recreational purposes and preserve good living conditions for the flora and fauna on land and in water. Within the protected area of a shoreline, it is forbidden to erect new buildings or to change the primary use of existing buildings, to excavate soil or conduct other activities that negatively impact the purpose of shoreline protection. General shoreline protection is 100 metres inland and 100 metres out into the water from the shoreline at the normal average water level. In some waters, extended shoreline protection of up to 300 metres may apply. All extended shoreline protection in Sweden will be reviewed and adjusted by 2014. Parts of protected shoreline areas are already set aside as nature reserves and are therefore part of the core area.

### **National interests**

The concept '**Area of national interest**' has existed since the 1970s. The Act on Economizing on Natural Resources (NRL), which went into effect 1 July 1987, and later the Environmental Code (1 January 1999), specifically defined the concept from a legal standpoint: "Land and water areas, as well as the physical environment in general, that are important for reasons of public interest on account of their natural or cultural value or for outdoor recreation shall, to the extent possible, be protected against measures that damage the natural or cultural environment."

The Swedish Planning and Building Act states in its requirements for municipal comprehensive planning is that sites of national interest are listed. The plan must indicate how the municipality intends to meet the listed national interests.

In the proposed biosphere reserve, parts of national-interest sites are already set aside as nature reserves or Natura 2000 sites, and are therefore already in the core area. (Large parts of the sites of national interest are in the transition area.)

### **...for natural values**

Must represent the primary characteristics of Swedish flora and fauna, illustrate the development of the landscape and show biodiversity in nature. In each natural geographic region (the country

is divided into regions based on plant geographical, climatic, geological and landscape properties), areas have been selected that best represent the landscape types and habitats.

### **...for outdoor recreation**

Must have great value for outdoor recreation due to 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, and perhaps also from abroad. The selection was made with the consideration that many different Swedish landscape types must be represented.

### **...for cultural environment values**

The Swedish National Heritage Board makes decisions on areas of national interest as regards cultural environment. There are 1,700 such areas in Sweden, ranging from tiny localities reflecting a specific era in history, to expansive landscapes that have developed over many years.

### **...for commercial fishing**

“Land and water areas that are important for reindeer husbandry, commercial fishing or aquaculture shall, to the extent possible, be protected against measures that may significantly interfere with the operation of these industries.” The Swedish Board of Fisheries is one of the central authorities that provide information to the county administrative boards on areas that the authority considers to be of national interest.

The great importance of the Nedre Dalälven in these contexts was confirmed again in 1987, when the Act on Economizing on Natural Resources (1987:12) went into effect. The third chapter pointed out the entire region surrounding the Nedre Dalälven as an area of national interest due to its collective natural and cultural values. It is one of 24 areas in which special geographic regulations apply, and in which the interests of active outdoor recreation and tourism are to be given special consideration. Parts of the area are also of national interest for nature conservation, preservation of ancient monuments and outdoor recreation according to chapter 2, section 6.

## **17.4 Land use regulations or agreements applicable to the transition area**

(if appropriate).

Several laws regulate land use:

### **The Planning and Building Act of 1987.**

This law regulates how the development planning for land and water areas goes from the comprehensive level to the detailed level. In physical planning, the municipality considers and decides on the uses of different areas: for residential construction, nature areas, industrial use, etc. The municipalities have a monopoly on all planning and are required to have an up-to-date comprehensive plan. The municipality-wide comprehensive plan is a long-term vision for the use of land and water in the development of the municipality. At the same time the plan is a vision for future residential areas, workplaces, infrastructures and green spaces. The detailed plans regulate aspects such as land use and the placement and layout of buildings. All planning is

carried out in a democratic process with the general public, businesses, associations and affected authorities.

### **The Environmental Code of 1999**

Aims to promote sustainable development and a good living environment. This goal clearly indicates that nature is not simply a living environment for humans, but has a value of its own worth protecting. The proposed biosphere reserve contains areas of national interest for nature conservation, preservation of ancient monuments, outdoor recreation and commercial fishing. These areas are dealt with in chapter 3 of the Environmental Code, which states that they should be protected, to the extent possible, against measures that may significantly interfere with them.

The use of land for agriculture is regulated to some degree by the Environmental Code's regulation on environmental care in agriculture.

Several species of flora and fauna are protected by law (chapter 8). Protected animals may not be harmed, captured or killed, and protected plants may not be harmed or removed, and no parts of them may be collected. About 300 species are protected in Sweden. In addition to these species, all birds and mammals are protected under hunting legislation, apart from specific hunting seasons for certain species.

The Government recently decided that all protected species would be included in a new Species Protection Ordinance. This makes it easier to gain a clear overview of the rules and which species are protected. The Species Protection Ordinance (2007:845) went into effect 1 January 2008.

### **Other environmental legislation**

The Swedish Forestry Act (SFS 1979: 429) affords equal importance to environmental and production goals, stating in the first paragraph that: "The forest is a National resource. It shall be managed in such a way as to provide a valuable yield and at the same time preserve biodiversity." The rest of the law text regulates how felling is conducted and what considerations must be taken.

Fishing and hunting are regulated by the Fishing Act (SFS 1993:787) and the Hunting Act (1987:259).

The Swedish Heritage Conservation Act (1988:950) regulates the use of land in and around ancient monuments.

## **Other types of agreements**

Beyond this legislation, the use of land is also regulated by voluntary agreements and management contracts.

Governmental environmental compensation for agricultural land, for example for the preservation of pastoral lands and hay meadows and for various measures to reduce leakage of mineral nutrients, and nature conservation agreements for forest lands.

In addition to this, the industries have their own agreements, for example certification of forests (e.g. FSC and PEFC) and lands for organic farming (e.g. KRAV).

### **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.]

#### **17.5.1 Core Area(s):**

Government (Environmental Protection Agency)	70%
Municipalities and county councils	4%
Church of Sweden	0%
Physical person or estate	7%
Company (mainly Bergvik Skog)	17%
Association or foundation	2%

#### **17.5.2 Buffer Zone(s):**

Government (Environmental Protection Agency)	1%
Municipalities and county councils	1%
Church of Sweden	0%
Physical person or estate	52%
Company (mainly Bergvik Skog)	43%
Association or foundation	3%

#### **17.5.3 Transition Area(s):**

Government (mainly Sveaskog AB)	14%
Municipalities and county councils	2%
Church of Sweden	1%
Physical person or estate	67%
Company (mainly Bergvik Skog)	15%
Association or foundation	1%

#### **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?]

Sveaskog (a government-owned company and Sweden's largest forest owner) is selling 5–10% of its total forest holdings, and a few of those holdings are located within the proposed biosphere reserve.

#### **17.6 Management plan or policy and mechanisms for implementation**

[The Seville Strategy recommends promoting the management of each biosphere reserve 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, 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.]

We choose to call it the 'Policy for the Biosphere Reserve' to avoid confusion with the management plans for protected areas for which the county administrative boards are principally responsible.

#### **The biosphere reserve will:**

- Promote collaboration for sustainable community development.
- Make the area a role model for sustainable development.
- Promote the region with a positive profile.
- Enhance the identity of the region and attract the interest of the surrounding world.
- Further develop tourism.
- Create greater opportunities for people and businesses to live and work in the region.
- Contribute to households and businesses moving into the region.
- Conserve the river landscape through use.
- Make the most of local interests, knowledge and commitment.
- Monitor trends, such as new technology, forms of support and research.
- Create and further develop national and international networks.

#### **How to achieve this**

##### **Positive profile**

A biosphere reserve is a strong international brand that will enhance the existing Nedre Dalälven Collaboration. The biosphere reserve will create the conditions for cooperation across traditional boundaries for sustainable community development.

The positive profile will boost the chances of attracting tourists and encouraging households and businesses to move into the area. More tourism and households and businesses moving in have long been highlighted as essential to the future of the area.

### **Benefit to those who live and work in the area**

The existence of a biosphere reserve creates better opportunities for pursuing projects that are important for the area and its people, regardless of the national and international programmes and sources of financing that are available from time to time.

### **Tourism**

The conditions for sustainable tourism, ecotourism and cultural tourism are very good in the Nedre Dalälven area. Involvement in tourism is based on high-quality, small scale operations and sustainable development. There is room for a considerable increase in the volume of tourism while still retaining the quality-led approach. It should be possible to double visitor numbers from current levels within ten years without creating problems for the natural environment or the surrounding community. Such an increase can realistically be achieved with the help of continued, sustained collaboration. The collaboration in the field of tourism currently involves over a hundred stakeholders, most of whom are small-scale entrepreneurs. The tourism departments of the municipalities also play an important role in this collaboration.

### **Conservation through use**

The Nedre Dalälven area is a mixture of old open cultivated land and large-scale forest. The open landscape and its border zones embracing big forests, the river and other waterways are essential to the area's attractiveness and its biodiversity. The open landscape can only be maintained through use. Contributing to this is one of the most important tasks of the biosphere reserve.

The area also contains many old industrial sites which mainly have their roots in the 17<sup>th</sup> century. Some of these sites have been developed into modern industrial plants, which make up the basic industry of the area, along with the forestry industry and agriculture. Other activities, often in the field of tourism, have taken over at most of these industrial sites. A common feature of all is that their value can be preserved through use.

### **Using the core areas in the development of the area**

The core areas along the river and out in the sea, i.e. the national park and nature reserves, normally contain the most valuable natural assets. These should be used to a greater extent than today as visitor attractions, demonstration objects and in research. Local users and entrepreneurs can also have greater employment opportunities thanks to management and maintenance tasks.

### **Dialogue between public authorities and local population**

Sustainable development efforts require close cooperation between the local population and public authorities, among other things on issues concerning the core areas and any new protected areas. There are also many issues outside the core areas, for example concerning various regulations, in which dialogue at an early stage is particularly beneficial.

### **Collaboration between municipalities**

The Biosphere Candidate Office can be the referral body when the general plans are prepared to create common visions for areas near the river.

### **Research and teaching**

The biosphere reserve can be a point of contact for students from nearby universities and other institutes of higher education, and for international students. An inventory is beginning in 2010 to show how resources can be created to coordinate and develop research and teaching.

### **Study visits**

The positive image of our area can be enhanced by building up the expertise and resources to accept an increasing number of study visits. Study visits often function as an exchange of knowledge for mutual benefit.

### **Projects for sustainable development**

The most important task of the Biosphere Candidate Office is to work with municipalities, regional bodies, organisations and businesses to help develop large and small projects that can contribute to achieving what we want to achieve together with the biosphere project. The Swedish Rural Development Programme and in particular Leader are currently the primary sources of opportunities for such projects. The current programmes will be changed or replaced by others over time. By the area becoming a biosphere reserve, we can facilitate the transition between different forms of financing. We will also have greater opportunities to conserve expertise and transfer experience between initiatives that last for limited periods of time.

#### **17.6.1 Year of start of implementation of management plan or land use policy:**

### **Activity plan**

A more detailed activity plan for the biosphere reserve will be prepared for each year, starting in 2010, in close cooperation with the Development Council, which consists of representatives from the affected authorities, municipalities, land and water owners and other organisations (see organisational chart) that will be appointed (this is described in section 4.6).

#### **17.6.2 Main features of management plan or land use policy and means of application.**

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

The aim of the Nedre Dalälven River Landscape Biosphere Reserve will be to coordinate activities affecting both development and conservation. A key element is to promote collaborative processes for social, economic and ecologically sustainable development.

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

A Biosphere Candidate Office will be established in Gysinge and run as a non-profit organisation with the Nedre Dalälven Special Interest Association as the coordinator.

On the basis of previous collaboration, public and private stakeholders founded the Nedre Dalälven Special Interest Association in 1986. According to Section 1 of the association's statutes, its task is to work to achieve positive development in the Nedre Dalälven area. This development work must take into consideration the interests of the land-based industries, natural and cultural interests and the other distinctive qualities of the area.

The Biosphere Candidate Office for the Nedre Dalälven River Landscape will be the responsibility of the Board of the Nedre Dalälven Special Interest Association. The Board includes leading political representatives of all nine municipalities affected and representatives of the business community. The Chair of the Board has always been the Chair of the Municipal Executive Board of one of the member municipalities. The Chair of the Municipal Executive Board in Avesta is the current Chair of the Board. The representative of Bergvik Skog AB, the biggest private landowner in the area, holds the position of Vice Chair. In addition to the municipalities, members include representatives of a large majority of land and water owners such as Bergvik Skog AB, Sveaskog, Korsnäs, the Federation of Swedish Farmers (LRF), Fortum and Vattenfall. Other members of the association are mainly large tourism companies.

Throughout the history of the association, it has worked closely and continuously with the four county administrative boards affected, particularly on nature conservation issues. Among other things, the association is represented on the Management Council of Färnebofjärden National Park and the Management Council of the large Båtfors, Bredforsen and Spjutholmen reserves. The association is continuously represented in working groups under the responsibility of the county administrative board, such as the working group for the creation of Naturum Färnebofjärden and the current working group on the Water Flow in the Nedre Dalälven project.

In addition to the Board, there will be a Development Council for issues related to the biosphere work. The group will include representatives of affected municipalities, county administrative boards, land and water owners and other stakeholders.

In this connection, it should be emphasised that the coordinator, the Nedre Dalälven Special Interest Association, will not be any kind of authority, as the establishment of a biosphere reserve does not entail any new rules or regulations. The principal task of the coordinator is instead to promote collaborative processes for social, economic and sustainable development.

The office will consist of the managing director, working part time, plus a biosphere coordinator and the association's existing administrative/financial support functions. People will also be hired for specific tasks and projects.

#### **17.6.4 The means of application of the management plan or policy**

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

The original idea that the Nedre Dalälven area would be suitable as a biosphere reserve came from a group of teachers and researchers active in the region. The Nedre Dalälven Special Interest Association subsequently coordinated the preliminary study and the continued biosphere work.

Solid work to establish the idea locally was carried out for three years before the preliminary study was adopted in January 2006. Four county administrative boards and nine municipalities participated in the process. Associations, local community associations, landowner representatives, LRF, fishery conservation areas, forestry companies and other non-profit and private stakeholders were also involved.

Extensive meetings in the community with affected parties have clarified the focus of the biosphere work in the Nedre Dalälven area. The focus is on contributing to retaining the open landscape, which is crucial in order to maintain an attractive community for the residents and to attract new residents and tourists.

To achieve this objective, landowners, in particular farmers and LRF, are an important part of the continued work. The Swedish Rural Development Programme and in particular Leader are the primary sources of opportunities for project financing.

There are also a number of activities, networks and projects with a clear biosphere focus, i.e. which promote social and economic development and protect biodiversity. An example of such activities is the fishery conservation issues, for which NeDa coordinates a network consisting of fishing water owners, tourism activities related to fishing and other stakeholders. The aim of the Fishing Network is to implement fishery conservation initiatives to guarantee that fishing will be based on the water's natural conditions. This is of social importance to local people and of financial importance to fishing rights holders and tourism companies.

#### **17.6.5 The year of start of implementation of the management plan or policy**

Because land use is regulated by the municipalities' general plans, it is not possible to give a start year. The general plans are updated regularly. The Biosphere Candidate Office will work to establish collaboration between municipalities on planning/land use for areas near the river.

Management plans for protected areas have various start years. A new management plan for Färnebofjärden National Park (the largest protected area) is currently being prepared.

#### **Activity plan**

A more detailed activity plan for the biosphere reserve will be prepared for each year, starting in 2010, in close cooperation with the Development Council, which will consist of appointed representatives from the affected authorities, municipalities, land and water owners and other organisations (see organisational chart). (This is described in section 4.6).

#### **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.]

During its candidacy, the proposed biosphere reserve has had a yearly budget of SEK 900,000. The financing has covered management and coordination of the proposed biosphere reserve, information and marketing, network contacts and, to some extent, development projects. In addition, Leader has contributed subsidies to biosphere projects both directly via application to LAG (Local Action Group, the decision-making body for Leader areas) and via framework projects for local development.

## Funding

	<u>per annum</u>
Swedish Environmental Protection Agency, SEK	360,000
SEK 20,000 per annum per municipality	180,000
Leader + Nedre Dalälven	<u>360,000</u>
<b>Total SEK:</b>	900,000

The activities of the Biosphere Candidate Office will be funded in a similar manner with funds from the State via the Swedish Environmental Protection Agency and from the nine municipalities.

The management of land and water areas in the Nedre Dalälven's protected areas, the national park, nature reserves and the Natura 2000 areas, is funded by environmental subsidies from the Swedish Environmental Protection Agency via the county administrative boards.

Funding for biosphere-related projects will also be applied for from the Swedish Rural Development Programme 2007–2014.

### 17.8 Authority in charge of administration

#### 17.8.1 The proposed biosphere reserve as a whole:

Name:

Municipalities: Säter, Hedemora, Avesta, Sala, Heby, Sandviken, Gävle, Tierp and Älvkarleby

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

Not applicable

#### 17.8.2 The 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)]

Name:

County Administrative Boards of Dalarna, Västmanland, Uppsala and Gävleborg

Legal powers:

The county administrative boards and the Swedish Environmental Protection Agency

### **17.8.3 The buffer zone(s)**

Name:

Legal powers (if appropriate):

Municipalities: Säter, Hedemora, Avesta, Sala, Heby, Sandviken, Gävle, Tierp and Älvkarleby.

### **17.8.4 Mechanisms of consultation and coordination among these different authorities:**

(For example through consultative meetings, the designation of a special coordinator or facilitator to maintain contacts with all stakeholders and actors.)

Regarding the work of preparing for the creation of a biosphere reserve, the Nedre Dalälven Special Interest Association coordinated meetings and other communications between authorities, special interest groups and others.

## **17.9 Local organizational arrangements**

### **17.9.1 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**

(For example through public hearings, participation of local authorities at preparatory meetings, etc)

Extensive meetings in the community with affected parties have clarified the focus of the biosphere work in the Nedre Dalälven area: To contribute to preserving the open landscape. This is crucial in order to maintain an attractive community for the residents and to attract new residents and tourists. This means that landowners, in particular farmers and the Federation of Swedish Farmers (LRF), are a very important group.

A network has been created consisting of researchers representing all the nearby universities and other institutes of higher education. Their goal is to attract resources for research and education to the area. The research team is also involved in the practical work of preparing the biosphere reserve nomination.

Representatives from the nine municipalities have regularly participated in the process and several municipal ecologists have worked with the nomination regarding habitats/land cover types.

A group of representatives from the area's four county administrative boards has also worked actively with parts of the biosphere nomination.

In addition, NeDa has arranged several popular seminars discussing the future biosphere reserve.

### **17.9.2 Indicate how and to what extent the local communities can participate in the formulation and the implementation of the management plan or land use policy:**

The Biosphere Candidate Office for the Nedre Dalälven River Landscape will be the responsibility of the Board of the Nedre Dalälven Special Interest Association. The Board includes leading political representatives of all nine municipalities affected and representatives of the business community. The Chair of the Board has always been the Chair of the Municipal Executive Board of one of the member municipalities. The Chair of the Municipal Executive Board in Avesta is the current Chair of the Board. The representative of Bergvik Skog AB, the biggest private landowner in the area, holds the position of Vice Chair. In addition to the municipalities, members include representatives of a large majority of land and water owners such as Bergvik Skog AB, Sveaskog, Korsnäs, the Federation of Swedish Farmers (LRF), Fortum and Vattenfall. Other members of the association are mainly large tourism companies.

Throughout the history of the association, it has worked closely and continuously with the four county administrative boards affected, particularly on nature conservation issues. Among other things, the association is represented on the Management Council of Färnebofjärden National Park and the Management Council of the large Båtfors, Bredforsen and Spjutholmen reserves. The association is continuously represented on working groups under the responsibility of the county administrative board, such as the working group for the creation of Naturum Färnebofjärden and the current working group on the Water Flow in the Nedre Dalälven project.

In addition to the Board, there will be a Development Council for issues related to the biosphere work. The group will include representatives of affected municipalities, county administrative boards, land and water owners and other stakeholders.

### **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]

Name:

UNESCO World Heritage Site  
 RAMSAR Wetland Convention Site  
Lake Hovran and Färnebofjärden Bay

Other international conservation conventions/directives [Please specify]

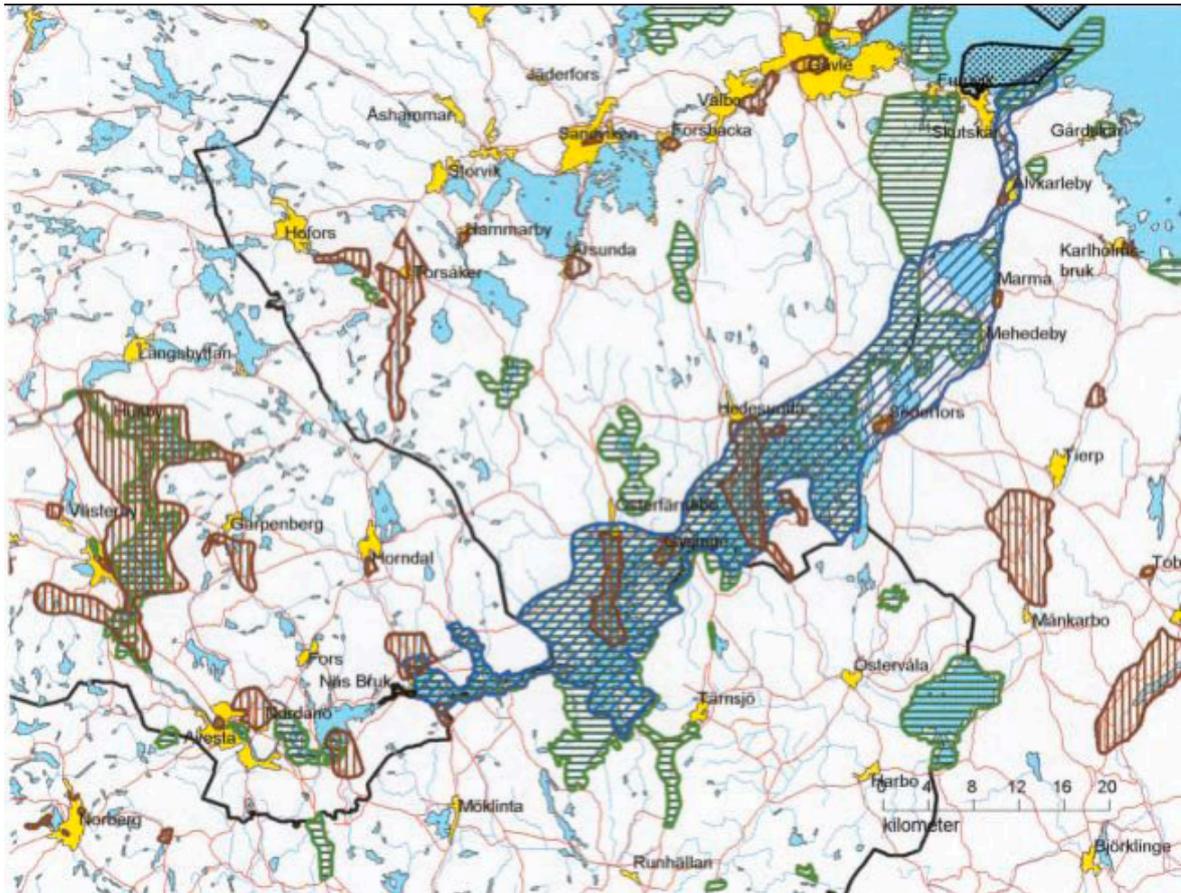
Birds Directive 79/409/EEG for the protection of wild birds  
Habitats Directive 92/43/EEG for the protection of living environments, wild animals and plants  
Natura 2000 sites

Long term monitoring site [Please specify]

(x) Other. [Please specify]

National interests in the Nedre Dalälven as defined in Chapter 3, section 6 of the Swedish Environmental Code:

The Boliden mine in Garpenberg is classified as being of national interest for the nation's materials procurement.



Green = nature, blue = outdoor recreation, brown = culture, black = commercial fishing

*Source: Nedre Dalälven: planeringsunderlag och en samlad beskrivning av natur- och kulturvärden i ett område av riksintresse (The Nedre Dalälven: Planning information and a complete description of natural and cultural values in an area of national interest). County Administrative Boards of Dalarna, Västmanland, Uppsala and Gävleborg, 2000*

## 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.



(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 a A-4 writing paper format in black & white for easy photocopy reproduction.]

(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].

(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 5: Justifying documents and management plans for the nature reserves and national park

( ) 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]

(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 3: Nationally red-listed species in the area

(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].

## 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: Nedre Dalälven River Landscape Biosphere Candidate  
Street or P.O. Box: Granövägen 10  
City with postal code: 810 21 Gysinge  
Country: Sweden  
Telephone: +46 (0)291-211 80  
Fax (or telex):  
E-mail: cristina.ericson@telia.com  
www.nedredalalven.se

### 20.2 Administering entity of the core area:

The authorities that administer and manage the core areas are the Swedish Environmental Protection Agency, the Swedish Forest Agency and the county administrative boards, see chapter 7.

More information is available on the following websites:

[www.naturvardsverket.se](http://www.naturvardsverket.se)  
[www.lansstyrelsen.se/dalarna](http://www.lansstyrelsen.se/dalarna)  
[www.lansstyrelsen.se /vastmanland](http://www.lansstyrelsen.se/vastmanland)  
[www.lansstyrelsen.se /uppsala](http://www.lansstyrelsen.se /uppsala)  
[www.lansstyrelsen.se /gavleborg](http://www.lansstyrelsen.se /gavleborg)

### 20.3 Administering entity of the buffer zone:

The municipalities administer and manage the buffer zones; see chapter 7.

More information is available on the following websites:

[www.sater.se](http://www.sater.se)  
[www.hedemora.se](http://www.hedemora.se)  
[www.avesta.se](http://www.avesta.se)  
[www.sala.se](http://www.sala.se)  
[www.heby.se](http://www.heby.se)  
[www.sandviken.se](http://www.sandviken.se)  
[www.gavle.se](http://www.gavle.se)  
[www.tierp.se](http://www.tierp.se)  
[www.alkarleby.se](http://www.alkarleby.se)

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Baranowski, R. 1982. Några bidrag till kännedomen om coleopterfaunan vid nedre Dalälven (Contributions to the Knowledge about Coleoptera Fauna in the Nedre Dalälven Area). Ent. Tidskr. 103: 65–70

Dalarna Museum: Husbyringen in Dalarna

Dalälvens vattenvårdsförening (Dalälven Water Protection Association) 1996: Dalälven från Grövlan till Eggegrund (The Dalälven from Grövlan to Eggegrund)

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Eriksson, P. 2000. Populationsutvecklingen för några trädlevande skalbaggar vid nedre Dalälven (Population Trends for Some Tree-living Coleoptera in the Nedre Dalälven area). Ent. Tidskr. 121: 119–135

Hedin Kalle 2008: Övergripande fiskevårdsplan för Nedre Dalälven (General Fishery Conservation Plan for the Nedre Dalälven)

Hedin Kalle 2001: Nedre Dalälven: Landskapet mellan landskapen (Nedre Dalälven: The landscape between the landscapes)

Hellstrand Gösta 1980: Flottningen i Dalälven (Timber floating on the Dalälven)

Jonsell, M. and Eriksson, P. 2001. Jämförelse av vedskalbaggsfaunan på gran och björkhögstubbar mellan naturreservatet Båtfors och dess omgivning (Comparison of Wood Coleoptera Fauna on Spruce and Birch Standing Deadwood between the Båtfors Nature Reserve and its Surroundings). Ent. Tidskr. 122: 107–122.

Isaksson, D. 2004. Inventering av aspinsekter i Gävleborgs län 2004 (Inventory of Aspen Insects in the County of Gävleborg in 2004). Report to the Gävleborg County Administrative Board.

Leader Nedre Dalälven 2008: Development plan

Ljung, Tomas, County Administrative Board of Dalarna 2000: Landet bortom tiden (The Land Beyond Time)

Ljung, Tomas, County Administrative Board of Dalarna 2006: Sätters Dal (Säter Valley)

Gävleborg County Administrative Board 2000. Nedre Dalälven: planeringsunderlag och en samlad beskrivning av natur- och kulturvärden i ett område av riksintresse (The Nedre Dalälven:

Planning information and a complete description of natural and cultural values in an area of national interest).

County Administrative Boards of Dalarna, Västmanland, Uppsala and Gävleborg, 2000

Västmanland County Administrative Board 2005: Bevarandeplan för Natura 2000 Färnebofjärden (Preservation Plan for Natura 2000 Färnebofjärden)

Västmanland County Administrative Board 2006: Förslag till skötselplan för Färnebofjärdens nationalpark (Proposed management plan for the Färnebofjärden National Park)

Dalarna County Administrative Board 2007: Bevarandeplan Natura 2000 Säterdalen (Preservation Plan for Natura 2000 Säterdalen)

Dalarna County Administrative Board 2007: 28 Regionala landskapsstrategier i Dalarnas län (28 Regional Landscape Strategies in Dalarna County)

Swedish Environmental Protection Agency 1989: Nationalparksplan för Sverige (National Park Plan for Sweden)

Swedish Environmental Protection Agency, memo 1300, 1980: Naturvårdsplan för Nedre Dalälven (Nature Conservation Plan for the Nedre Dalälven)

Swedish Environmental Protection Agency 1997: Nationalparkerna i Sverige (Sweden's National Parks)

Nilsson Christer, Renöfält Birgitta 2009: Mygg och Bti i Nedre Dalälven (Mosquitoes and Bti in the Nedre Dalälven Area)

Swedish National Heritage Board and National Historical Museums 1979: Med Dalälven från Avesta till havet (Following the Dalälven from Avesta to the Sea)

Swedish National Heritage Board 1999: Värdebeskrivningar avseende områden med kulturmiljövärden av riksintresse enligt 2 kap 6 § NRL (Value Descriptions of Areas with Cultural Environments of National Interest as Defined in Chapter 2, Section 6 of the Act on Economizing on Natural Resources).

Swedish Forest Agency 2002: Handbok för inventering av nyckelbiotoper (Guide to Inventories of Key Biotopes)

Swedish Forest Agency, Lundmark 1986: Skogsmarkens ekologi (Forest Land Ecology)

Swedish Forest Agency 2006: Strategi för formellt skydd av skog i Västmanlands län (Strategy for Formal Protection of Forests in Västmanland County)

Swedish Agricultural University 1980: Garpenbergs Bruks skogar (The Forests of Garpenbergs Bruk)

Sundell Olof 1991: Korsnäs, Ett skogsindustriföretag växer fram (Korsnäs: A Forest Industry Company Emerges)

Stiftelsen för Hovranområdet (Lake Hovran Area Foundation) 1996: Levande Våtmark (Living Wetlands)

Troedsson Ingegerd 1997: Bensåsen – byn som försvann (Bensåsen – the Village that Disappeared)

Turism Ekonomisk Modell/TEM (official tourism statistics) 2007: Ekonomiska och sysselsättningsmässiga effekter av turismen i Nedre Dalälven 2007 (Financial and employment effects of tourism in the Nedre Dalälven Area 2007)

Wanntorp, H.-E. 2005. Inventering av svämskogslöpare vid nedre Dalälven i Gävleborgs län 2005 (Inventory of Platynus longiventris Beetles in the Nedre Dalälven area in the County of Gävleborg in 2005). Report to the Gävleborg County Administrative Board.

Data were retrieved from the following websites:

[www.lansstyrelsen.se](http://www.lansstyrelsen.se)

[www.artdata.slu.se](http://www.artdata.slu.se)