BARENTSwatch

GREEN BELT FENNOSKANDIA

The vision of a green belt through Europe

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The vision of a green belt through Europe

"European Green Belt" is the vision of an ecological network, from the Barents Sea in the north to the Black Sea in the south. A continuous belt of protected areas stretching over 12 500 km. The vision is that the Green Belt will stand as a living monument and a global symbol for transboundary cooperation in nature conservation and sustainable development.

The origin of the European Green Belt

The Iron Curtain divided the continent between east and west for nearly 40 years. Along this east-west border a unique ecological network emerged - a green belt. The strong security along the the russian-norwegian and finnish-russian border also gave nature a time to rest.

This green belt creates a home for many plants and animal species that are important to preserve! Today, many habitats are broken up or lost due to different human activities, and this poses a major threat to biological diversity.

Today, we are also facing a different threat: The climate change. The temperature rises and many species must escape to relocate to their climate zone. Green Belt Fennoscandia could represent a north-south corridor for migratory species under changing conditions. We can help species to survive by preserving contiguous belts of nature.

Green Belt of Fennoscandia

A large number of associations, groups and authorities in 24 countries are cooperating within the European Green Belt Initiative. Currently there are three sections of activity to be distinguished: Balkans green belt in the south, Central Europe's green and the green belt of Fenno-scandia, which constitutes the northern part.

In 2010 Norway signed, Finland and Russia, a "Memorandum of Under-standing", an agreement that laid the foundation for further work on Green Belt Fennoscandia. There are many challenges in cross-border cooperation: Different countries has different rules, different cul-tures and languages, but as the articles in this issue of the Barents-watch shows, as long as you are working towards a common goal the challenges are possible to overcome.

Runhild Dammen
Communications advisor
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Innhold

The European Green Belt Initiative :

Joint effort for an ambitious goal

‘Nature knows no boundaries’ is an often stated slogan, but most relevant in Europe with its dense pattern of political borders which frequently follow natural features such as mountain ranges or river systems. Regarding the European Green Belt, nature does not only know no boundaries, nature is uniting across borders: people, organizations and states, large pristine areas throughout the continent, animal and plant populations as well as Europe’s history and future.

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Wolf, Canis lupus, Photo: Paul Eric Aspholm

Along the Iron Curtain, which separated the continent in East and West for nearly 40 years, an outstanding ecological network and living memorial landscape developed. Despite its inhumanity, the Iron Curtain granted nature a pause for breath along more than 12,500 kilometres from the Barents Sea, along the Baltic Coast, through Central Europe and the Balkans to the Adriatic and Black Sea.

In the former Eastern Bloc countries the use of border areas was mostly prohibited, in some villages at the border people were forcefully settled down in the inland in order to control the area more efficient. Whereas on the western side remote border areas were less attractive for investors, sparsely populated and no major infrastructure was established.

A lack of conventional land use and agriculture as well as the absence of most anthropogenic disturbances along large parts of the Iron Curtain and also in its surrounding led to the conservation and development of large pristine areas and a connected system of various natural and semi-natural habitats and landscapes.

European Green Belt is a retreat for many endangered animal and plant species and a very important corridor for the migration of endangered large mammals.

The outstanding importance of the European Green Belt for the continent-wide ecological network is obvious: 39 national parks are situated directly along the Green Belt, 16 thereof are trans-boundary protected areas. More than 3,200 nature reserves can be found within a 25 kilometres buffer on either side of the European Green Belt. Consequently the European Green Belt is a retreat for many endangered animal and plant species and a very important corridor for the migration of endangered large mammals. Therefore it represents a unique European nature heritage.
The European Green Belt connects 24 European countries and a great number of pristine, natural and semi natural landscapes.

The European Green Belt Initiative – Background history and current status

The vision of a Green Belt connecting the very North with the very South of Europe was officially discussed for the first time during the international conference "Perspectives of the Green Belt" in Bonn (Germany) conducted by the German Federal Agency for Nature Conservation (BfN) in July 2003. A very big step forward was the international pan-European Green Belt Conference in Hungary in September 2004, which was jointly organised by the World Conservation Union (IUCN) and BfN. More than 70 participants from 17 countries attended the conference and developed a common structure and a Programme of Work for the European

Green Belt Initiative.

In the meantime a large number of associations, groups and authorities in 24 countries are cooperating within the European Green Belt Initiative.

Currently there are three sections of activity to be distinguished:

The Fennoscandian Green Belt, with Norway, Finland, the Russian Federation and the Baltic countries Estonia, Latvia and Lithuania.

The Green Belt Central Europe running through Poland, Germany, Czech Republic, Austria, Slovakia, Hungary, Slovenia, Croatia and Italy.

The Balkan Green Belt running along the barrier that separated the Balkan countries during the Cold War. Today Serbia, Montenegro, Kosovo, FYR Macedonia, Romania, Bulgaria, Albania, Greece, Turkey are located at this former Iron Curtain.

For each of the three sections of the European Green Belt a Regional Coordinator was appointed at the first pan-European conference: The Association of Zapovedniks and National Parks in Northwest Russia for Fennoscandia, BUND for Central Europe and EuroNatur for the Balkan region. IUCN hosted the European secretariat of the initiative for some years. Due to budget constraints IUCN had to resign from this function, but in the meantime took over the patronage of the initiative. Furthermore, in every country so called National Focal Points, mainly from ministries, were nominated. Crucial is the contribution of many NGOs along the entire European Green Belt. The initiative should be understood as a joint effort of GOs and NGOs. After the successful implementation of the Baltic Green Belt-project, which closed a strategic gap of the European Green Belt Initiative between the (northern) Fennoscandian Green Belt (Norway, Russia and Finland) and the Central Europe section, it is under discussion to distinct a fourth section of work along the European Green Belt – the Baltic Green Belt – and a decision is to be expected in the near future.

The Future of the European Green Belt Initiative: New Approaches

Due to the large geographical range of the European Green Belt as well as the quantity of actors, the coordination of the European Green Belt Initiative is a huge challenge which requires time and finances. As no core funding for the European Green Belt Initiative is available, most of the coordination and communication activities implemented so far by IUCN as former overall coordinator as well as the Regional Coordinators were financed within externally funded projects or by own resources of the respective organization.
This proved to be no longer feasible as the degree of engagement of the organizations strongly depended on the availability of external funds. It became obvious that – in order to conquer the above mentioned challenge - innovative models for coordination and financing are needed.
The development of such will be addressed within a project which is jointly implemented by BUND Green Belt Project Office and EuroNatur, financially supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the German Federal Agency for Nature Conservation.

Eurasian lynx, Lynx lynx, Foto: Paul EricAspholm

Main activities of the project which aims to further enhance the European Green Belt Initiative will be to

- further develop the organizational structure of the Green Belt Initiative
- generate a sustainable model for financing the Green Belt Initiative
- develop a functioning communication strategy, addressing both internal and external aspects.

All aspects will be worked out by a core project team led by the BUND-Project Office Green Belt and EuroNatur. Results will be presented to all players on GO and NGO level in meetings as well as during several international conferences planned during the implementation of the project in order to ensure participation of the Green Belt Community.

Outlook

In the next years it will be of great importance that the stakeholder network will be strengthened and public relations as well as political lobby work especially towards members of the European Parliament will be intensified. Furthermore existing nature reserves have to be sustainably protected, further new reserves should be declared (e. g. as national nature heritage) and the aims of the European Green Belt Initiative should be adopted by all state authorities and governments along the Green Belt.
The implementation of the European Green Belt Europe as one of the largest European and transboundary ecological networks is one of the main challenges of nature conservation in Europe in the next decades.

Natural Specifics and Current State:

Forests in the Green Belt of Fennoscandia

The concept of the 'Green Belt of Fennoscandia' (GBF) first appeared in the early 1990s, when Finnish and Russian (Karelian) researchers came up with their first proposals to preserve the natural complexes covering both sides of Russian-Finnish and Russian-Norwegian borders. The GBF was later nominated for inclusion in UNESCO's World Heritage List.

Gromtsev Andrey Nikolaevich, Sc.D (Silvics and Forestry), Forest Research Institute of the Karelian Research Center, Russia.

On the Russian side of the border, the GBF is a forested strip of several dozens of kilometers in width with large fragments of well-preserved forest and mire complexes adjacent to the vast natural areas which have been largely transformed as a result of anthropogenic impact – harvesting operations, hydro- and forest melioration.

Stretching in the north-south direction, this strip of land runs along the border between Russia, Norway and Finland, thus embracing west periphery of the three Russian administrative regions – Murmansk (ca 430 km, exclusive of the Barents Sea water area), Karelian republic (700 km) and Leningrad Region (140 km, exclusive of the Baltic Sea water area).

Unique natural site

Ecologically, environmentally and recreationally speaking, this is a unique natural site of pan-European value. Its most valuable asset is the remaining smaller-sized indigenous forests con-centrated immediately within the countries' borderline area. Vegetation here was formed in post-glacial period (about 10 thousand years ago) and was never undergoing any major anthropogenic impact. This practically makes them absolutely 'indigenous'. They are the largest in the western sector of Eurasian taiga and there is nothing similar remaining westwards from Norwegian fjords. The outcomes of our special-purpose research evidence the presence in these forests of the two ma-jor areas that are absolutely different in terms of their natural specifics.

Massif of spruce stands on north-Taiga lowland landscape (the Paanajarvi Lake area. See upper part of the figure). Its forest cover is markedly dominated by spruce forests (accounting for ca 85 % of the area) – mainly, by a variety of whortleberry spruce ones. Forest communities appeared here less than 400 years ago on a vast area affected by naturally occurring fires. The stands are the average of 160-200 years old and make up the core age group. The age of upper tier of spruce, however, shows sweeping amplitude – from 80 to 300 years and even older. This evidences the formation of uneven-aged structure of stands, which, in turn, is the key feature of climax forest communities. With about 500-year growth cycle, they reach dynamic balance in

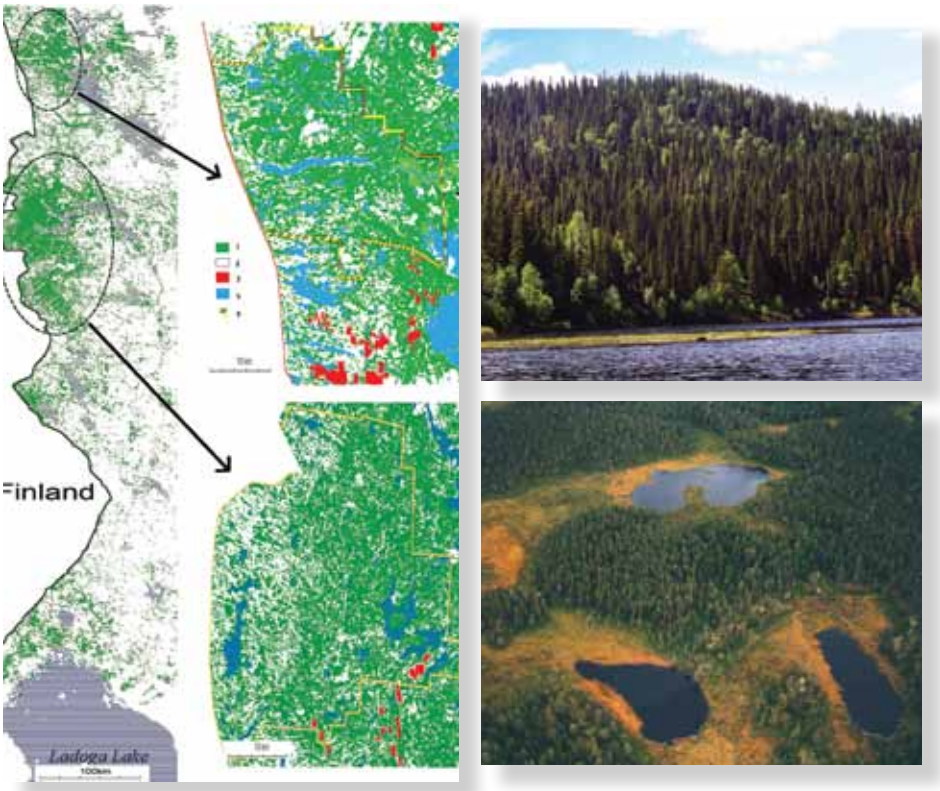


Figure 1: The largest indigenous forest massifs in the Green Belt of Fennoscandia (classified satellite imagery and typical forests images). Symbols: 1) forest lands; 2) logged areas; 3) non-forest lands (wetlands, forest tundra, tundra); 4) lakes and rivers; 5) borderlines of Paanajarvi and Kalevalsky National Parks.

Figure 2: The largest indigenous forest massifs in the Green Belt of Fennoscandia (classified satellite imagery and typical forests images).

the growth and the mortality of their wood volume.

This state of forests may last for an indefinite period of time – until the lightning strikes them in one of the anomalously dry years. Against the background of the GBF, these forests' yield is low, the average volume of 120-140-year-old stands being 115 m3/ha. These spruce forests have almost never been affected by selective cutting. They are the unique communities comprising fir-spruce-birch tundra forests around low-hill terrain (500 m above sea level or more), that exist in the severe climate and grow on meagre soil.

Vulnerable

Their specific flora and fauna is particularly vulnerable to any anthropogenic impacts (we mean their sensitivity to atmospheric pollution, regeneration efficiency after clear cutting and resistance to recreational load). While many natural sites are protected within Paanajarvi National Park (103 thousand ha), there are still more undisturbed areas located close to the Park, namely, northwards from it.

Massif of pine stands on north-Taiga hummocky landscape (located westwards from the Upper Kuito Lake along the Russian-Finnish border, see lower section of the figure). With pine (ca 85%) dominating the forest cover, the territory features the whole mosaic of natural forest commu-nities ranging from all-aged pine-dominated pyric primitive plant aggregations to climax spruce forests in almost absolutely 'fire-immune' ravines.

This area also features the topo-ecological series of forest phytocoenoses – so typical of eastern part of Fennoscandia – whose habitats, too, vary from rocky ones (up on the tops of crystalline-structure hummocks and ridges) down to swamped ones in depressions and flatter areas. The crown cover of more than half of whortleberry pine forests (dominant in vegetation) hides abundant understory spruce, or spruce undergrowth. Unable to regenerate itself, pine is being ousted here by spruce.

In natural conditions, the stability of pine-spruce balance was ensured by periodically occurring fires that used to destroy spruce growth under the pine crown cover. On the major part of mineral soil, the age of stands average 120-160 years. Several stand alone pines were registered to be approximately 500 years of age. Against the back-ground of the GBF, these forests' yield is medium, the average volume of 120-140-year-old stands being 145 m3/ha. About half of the forests growing on mineral soils have previously underwent low-intensity selective felling. Although this has resulted in a slight increase of spruce trees in the areas abounding in pine, the communities' structure remains unchanged.

Flora and fauna here represent those most typical of eastern part of Fennoscandia. This relatively well-preserved pine taiga massif is the largest in west Eurasia that has pronounced post-fire origin. Natural sites are protected within Kostomuksha Nature Reserve (47 thousand hectares), Kalevalsky National Park (82 thousand

hectares) and a number of smaller wildlife areas (reserves). For the time being, the large parts of pine taiga at the periphery and close to these protected sites remain uncut.

The area of full-fledged protected sites established in Karelian part of the Russian-Finnish border totals ca 250 thousand hectares. The GBF also comprises vast indigenous forests of Mur-mansk Region (Laplandsky Nature Reserve, for instance, with 280 thousand hectares). Protection is enhanced by long-established system of water conservation districts – the so-called 'ecological cor-ridors' that connect protected sites and are covered by all-the-year-round environmental activities. No clear cutting is allowed in such corridors.

In general, the present-day forests covering the area from the Barents Sea to the Gulf of Fin-land are described as having various degrees of anthropogenic transformation. They represent cut-over patches (failed areas), or secondary forests (growing on areas cut over at different times), or massifs of remaining taiga forests. It should be noted that as indigenous forests get closer to the border line, their number increases. This is due to their remoteness from the traffic arteries and re-stricted access to the borderland. At the same time, as indigenous forests move southwards they de-crease in number and almost disappear in the area from 63ºE down to the Gulf of Finland. On the Russian side of the GBF, the area of the already functioning and planned protected sites (compris-ing secondary forests) totals around 1 mln hectares. In Finland, the priority GBF sites are either of-ficially protected or scheduled for protection in the framework of the national parks related programmes, old growth forests protection plan, EU's Network of Protected Areas Natura 2000, etc.

More details

For more details (available in Russian and English) about the Russian part of the GBF and the list of currently existing publications go to RAS Karelian Research Centre's web page: http://green-belt.krc.karelia.ru/section.php?plang=e&id=518. Most of the materials posted cover the forests' natural specifics; naturally and anthropogenically induced dynamics and associated flora and fauna.

Preparation of a transboundary nomination:

Our common World Heritage

The Green Belt is an important part of our common world heritage , and as early as 1995 the idea of a transboundary nomination of the «Green Belt of Fennoscandia» for the World Heritage List appeared. The Green Belt represents a range of ecosystems from Arctic tundra at the Barents Sea coast, to mixed broad-leaf forests covering the islands of the Gulf of Finland, and a long and difficult prosess of including the «Green Belt of Fennoscandia» for the World Heritage List has started.

Alexey Butorin, Natural Heritage Protection Fund, Russia.

The high degree of conservation of these taiga ecosystems in the past was conditioned by strictness of the national security belt along the borders. Aside from the unique preservation of the last tracts of old-growth taiga in the European part of the continent, this area has interesting geological structure and relief. On the one hand, the area is a part of the ancient Baltic crystalline shield. Fragments of the shield appear as large and small ridges and individual erratic massifs. On the other hand, the surface has been intricately transformed by glaciations, which resulted in the undulating moraine relief and unusual shapes of various moraine features, such as kames, eskers, outwash plains, drumlins, roches moutonnees, etc. The last glacier receded 10,000 years ago and this region's landforms are among the youngest in the world.

Northern hawk owl. Photo: Ragnar Våga Pedersen.

The formation of its ecosystems is still in the beginning stages and they are yet fairly unstable. Dissection of terrain, tectonic depressions and abundant precipitation resulted in formation of a multitude of picturesque lakes, appearing as the most fascinating trait of the local landscapes. A large number of rapids and waterfalls on small rivers add to the spectacular natural beauty of the area.

Geographical position, climatic and geological features found their reflection in the remarkable mosaic of picturesque landscapes and frequent alteration of spectacular natural complexes. Location of the region in the taiga zone with predominantly light coniferous pine forests, combined with its remarkable terrain and multitude of lakes created its unique coloration.

The preparation prosess

The preparation was first widely discussed at the International Russian-Finnish meeting in the Ministry of Ecology of RF in autumn 1995. Later on, this subject has had wide response, and in 1995-98 there has been held many conferences and work meetings with participation of Russian, Finnish, Norwegian and German governmental and non-governmental environmental bodies.

The largest conferences were held at Petrozavodsk and Murmansk (Russia), Kuhmo (Finland) and the Island of Vilm (Germany). The project of nomination preparation has been repeatedly discussed with authorities of Murmansk and Leningrad regions and of the Republic of Karelia.

First, after the inventory has been carried out, the Russian part of the Green Belt of Fennoscandia was proposed to include over 30 isolated nature sites forming the narrow line (average width 20-30 km) along the Finnish and Norwegian boundary. All chosen forest and taiga tracts had a high level of integrity, which was promoted by the strict near-frontier zone regime of the soviet period.
By 1998 the number of the proposed sites has decreased to 20 and included only existing and projected protected areas of both federal and

Capercaillie. Photo: Terje Kolaas/naturspesialisten.no

regional level. Diploma thesis of Eva Kleinn (Institute of Geography and Geoecology of the Karlsruhe University) have played an important part in the project development at this stage.

Henceforth, taking into consideration the significant difficulties in realization of such large-scale project, and also taking account of the experience of nomination preparation of other natural properties, the number sites projected into the Green Belt, has decreased to 6. Five of the sites already have a federal protection status (3 Nature Reserves and 2 National Park); one – regional zakaznik. All the sites are united into 5 near-boundary complexes and, in major cases, make a single whole with Finnish and Norwegian near-boundary protected areas and have doubtless natural significance.

The territory actually presented for the inscription on the WH List from the Russian side is a natural site consisting of five separate clusters located along the Russian-Finnish and Russian-Norwegian borders. Distance between the clusters is 30-150 km.

Two clusters are located in Murmansk Region:

- Pasvik State Nature Reserve (14 727 ha),
- Laplandsky State Nature Biosphere Reserve (278 435 ha) and organized in 2011 Lapland Forest («Laplandsky Les») regional zakaznik (171 600 ha).

Three clusters are located in the Republic of Karelia:

- Paanajarvi State Natural National Park (104 000 ha),
- Kostomukshsky State Nature Reserve (47 457 ha),
- Kalevalsky State Natural National Park (74 400 ha).

Total proposed area 690 619 ha: 464 762 ha in Murmansk Region and 225 857 ha in the Republic of Karelia.

Proposed structure of the World Heritage Site

Existing Russian SPAs proposed for inclusion into the Green Belt of Fennoscandia.

Pasvik Reserve

The Reserve has been established for protection of intact European north-taiga forests at the limit of their spreading, and their flora and fauna.

Laplandsky Reserve

Aim of establishment – the necessity of restoration and population number support of wild reindeer at the Kola Peninsula, and also preservation of one of the two massifs of mountain-tundra ecosystems of the Kola Peninsula. Also protects a number of saami historical and archaeological monuments.

Paanajarvi National Park

Established for conservation of the unique natural complexes of Paanajarvi lake and river Olanga basin, their use in environmental, recreational, educational and scientific purposes. Forest covered area makes 75% of the area.

Kostomukshsky Reserve

Nature is typical for Northern Karelia and is unique as an intact natural complex. Here dwells reindeer population. Aim of creation – conservation and study of typical biogeocoenosis of Karelian north taiga and monitoring of development of the Reserve's nature complexes.

Kalevalsky National Park

Occupies area adjacent to the Russian-Finnish boundary, on the south – in immediate proximity to the Kostomukshsky Reserve.

Laplandsky Les regional zakaznik

Area between Laplandsky Reserve and the Russian-Finnish boundary. Protection regime foresees limitation of management use and restriction of main use cuttings.

Also there are a few areas without federal protection status to be pointed out as perspective clusters to the site.

Perspectives of the «Green Belt of Fennoscandia» transboundary nomination

During the 2004 the "Natural Heritage Protection" Fund with the financial assistance of the Moscow Bureau of UNESCO (together with the Karelian Research Center, Kola Biodiversity Conservation Center and Greenpeace Russia) has prepared the Russian part of the international nomination "The Green Belt of Fennoscandia". All necessary components of the nomination file, including text

according to UNESCO format, maps, flora and fauna lists, official management plans, orders and decrees, bibliography, have been collected and developed. The most valuable and conserved Russian natural complexes located along the Russian-Norwegian and Russian-Finnish boundaries have been proposed into the international WH site: Pasvik Reserve, Laplandsky Reserve, Kostomukshsky Reserve, Paanajarvi National Park, Kalevalsky National Park and Lapland Forest regional zakaznik. Total area of clusters makes 690 619 ha.

The prepared Russian part of the «Green Belt of Fennoscandia» nomination is not an independent one and is not planned for autonomous presentation into the WHC. The natural, economic and political significance of the site is many times increased with the joining up of efforts of Russia, Finland and Norway in nominating and the following conservation of the «Green Belt of Fennoscandia» transboundary site. The interconnection of the three countries in this field is continued since late 1990-s, and at this stage the site consisting of the 5 transboundary clusters seems to be the optimal version of the nomination:

- Pasvik Reserve – Vatsari wilderness (Finland) – Ovre Pasvik NP (Norway)
- Laplandsky Reserve, Laplandsky Les
- Urho-Kekkonen NP (Finland)
- Paanajarvi NP – Oulanka NP (Finland)
- Kostomukshsky Reserve - Friendship Park (Finland)
- Kalevalsky NP – Kalevala Park (projected) (Finland)

The next step in the preparation of the transboundary nomination should be the international expedition into the near-border SPAs with the aim of raising the attention to the project from the side of local administration, science and the population.

Biological crawler lane can save climate refugees among animals and plants

Man's emissions of greenhouse gases means that the planet is becoming warmer. Particularly large temperature increases are expected in the northern areas of Europe and Asia. This threatens animal and plant life because species have to move to find their climate again. We can help species survive by preserving contiguous belts of nature that they can migrate in, referred to as biological crawler lanes. The shortest way is over the hills.

Sigmund Hågvar, Professor Emeritus of Natural and Environmental Protection, the Norwegian University of Life Sciences, Ås, Norway.

Photo: Rein Midteng

The planet is becoming warmer

Global warming seems to be happening faster than the IPCC (Intergovernmental Panel on Climate Change) estimated. The American climate researcher James Hansen (2008) has warned the world that we could come to a tipping point where we lose control. More open sea in the North draws more heat, and the melting tundra releases ever more methane, which is a strong greenhouse gas. This means that warming can continue by itself.

In the meantime we should do two things: reduce all CO2 emissions globally as quickly as possible, and we must prepare ourselves for the world becoming warmer. The greenhouse gases that have already been emitted will mean that the temperature will continue to rise regardless.

Climate refugees

The IPCC has warned that there will be a number of threats to humans: drought in some places, floods and landslides in other places, powerful and destructive cyclones and a rise in sea level. Large numbers of people will have to move and a new term has already been in use for some time: climate refugees. However, not only people will have to move: plants and animals will also become climate refugees. Many species are already migrating northwards to find their climate again, but migrations like this are full of risks. British butterflies are now moving northwards, but many species are also becoming rarer because they are encountering environments that are unsuitable (Warren et al. 2001).

Creating scattered protected areas is not enough

So far, the most important measure to preserve species has been the creation of protected areas. These are like scattered islands in a sea of other types of nature. There are two problems with protected areas: many are too small to hold viable populations of certain species, and areas are often so isolated that an exchange of individuals and species between them is impossible.

When species have to migrate due to climate change, many of the protected areas will become heat traps: it will be too warm to stay and the species that try to migrate will encounter a number of barriers in the form of completely different natural environments such as towns, rivers, lakes and seas. For example, specialised species on a protected marsh surrounded by forest will not have access to new, contiguous marsh areas where they can migrate. Similarly, many of the old-growth species in a virgin forest reserve could not use the surrounding areas of clear-felling or young trees to migrate. In addition, many species have poor dispersal abilities. While birds and butterflies are technically able to move over long distances, this does not apply to wingless insects, earthworms, snails, certain species of lichen and many others.

Biological crawler lanes: contiguous strips of nature

When species have to migrate, we can help them by preserving contigu-

ous belts of nature – referred to as biological crawler lanes. Since half of Fennoscandia's endangered species are forest-inhabiting, the conservation of contiguous north/south running belts of old forest is very important. In these belts, species can move in fairly contiguous forest, with as few migration barriers as possible.

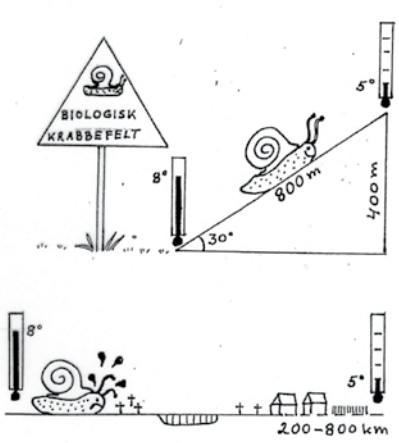
Along the old Iron Curtain in Europe there is actually one of these belts of nature, and it should be kept as contiguous and intact as possible for the future (Figure 1). For us in the North, the green forest belt between Finland and Russia is of particular importance. In the North, the belt continues in the Pasvik Valley before it fades out towards the Barents Sea.

Only recently, large natural forests that are worth preserving have been discovered north of Upper Pasvik National Park. (Map, page 15).

Protection of these forests will not only save Norway's largest, continuous virgin/natural forest, but will also help to preserve a biological crawler lane as far north as possible.

Steep crawler lanes

Where possible, crawler lanes should be located in steep terrain because it is much shorter to crawl uphill than along when moving to a colder climate. As Figure 3 shows, climbing four hundred metres gives a similar climate effect as migrating hundreds of kilometres north. From Hågvar (1994).



Where possible, crawler lanes should be located in steep terrain because it is much shorter to crawl uphill than along when moving to a colder climate.

Green belt in Norway, longer and more important than previously thought

As a result of the conducted surveys of valuable pine forest in Pasvik (see article in Barents Watch 1-2010), valuable new knowledge has been gained about the extent and value of the Norwegian part of the Green Belt of Fennoscandia.
Virgin and natural forests in Pasvik are the northernmost part of the Green Belt and represent priceless natural assets. They contribute to the increased variety and size of the Green Belt and therefore increase its total ecological impact.

Rein Midteng, biologist, Asplan Viak AS, Norway.

Species requiring space, including bird species associated with old-growth forest, are able to survive in the long term, unlike in most other forest landscapes in Fennoscandia.

Buteo lagopus. Photo: Espen Tangen Årnes

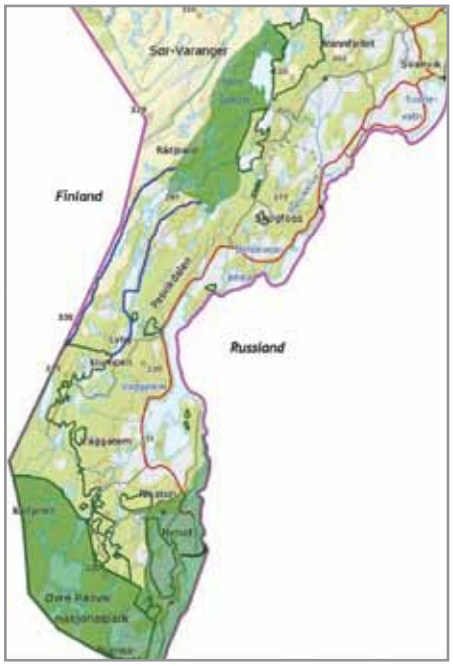
Valuable areas

Norway's knowledge of the valuable natural areas within the zone of the Green Belt has until now been insufficient. From the Norwegian side, it has not been clear whether the Green Belt of Fennoscandia extends much further north and is larger than previously assumed. Records funded by the County Governor of Finnmark with surveys of old forest (habitat surveys), have indirectly documented that the belt in Norway extends 50 km further north than the trilateral park between Norway, Finland and Russia. In fact, the belt in Norway is intact and continuous, and consists of natural areas which have great natural value in a national and international context. From Treriksrøysa to the north end of this continuous belt, it is about 70 km.

What natural resources has Norway contributed to the Green Belt?

Norway's largest instances of virgin forest are found in Pasvik. This applies both to the largest contiguous areas and to the greatest number of acres.

Pasvik has Norway's largest continuous area of natural forest. The National Park and Store Sametti-Skjelvatnet Nature Reserve and areas between these that are not protected constitute a continuous area with natural forests and marshes and waters of about 350 km2, of which most is also virgin forest or ancient natural forest.



Map: Green, crooked line shows the conservation areas that are not protected, and the area with blue demarcation is a joining area with some virgin forest qualities.

The worlds intact forests landscapes

Pasvik's natural forest massif is one of three Norwegian forests, which together with adjacent large natural forests in Sweden and Finland, is defined as belonging to "The world's intact forest landscapes" (www.intactforests.org). Pasvik is directly connected with the Vätsäri area in Finland, which is one of these three areas.

Records have documented that the Norwegian part of "The Green Belt of Fennoscandia" in Norway is 50 km long and also larger and more coherent than previously thought.

Compared with most other forest landscapes in Norway, Pasvik a high proportion of natural forest at landscape level. This means that species requiring space, including bird species associated with old-growth forest, are able to survive in the long term, unlike in most other forest landscapes in Fennoscandia.

Pasvik has previously been mainly in focus for having occurrences of many Eastern species. This is still true, but the main focus should instead be on Pasvik's unique natural resources related primarily to the old pine forest.

Based on present knowledge of ancient pine forests in Norway, we can conclude that Pasvik's old pine forests are the most important core area in Norway for pine forest-related species dependent on old forests.

This new knowledge should be the basis for further trilateral cooperation on The Green Belt of Fennoscandia. There is also a need for surveying old pine forest if natural resources are not yet documented.

Photo: Rein Midteng

Photo: Rein Midteng.

Dead trees – a living environment

Few places match the concept of "One man's meat is another man's poison" as well as dead trees. Even in old age, many years before a tree dies, it is invaded by different organisms, from bacteria to fungi and a host of animals and insects. From the tree falling on the ground until it is completely gone, these organisms have had trees as their habitat perhaps through hundreds of generations. They appear in a specific order from the pioneering phase to the final stage, many centuries later.

Leif Ryvarden, University in Oslo, Norway.

Numerous organisms

A tree in all its glory is not only a beautiful sight, but also a formidable energy store. Through the leaves' or needles' photosynthesis, energy is stored in the trunk in the form of cellulose and lignin, which together form a strong structure that holds the trunk up. Numerous organisms which live on what others have produced, such as bacteria, fungi, insects and small animals, experience the tree as a food source and attack it as best they can.

Balanced arms race

Over millions of years, the tree has developed a defence against these invaders, which in turn have developed and improved their attack weapons. There is a balanced arms race between them, where the tree's main defence is a dense and strong bark and a stock of various toxins, such as resin and similar compounds. It is also important to have high water pressure inside the trunk, so that there are no air pockets of oxygen, which is a vital necessity for the attackers. Even though many of them manage to penetrate the defence, the toxins and lack of oxygen mean that they remain almost in a dormant state or on what we might call the back burner. The important thing is that they are in place when the tree dies and air comes in and the production of toxins stops. When that happens, they begin the breakdown process and utilise the energy for the production of spores and eggs of various kinds.

Decomposition

Decomposition occurs in a specific order with pioneer species, which are generally specialists in breaking down what remains of the toxins. After each of these substances disappear, pioneer species lose their advantages and are slowly replaced by other more competitive organisms. The number of species in all groups rises after the pioneer phase to a maximum when approximately 50-70% of the energy in the trunk is used up. Then it starts to decline until the tree is completely gone. Studies have shown that in the northern parts of Scandinavia, this may take up to 400 years for a large pine or spruce.

In a virgin forest there is biodiversity far greater than in a culture-related forest with regular felling. In virgin forests, there will be many trees in all stages of decomposition, so that decomposers always find niches where exactly their life requirements are met.

Need fungi

Fungi are the most important partner in the decomposition cycle. The reason is that the thread-like cells can easily penetrate between the cells while the tree still retains almost its entire mechanical strength and density, which among other things, makes it difficult for wood-boring insects to get into the trunk. Fungal cells produce enzymes that break down cellulose and use glucose, which is the main constituent of cellulose, for their own reproduction and to build up a fruit body. This work takes place day and night as long as there is water present, and the temperature is above freezing. As the tree is eaten up, cavities form where bacteria, insects and small animals become established. They eat not only the pure wood, but first and foremost, the fungus-infected part of it, then they get both fungal nutrition and the tree's.

The wind spreads the genes:

Fomes fomentarius - perennial species, most common on birch. Here under sporulation with deposits of white spores around the basidiocarp.

It is all well and good to live inside the tree, but sooner or later the fungi have to spread their genes, that is, produce spores which can spread the species into new niches of life, so it will survive as a species. The fungus therefore forms a fruit body on the trunk surface, so that spores are released into the air, where the wind takes care of further transportation. The insects that inhabit wood, especially beetles, which are the most important group, just fly to the next tree, where after mating they lay eggs for a new generation. While insects are targeted, the spread of fungal spores is completely arbitrary. Each fruit body therefore produces millions of spores to make sure that some will land in the right place. It may in passing be mentioned that several fungi have developed a relationship with insects, so that fungal spores or cells are included in the spreading process when the insect looks for a new suitable tree for reproduction.

Biodiversity

In a virgin forest there is biodiversity far greater than in a culture-related forest with regular felling. In virgin forests, there will be many trees in all stages of decomposition, so that decomposers always find niches where exactly their life requirements are met. During active logging, however, the mature trees are removed, and there are few or no trunks on the ground.

It is therefore very important that we have virgin forest areas in order to preserve the biological diversity that has evolved over millions of years, when all the forest was virgin forest where life processes could develop freely. We should also remember that both the trees and the attackers have evolved under different climatic conditions, so that it is necessary to create national parks and forest reserves in all climate zones.

Gloeophyllum sepiarium - a species with high temperature tolerances and thus often invading stumps and logs in exposed positions. Very common as degrader of wooden roofs in Scandinavia because of this.

Brown rot in spruce. Only the heart wood is degraded while the peripheral and younger wood is resistant.

Establishing the Pasvik-Inari Trilateral Park:

Challenges and experiences

Pasvik-Inari Trilateral Park and its surrounding wilderness is located on the north-western edge of the taiga, in the area where Norway, Finland and Russia converge. A continuous stretch of land crossing three national borders is protected - five protected areas comprise the Trilateral Park. Environmental authorities and relevant stakeholders in the three countries have cooperated since early 1990s in the areas of nature protection and management, environmental monitoring and research activities. The Trilateral Park is a unique example of long-term and constructive cooperation over three nation's borders.

Tiia Kalske1, Bente Christiansen1, Vladimir Chizov2, Marina Trusova2 and Tapio Tynys3
1The Office of the County Governor of Finnmark (Norway), 2 The State Nature Reserve Pasvik (Russia) and 3 Metsähallitus Natural Heritage Services (Finland)

Nature, culture and history shared

The lush valley of the Pasvik River stretches from Lake Inari towards the Barents Sea, appearing as a nerve of life in the wide, forested, marsh and small lake mosaic landscape. The Lake Inari area and the Pasvik River valley is known for its great nature and cultural values. The region comprises a unique nature system where the European, Asian and Arctic species meet. Some of the species reach here their ultimate limits of their distribution. The area is also an important nesting and resting place for a large number of migratory birds.

The Pasvik-Inari region is a meeting point for different cultures. Different Sámi groups live in the area: the Northern, Inari and Skolt Sámi. Since the Early Middle Ages, Finns, Norwegians and Russians also have settled in the region. Although different cultures coexist in the area and have learned a lot from each other, they have each retained their distinctive traditions.

In earlier times the river was also an important channel from inland to the Barents Sea along which trades were transported. During the great loggings of the 1920's, logs were floated to sawmills located by the outlet of the Pasvik River. Later, the battle for nickel in Pechenga brought changes to the area, as the rapids of the Pasvik River were used to produce energy for mining and smelting.

Despite the changes the Lake Inari area and the Pasvik River valley has preserved its natural values and species diversity. The specific features of the area make it an attractive nature and culture destination.

Cross-border cooperation - challenges, experiences, results and benefits

Nature, animals and plants, and also pollution do not recognise man maid borders. The cross-border cooperation between environmental authorities in Norway, Russia and Finland emerged in the early 1990s. Annual meetings, exchange of information, joint mappings and field expeditions and also joint projects are conduct-

From the opening of the Piilola track 2009, crossing the Ellen river. Photo G. Reinholdsen

Pasvik-Inari Trilateral Park
1889, 4 km²

The five protected areas comprising the Trilateral Park are:

Russia : State Nature Reserve Pasvik (Pasvik Zapovednik) in: 147,2 km² - established in 1992.

Norway: Pasvik Nature Reserve: 19,1 km². Established in 1993 (Ramsar-status in 1996)
Øvre Pasvik National Park:119 km² Established in 1970 and extended in 2003
Øvre Pasvik Landscape Protection Area: 54 km². Established in 2003.

Finland: Vätsäri Wilderness area 1550 km². Established in 1991.

ed. Over the years the knowledge of the protected areas and challenges connected to management and monitoring issues on common species grew and also off course the friendship between the persons involved in the daily work with the protected areas.
In the early 2000 the idea of a joint 'Friendship park' was introduced. The Interreg project "Promotion of nature protection and sustainable nature tourism in the Inari-Pasvik area" the years 2006-2008 intensified and structured the cooperation towards what it is today.
The main objectives being: to unite the protected areas under a common name, and to establish a formal framework for the management of the common area despite the national borders. In the course of the project joint monitoring and harmonisation of methodologies on chosen border-crossing species were implemented (brown bear, waterbirds and golden eagle), a joint action plan and a joint vision was created, also activities to promote local nature tourist business were made.

EUROPARCs 'Transboundary Park

In 2008 Pasvik-Inari Trilateral Park was awarded the European certification for
EUROPARCs 'Transboundary Park – following nature's design'. This certification provides managers of the protected areas with tools for maintaining a long-term, workable cooperation for nature management in the future.

Numerous challenges

There are numerous challenges for the cooperation to address; different legislation, different level of protection, many languages, different terminology and methodologies, operational culture, funding issues, border restrictions and formalities, possible conflicts between different interest groups and stakeholders, effects of water regulation and pollution issues etc. The experience is that almost all these challenges can be handled with an open and transparent communication, and mutual understanding of the different cultures and operational environments existing in the three countries. The human resources involved in the cooperation are also of crucial importance; both short-term and long-term joint benefits have to be recognised by all the parties to see the day-to-day benefits of the cooperation. Also the timing of actions is important – and to act together when the time is right.

Great thanks goes to all the pioneers and their later successors in the cooperation, without their ideas, enthusiasm and working energy the cooperation would not have reached the results we witness today and the level of aspiration the cooperation has for the future!

Pasvik Inari
Trilateral Park

Read more on our web site – www.pasvik-inari.net

Wetlands for water, forests and people – a powerful relationship

Water is essential. A diversity of life forms has arisen where water and land meet - in wetlands with high bioproduction and good living opportunities for wildlife and people. Wetlands are coastal bays, estuaries, rivers, lakes, wet meadows, marshes, reed beds, peatland fens and bogs. Wetland ecosystems account for a large part of the Barents region. Their services are vital for us. We need to use them wisely, and cooperate where national borders cut across such ecosystems.

Tobias Salathe, Ramsar Convention Secretariat, Switzerland

Traditionally, people have used, and are still using wetlands in many different ways, as places to live, for grazing, haymaking, obtaining wood or peat for fuel, and for hunting, shooting and fishing. The ways in which people use wetlands took a more dramatic turn during the 20th century when modern technology and practices, like the use of artificial fertilisers and pesticides, were introduced leading to the total reclamation or intensive use of many wetlands. Draining, damming up, canalizing, filling in, cultivation, regulation, building development for industry, electricity production, harbours, transport, farming, recreation and other purposes led to significant encroachments and a drastic reduction in the area taken up by certain wetland types. This has had repercussions for various habitats and life forms. Similar destruction and degradation is still taking place today, albeit at a reduced pace.

Freshwater is abundant in the Barents region, and so are wetlands and associated wet forests, meadows and peatlands. But a warming climate may bring significant changes: increased water run offs and floods, provoked by storms, glacier melting and permafrost thawing. Oil and gas exploration, industrial and mining emissions are likely to continue to increase acidification, water pollution with heavy metals, persistent organic pollutants and nutrients (eutrophication). The fragmentation of wilderness areas will reduce biodiversity and pristine areas suitable for leisure and tourism. This scenario is not meant to paint a bleak picture, but to illustrate how important water-related ecosystems are for us, and that it is essential to work for their conservation and wise use - even in the Barents region, where wetlands still seem to be abundant and apparently safe.

The best is to start with a water catchment basin approach: to focus on the capacities of wetlands and forests to improve freshwater quality, to withhold sediments and to reduce erosion, to regulate water flows and supply, to store water and support its infiltration in the soil and recharge groundwater. These are the so-called water-related ecosystem services – essential four our provision with good quality drinking water. Wetlands are the natural infrastructure in the hydrological cycle. Here they perform many functions. These services need to be valuated and taken into account when considering sustainable development options. Highest priority should be given to avoid destruction and degradation of ecosystems. Where this is not possible, restoring lost ecosystem services is often an affordable choice. And still much cheaper than to have to rehabilitate entire ecosystems and their functions, or to replace them with constructed, technological solutions.

The wetlands of the Barents region have global significance: think about carbon sinks. Peatlands cover 400 million ha, about 3 percent of the land surface of the Earth, much more in the Barents region. In undisturbed peatlands without agriculture, forestry and peat extraction, more carbon is fixed than might be released to the atmosphere through methane gas. Bog drainage, on the contrary leads to oxidation, soil compaction and subsidence. Caring about climate change means caring about wetlands and biodiversity. Climate change mitigation is all about carbon - but adaptation to climate change is all about water and wetlands.

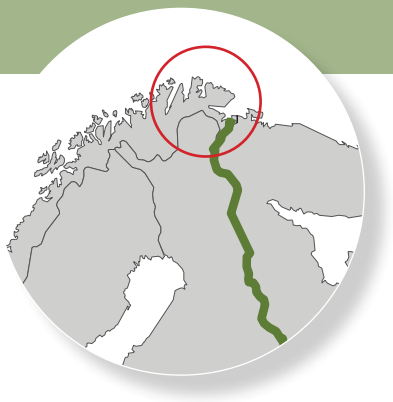
Forty years ago, in February 1971, the first modern global environmental treaty was signed for the conservation of wetlands in the Iranian town of Ramsar, at the shores of the Caspian Sea, one of the most coveted wetlands in the world. The parties to this treaty, today 160, including all four Barents countries, agreed to protect their wetlands, to value their ecosystem services and to account for them when taking development decisions that need to be compatible with the “wise use” approach developed by the convention. Ramsar Sites are wetlands of outstanding value, formally listed under the convention. Currently 37 Ramsar Sites exist in the Barents region - only two of them in its Russian part. These are the hotspots for biodiversity conservation. And they need to become showplaces for local water management and sustainable development, for responsible tourism and the integration of cultural aspects into natural site management.

Grus grus. Photo: Espen Tangen Årnes

Along the Fennoscandian Green Belt, where the Iron Curtain divided Western from Eastern Europe, and where today the outer border of the European Union still maintains restrictions of movements, important wetland ecosystems extend across the dividing line. Transboundary cooperation for the joint maintenance of these wet forests, rivers and lakes provides important opportunities for nature conservation and local development. A striking example is the Pasvik-Inari region where Finland, Norway and Russia meet. The lush valley of Pasvik River stretches downstream of Lake Inari to the Barents Sea. A wetland system that serves as a subsistence resource and transport route for the inhabitants since centuries. A meeting point for different cultures and traditional lifestyles, particularly the Sámi reindeer husbandry. This area should become a showcase for cross-border cooperation, to inspire and be taken up by many other places along the Green Belt between the Barents and the Baltic Seas.

Further information about wetlands: www.ramsar.org

Photo: Rein Midteng



Varanger among Top 100 birding sites of the world

Varanger has long been known among bird watchers internationally. The presence of Steller's Eider (Polysticta stelleri) is the main reason for this. In the summer of 1979, Britain's Richard Vaugh published his book "Arctic Summer." This book deals with the whole Varanger Peninsula and adjacent areas. The book "Top 100 birding sites of the world" came out in 2008, and for Norway only one site is mentioned, namely Varanger. These books have laid the foundation for the Varanger area becoming known internationally as an exciting area for birds.

Bjørn Frantzen, Bioforsk Svanhovd, Norway.

The project "Bird Tourism in Central and Eastern Finnmark" started in 2010 and will run until 2013. The background to the project was a large programme called "Natural heritage that creates value" in which 15 national projects are included. What all the projects have in common is that they have geographic proximity to protected areas and will contribute to increased turnover for local tourism businesses, and more local support for nature conservation among residents living near protected areas. 27 small tourism businesses are participating in the project, which geographically covers the coastal areas from North Cape to the border between Norway and Russia.

The most important bird areas in Finnmark

The core area for bird tourists in Finnmark is the stretch Varangerbotn – Hamningberg along the outer coast in the south and east of the Varanger Peninsula. All of the Varanger Peninsula with the coast and easily accessible mountain areas is worth visiting.

Bird cliff with Steller's Eider

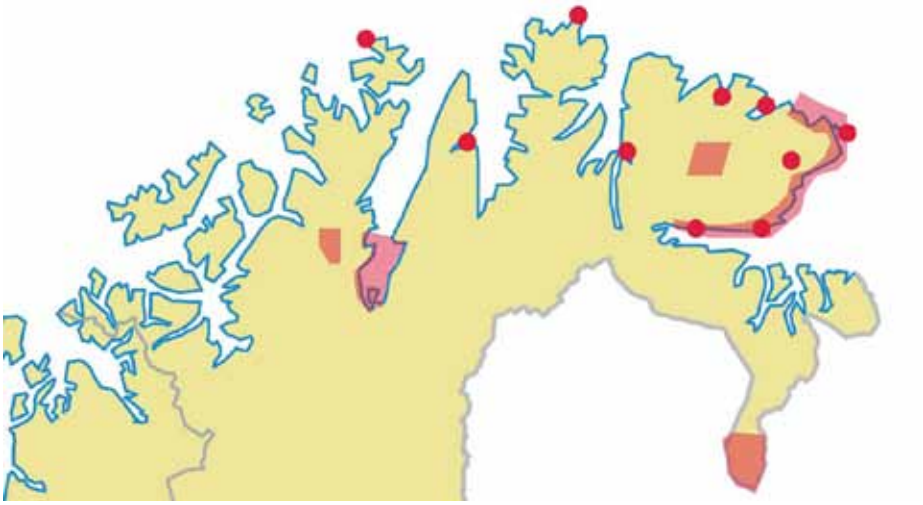
The bird cliffs, Ekkerøy and Hornøya, are accessible to tourists. Hornøya outside Vardo, where tourists are taken over by boat, provides immediate experiences of most species in the bird colony along a marked path. In the period from November to April/May, thousands of Steller's Eider (Polysticta stelleri) and King Eider (Somateria spectabilis) winter on the sea along the coast of Finnmark. These beautiful arctic ducks that nest along the Northern Russian coast are easily accessible to birds watchers when they come to Finnmark.

Bird photography

Many of the tourists are keen amateur photographers with professional equipment. Here they take pictures that they can enjoy, as well as their friends and other people, since the images are often posted on the internet as a documentation of the photographer's ability to take good and beautiful pictures. The port of Båtsfjord is a place where photography is well organised by a local tourist company (Arctic Tourist).

Tana Estuary Nature Reserve

(zapovednik/zakasnik) has up to 27,000 Common Mergansers (Mergus merganser) in the autumn (August-October). The Tana estuary is a site that has not yet been fully discovered by tourists. Wonderful nature and lots of sea birds and seals.



Important bird areas in Finnmark

Steller's Eider *(Polysticta stelleri) Photo: Terje Kolaas/naturspesialisten*

Species with eastern distribution

In the very East, Pasvik has always been a popular area for bird tourists. If you want to experience bird species with an eastern distribution without having to travel to Russia, Pasvik is a good alternative.

Migration of Pomarine Skua

Slettnes in outer Gamvik municipality is known for the numerous birds that migrate past on their way in spring. In particular, the migration of Pomarine Skua (Stercorarius pomarinus) and the Yellow-billed loon (Gavia adamsii) in May is well known and tourists from Europe come to see it. At Slettnes there is also a well known nature reserve (zapovednik/zakasnik) with many nesting waders and skuas. Overnight tourists can stay at the lighthouse, which is the best place to observe birds from.

Rare breeding birds

A little further west we come to Porsangen fjord where Valdak is known for the spring migration (May) of the Lesser White-fronted Goose (Anser erythropus), Norway's rarest breeding bird, and the migration of the Red Knot (Calidris canutus) (> 40,000 birds) which rest here before flying on to breeding grounds in Greenland and Canada. At the North Cape is the large Gjesværstappan bird cliff. Here there is provision so that tourists can visit the bird cliff from boats.

The path to good bird sites on the internet

So that tourists can easily find their way via the internet to Finnmark, the project has established a collaboration with the Norwegian Ornithological Society (NOF) concerning the establishment of a website (www.finnmarkbirding.no) to describe the best places to watch birds in Finnmark, with further practical information on where to stay, eat, shop, fly, find boat and bus services, car hire companies, and more. This website will be operational by summer 2012.

Practical arrangements for the individual tourist business

In collaboration with individual companies, advice and practical assistance is given for biological field preparations, such as how to set up bird boxes and how to create a feeding place for birds. Other important arrangements include the creation of hides to get good experiences of wild birds as close as possible without disturbing the wildlife.

Skills building through gaining knowledge about birds and their habitats, how to be a good guide and the way to the best bird areas are important areas for training.

Marketing measures

Marketing, in our context, consists of a conglomerate of measures. Some of the initiatives include participation in major trade fairs for birdwatchers (Birdfair and Falsterbo), get our best bird areas described and documented in national and international media by famous people, active blogging and organising on the internet so that the visiting bird tourist can easily find the areas that he/she wishes to visit and all practical information such as where to stay, eat, hire a car.

Local ties

Local acceptance of arrangements for tourists is important. This implies that local people support local protected areas and species. The visiting guests come primarily to see nature. A hospitable local population that is good at facilitating tourism is just a bonus experience for tourists.

Variety of mire ecosystems in the green belt og Fennoskandia

Stretching in north-south direction along the Finnish, Norwegian and Russian border area for 1000 km, the Green Belt of Fennoscandia (GBF) crosses over several natural zones – starting in the Arctic tundra and moving down to south-boreal zone (Moen, 1999). Each of them is described as having its own set of types of mire complexes formed under the combined influence of climatic and geomorphic factors.

Oleg Kuznetsov, Head of Mire Ecosystems Laboratory, Institute of Biology, RAS Karelian Research Centre, Russia.

Different types og mires

Palsa mires are confined to south of the Arctic tundra, while aapa can be found the north- and mid-boreal zones. Dominant in mid- and south-boreal zones, ombrotrophic-sphagnum raised bogs may occur more up north – in geomorphically favourable areas. Mires in the GBF demonstrate how diverse the mire ecosystems are in eastern Fennoscandia. They are home to many species of vascular plants and mosses inhabiting this vast area.

The GBF features a variety of relief forms and types ranging from mountainous hills to flatlands of different genesis – morainic, coastal and aqueoglacial. Valdai glaciation completely receded from the GBF around 11-12 thousand years ago, which was followed by immediate formation of the ecosystems (Elina et al., 2010). An indispensable part of all the GBF landscapes, mires occupy the topographic lows. They are a natural result of small ponds eutrophication and waterlogging in wet soils that started shortly after the glacial retreat. Mires are highly variable in terms of composition, vegetation structure, size, age and peat thickness, which, in turn, depend on the incoming waters' mode of occurrence and salinity. Like forests, mire ecosystems are demonstrative of a distinct bioclimatic zonal gradient, whose each zone number certain types of mires (Yurkovskaya, 1992).

Mire ecosystems

The GBF mires are home to some 400 vascular plant species and 200 bryophytes. They have adapted to specific conditions in mire environment and account for one third of the region's native flora. With many species inhabiting only mires, there's a big number of those concentrating close to their habitat limits that are rare and protected in one or several countries. Interlinked with territory's bioclimatic and landscape characteristics, the variety of mire ecosystems finds its manifold reflection in the GBF area. Mire ecosystems are complex in structure and therefore need to be classified at different levels – mire sites, mire complexes and mire systems.

The brief description of the GBF mires given in this article relies on geographic types of mire complexes. Here occur almost all the types of mires typical of eastern Fennoscandia (Ruuhijärvi, 1983; Kuznetsov, 2003). Paludification degree in certain GBF areas may vary between 10 and 50-60%.

The GBF's uppermost section – along the Russian-Finnish border in south Arctic tundra and smaller part of north-boreal zone – is dominated by the 'northern' types of mires, namely, palsa mires (with permafrost cores in their palsas) and Lapland aapa (with heavily flooded string-flark sites). But these two are not the only types to be found here.

The northernmost mires in the world

On lower flatlands – areas with no ground-water supply that get covered by fairly thick snow in winter time – form ombrotrophic-sphagnum ridge-hollow-pool bogs.

In Pasvik valley, they are the northernmost mires in the world. High peat acidity, low nutrients and oxygen content explain why raised bog's flora is so poor and specific. Their sphagnum ridges are only covered by dwarf shrubs (black crowberry (Empetrum nigrum s.l.), wild rosemary (Ledum palustre), bog-rosemary andromeda (Andromeda polifolia), heather (Calluna vulgaris), cloudberry (Rubus chamaemorus) and hare's-tail cottongrass (Eriophorum vaginatum); hollows are inhabited by rannoch-rush (Scheuchzeria palustris), mud sedge and looseflower alpine sedge

(Carex limosa, C. rariflora); secondary pools are devoid of vegetation. The valleys of the streams are occupied by a multitude of mesotrophic willow-sedge or sedge mires. Most of the mires here are intact. Some of them are covered by environmental activities of the international Pasvik Nature Reserve.

In eastern Fennoscandia, some of the mire complexes originate from isolated depressions, which, over the course of their development, have become overgrown by peat and joined together. Thus appeared the complex-natured mire systems. Their components also include small dead lakes ('lambas', or 'sourceless lakes') and mineral isles with waterlogged forests. Composed of small-sized mire complexes of various types, such mire systems stretch for many kilometres.

Dominated by Fennoscandian aapa mires

More than half of the GBF belongs to north-boreal zone (down to (64˚20'N), where ridged tectonic landscapes are most common. The prevailing element in mire systems here is fennoscandinavian aapa (often combined with sphagnum ridge raised bogs and mesotrophic grass-sphagnum mire complexes). In low-mountain and ridged landscapes – in groundwater discharge areas and along the groundwater streams flowing at different slope gradients – form peculiar looking sloping fens. Normally very narrow and with thin peat layer that rarely exceeds one metre, sloping fens are home to rich variety of vascular plants and bryophyte flora. They render special character to low-land landscapes and largely enrich the latter's floral variety. Sloping fens are very common in the biogeographic province of Kuusamo – on both sides of the Russian-Finnish border – where they were first described as special type in 1921 by Finnish wetland expert V.Auer. Due to carbonate rock outcrops and availability of nutrients delivered by the ground waters the province is also rich in small-size eutrophic grass-moss fens. On the Russian side of the GBF, all the mires in this area remain intact, while in Finland many have been reclaimed for agricultural and forestry purposes or peat harvesting. Here runs an extensive network of protected natural areas – Druzhba Russian-Finnish Park, Kalevalsky National Park and a number of Finnish protected areas that cover many natural wetlands.

Mid- and south-boreal zones

In mid- and south-boreal zones, prevail the zonal ombrotrophic-sphagnum ridge-hollow bogs (Ruuhijärvi, 1983; Yurkovskaya, 1992). Combined with oligotrophic and mesotrophic grass-sphagnum ones, they often form vast mire systems. In these GBF zones, lie the ridged and morainic landscapes whose underlying rocks and quaternary deposits are mainly poor and acid.
Aapa too can be found in mid-boreal zone (down to 63˚N). They are poor here and almost never contain eutrophic plant species. The flora of the sloping and the spring fens is much poorer too. Although the majority of the fens here on the Finnish side of the GBF have been dried, there are several which make part of the protected areas (Ulvinsalo, Patvinsuo, Koivusuo, Runa).
Many of the mires on the Russian side – northwards from the Janisjarvi Lake (62˚N) – remain intact, whereas the agricultural and forestry impact on those lying southwards – in north Near-Ladoga area and Karelian Isthmus – started already in the 18th century. Only several mires have survived and are now potential targets of protection.

Unique natural complex

In general, the GBF represents a unique natural complex with promising potential for preserving east Fennoscandia's rich biotic and ecosystem diversity. Such preservation can be ensured through sustainable nature management and protected (cross-border) areas to be newly established in the territory in question.

Palsa mires are northern mire complexes with permanently frozen peat hummocks, located at the outer limit of the permafrost zone. Palsa mires have high conservation status, being characterized by a rich diversity of bird species and unique geomorphological processes.
Photo: Paul Eric Aspholm.

Population fragmentation of wild animal populations in the north

The Pasvik Valley in Northern Norway and its neighbouring areas of Inari in Finland and Pechenga in Russia is home to one of the northernmost brown bear population in the world. Quite unique ecological conditions, such as the existence and the relatively pristine status of coniferous forest at 70 ° North within the valley, allowed the bears to outlast the times of extensive hunt and extirpation in the last century.

Alexander Kopatz, Bioforsk Svanhovd, Norway.

In many regions of Europe large carnivores, including brown bears, have been returning to areas in which they were extirpated. Brown bears can be found in most parts of Northern Europe; however, their densities vary greatly over the landscape. Some populations of bears have grown substantially, for example in Sweden to an estimated size of about 3300 individuals. Norway inhabits approximately 200 brown bears, concentrated in four areas. Finland has an estimated brown bear population of circa 1500 bears. All these countries are assumed to have connectivity with the substantial bear population of European Russia, accounting around 40.000 brown bears.

Protection and restricted hunting keeps these populations nowadays stable, although the latter is also used to limit their growth rate or might even lead to again a reduction of population size. Compared to the bear population of Sweden, many other populations are still small and vulnerable. Hunting is still a critical issue, especially when too high quotas are granted. Also, the impact of illegal hunting is still very difficult to quantify and estimate; the only known fact is that poaching occurs in most large carnivore populations.

Habitat fragmentation

In addition to this, so called habitat fragmentation caused by human activities such as pollution, intensive forestry, increasing infrastructure and spreading urban landscapes constitute a major threat.

Besides human induced habitat fragmentation, changes in the habitat composition evoked by climate change are not fully understood yet. These anticipated changes are especially threatening to animals and plants adapted to the arctic environment. A fragmented landscape can cause the loss of connectivity between populations, force some of them into isolation, increase inbreeding within those population fragments and, eventually, lead to extinction. Therefore wild populations of e.g. brown bears are sensitive to habitat restrictions and destruction and conservation efforts are directed towards enhancing and stabilizing connectivity among populations.
In this context, acceptance of large carnivores by the human population of a certain area is an important yet sensitive issue.

Wolf, Canis lupus, Photo: Paul Eric Aspholm

Barriers to migration

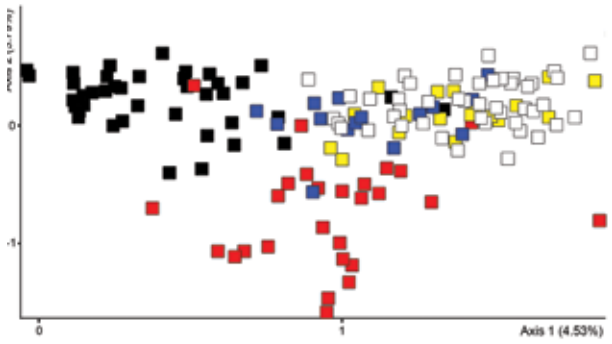
The situation and debate of the Swedish wolf population in Southern Sweden is an example of how difficult it is to merge public, political and biological interests. This population started off with a few individuals and began to grow rapidly as soon as one individual from one of the eastern wolf populations migrated into the population. The fact that, since, only a few individual wolves have been successful in migrating from east to west as well as vice versa, underline the assumption that barriers to migration occur in Northern Europe. Although the acceptance of brown bears is slightly better than

that of wolves, their situation is similar and difficulties of satisfying the demands of the human population and conservationists exist also here.

Isolated populations

Even though the brown bear is one of the most studied terrestrial mammals, we still know very little about its biology.
Bioforsk Svanhovd investigates the brown bear populations in North Western Europe. Since 2004, samples from Norway, Finland, Sweden and Russia have been collected and are now scientifically analyzed. These analyses of the population genetic composition of the brown bears in this area, showed fragmentation of the populations towards the south (Finland) and west (Sweden and Norway) as well as to the further eastern direction (Russia) into concentration areas of higher brown bear abundances divided by areas of lower brown bear density.

Especially the bears in the Pasvik Valley seem rather isolated from the populations further south and west and only a few animals seem to be successful in migrating between these regions. This type of population structure is probably caused to some degree by the distance between the areas, a fact that is known for many large populations spread across a vast area. However, it seems as other factors add to this so called Isolation by Distance. These factors might include water bodies, forest clear cuts, fences etc. Research to further increase the knowledge about the population structure across the entire Northern European distribution area is currently ongoing.



A so called factorial correspondence analysis visualizes the relationship between the genetic profiles of the sampled brown bears. This figure illustrates, that different groups can be easily distinguished according to the area the brown bears were found: Pasvik - Norway, Finland, Russia (black squares); Kainuu - Finland (white); Northern Karelia - Russia (blue); Southern Karelia - Russia (yellow) and Pinega - Russia (red). In an ideal, well connected population, the picture would not be that clear and all genotypes would belong to one large group including bears from all areas (colors). Source: Kopatz et al. 2012.

Given the fact that the Fennoscandian brown bear populations of the Pasvik Valley and Eastern Finland probably represent the edge of the distribution zone of the large populations of Russia, these findings imply further, more frequent monitoring and research of the bear populations with the help of genetics in the north. In order to identify landscape features that might pose as barriers to migration, genetic and spatial information will be used.

The results of frequent monitoring will help to understand the current migration pattern of brown bears in the region and will enable more efficient actions. These might include measures to increase connectivity with the help of e.g. protection zones, reforestation etc., as well as to restrict hunting in vulnerable populations and to identify areas where hunting does not harm the population.

The extent to which the still pristine Pasvik Valley and surrounding areas in Pasvik-Zapovednik in Russia as well as in Inari in Finland ensures survival and stability in the number of brown bears in the region, remains to be found out.

A female with cub in Northern Finland.
Photo: Alexander Kopatz.

Animal life on the seabed:

Long-term monitoring and the pursuit of good environmental indicators.

Lis Lindal Jørgensen, Institute of Marine Research, Norge.

The Barents Sea is among the richest, cleanest and most productive waters in the world. However, the ecosystem can also be vulnerable, especially to human impact and climate changes. Ecosystem-based management of human activities in the Barents Sea requires ongoing assessment of how the ecosystem's state changes in relation to the environmental objectives set. The objectives are related to the destruction of habitats and biodiversity.

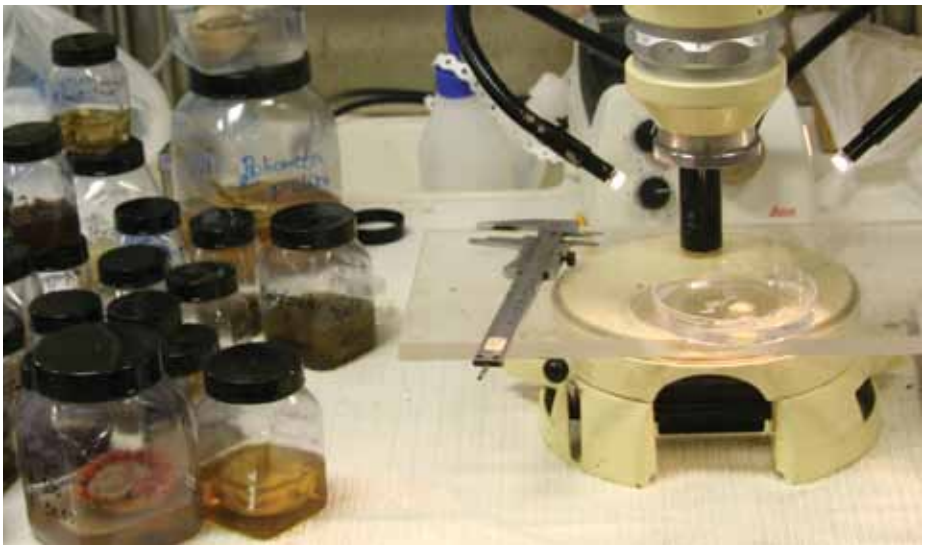
Ecosystem-based management

The establishment of the Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands (management plan), is intended to introduce holistic ecosystem-based management. An important reason to implement ecosystem-based management is precisely the growing recognition that the biological and physical elements of ecosystems interact, both directly and indirectly.

This means that if one part of the ecosystem is affected, this can have cascading effects so that all other parts of the ecosystem also suffer. This applies to both human activities and natural changes.

50 years of Norwegian – Russian cooperation

For more than 50 years, management and monitoring of the Barents Sea was a Norwegian – Russian cooperation at the Institute of Marine Research in Norway and PINRO; Polar Research Institute of Marine Fisheries and Oceanography in Murmansk. Annual cooperation meetings have been set routine between researchers and Fisheries from both countries. Shrimp (Pandalus borealis) and commercial demersal fish caught with research trawlers (bottom trawling) have been a staple of this bilateral cooperation. In 2003, the first attempt was made to analyse the entire bottom trawl catch, instead of throwing out the by-catch again. This analysis included, among other things, a wide variety of benthic organisms that are caught with bottom trawls.



Analysis of benthic animals in research trawls. Photo: Lis Lindal Jørgensen.

From 2003-2005, regular routines were adopted by all Norwegian (3) and Russia (2) research vessels for how these benthic creatures were to be accumulated and processed on the joint annual eco-expeditions.

In 2006, PINRO and The Institute of Marine Research had the first species matrix ready, which included all benthic organisms caught with research trawlers in both the Russian and the Norwegian sector of the Barents Sea and the grey area. Since then, this cooperation has continued in all subsequent years and currently represents the only long-term monitoring series we have on the fauna caught annually by trawlers (mega-fauna) and which covers the entire Barents Sea.
The development of this long-term monitoring has been going on in parallel with climate change and oil/gas operations and fisheries. This makes

this time series unique and is a substantial reason for it to be included in the "indicator development" in the management plan for the Barents Sea and Lofoten (Sunnanå et al 2009).

Joint Norwegian - Russian data matrix

From the Norwegian and Russian sides, the project has included 1682 trawl stations on banks, shelves, pools and channels taken in the period from 2006 to 2008 (Figure 1). This covers about 30 km2 of seabed (the Barents Sea is about 1.4 million km2 in size), which have been examined for megafauna. All species or species groups were counted and weighed on all the boats that had benthic experts onboard (all Russian and one Norwegian boat). On the other boats (2 Norwegian boats), all animals were counted and weighed after being put together to make large groups.

All data entered into a joint Norwegian – Russian data matrix which now includes information on the prevalence and frequency of about 476 taxa (337 to species level). Most species belong to molluscs (snails, mussels), crustaceans (amphipods, shrimps, true crabs, false crabs), Cnidaria (hydrozoa, jellyfish, sea anemones, corals) and echinoderms (starfish, brittle stars, sea urchins, sea lilies). Number of species recorded per station varied from 1 to 84

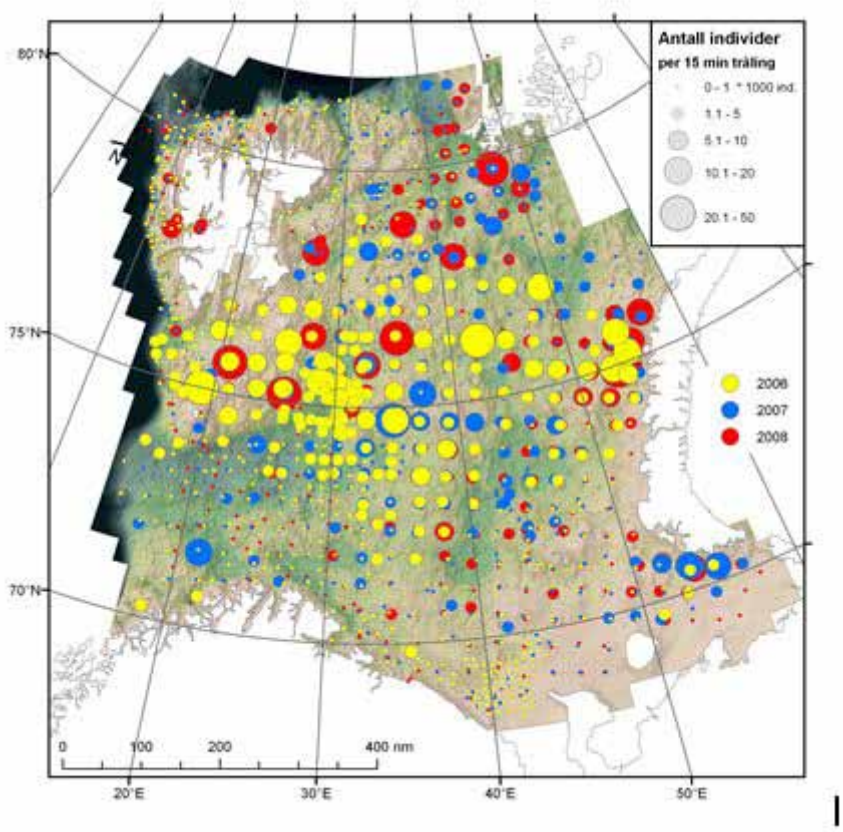


Figure 1. The distribution of the number of individual benthic creatures taken annually (2006 to 2008) with bottom trawls. The area that is covered by bottom trawls is about 18,000m2/per station.

Isopoden *Saduria sabini* på holothurian Molpadia borealis.

From protected areas to green infrastructure

Protected areas are often advertised as ecological networks or green belts. But do they really form functional green infrastructures for the conservation of biodiversity and valuable ecosystem services for society? Systematic spatial planning that includes both ecological and social systems is a way to improve the functionality of protected areas in their landscape context.

Per Angelstam, Marine Elbakidze, Robert Axelsson,
Swedish University of Agricultural Sciences, School for Forest Management, Sweden

While sacred places have been protected since ancient times, the modern idea of protected areas appeared a century ago in response to the heavy human footprint on ecosystems. Initially, the focus was on large trees, old forests and beautiful landscapes typical for the regions of a country. Much later the term biodiversity was created to highlight the need to halt the loss of species. This increased the demand for protected areas to secure the representation of all ecosystem types, and to maintain species by securing sufficiently large areas.
At present also the maintenance of valuable ecosystem services for human health and wellbeing is increasing the demands of protected areas. To enhance biodiversity conservation, provisioning of ecosystem services and to improve the overall ecological quality of the broader countryside, the concept green infrastructure has emerged.

Illustration photo: Beate Banken Bakke. ”Yield for traffic from the right”.

Protecting areas usually means that their lands and waters are no longer available for commercial use of renewable and non-renewable natural resources such as wood, for hydroelectric development or mining. Therefore conflicts about the creation of new protected areas may arise, and tough negotiations about how many protected areas are needed and what proportion of a region that should be protected. The outcomes depend on the strength of different interests, and the level of economic development. Developed countries therefore tend to afford to protect more, but have less natural environments left.

What, where and how much?

To implement on the ground the clear policy-level statements about the conservation of biodiversity and ecosystem services, solid empirical knowledge about species, habitats and processes in different ecosystems is crucial. What, where and how much are three central questions. “What” is about representation of all types of natural and culturally derived habitat qualities and biotopes. “Where” is about how patches of these biotopes are located in relation to each other in a given landscape for species to survive, and ecological processes to function. “How much” describes the need for a sufficient amount of such areas and how to maintain their ecological processes. Given such knowledge, systematic spatial planning can be carried out in three steps:

Birch forest. Photo: Paul Eric Aspholm.

1. Strategic planning

Estimate if the amount of different biotopes, such as old deciduous forest, is sufficient for the conservation of its species. Knowledge about how much of a biotope that can disappear without loosing the species is crucial.

2. Tactical planning

To identify the location of existing protected areas and areas that have high conservation value but are not yet protected, and to assess whether or not the areas are located in the local landscape so that species can use them. (Pasvik, p. 16).

Burning the forest. Photo: Juha Siekkinen

3. Operational planning

To manage, restore and even re-create sufficient amounts of structures, such as dead wood, and processes, such as fire, in the protected area network to make it a functional green infrastructure.

Given short or long histories of use of natural resources different parts of the Barents Sea Region have retained different amounts of natural habitats. While local landscapes near centres of economic development in Sweden and Finland have very few natural areas left, several NW Russian regions have still, for some time, the opportunity to maintain biodiversity and ecosystem services.

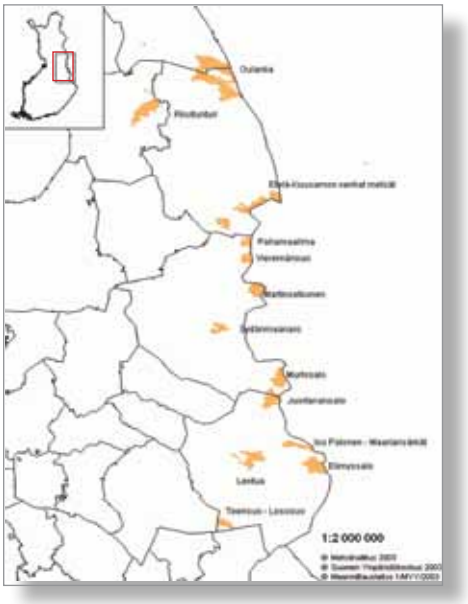
Functional green infrastructures are an important prerequisite for sustainable development. Assuring that networks of protected areas, such as the Barents Protected Area Network (BPAN), also will form functional green infrastructures requires land-use planning that integrates biodiversity conservation with sustainable use of natural resources at the landscape level. This requires multi-sector and multi-level stakeholder collaboration in entire regions. Rather than only extracting natural resources, also products based on ecological and cultural landscape values need to be developed. The Barents Region context offers opportunity for innovative regional collaboration to assure that protected forest areas form functional green infrastructures for present and future generations.

Green Belt Life project in a nutshell

The main objective of the Green Belt Life project (2004-2008) was to safeguard the favourable conservation status of thirteen Natura 2000 sites within the Fennoscandian Green Belt. The measures taken to achieve this objective included habitat restoration in drained mires and forests affected by forestry operations, and the reforestation of disused forest roads.

Hannele Kytö, Metsähallitus, Finland.

In addition, artificial nests were built to strengthen the golden eagle population. An important part of the project was monitoring the impacts of habitat restoration and providing information on nature conservation.



Hundreds of hectares restored

A total of 577 hectares of forests and 375 hectares of drained mires were restored.

In addition 4.1 kilometres of disused forest roads were reforested, and two hectares of gravel pits adjoining the roads were landscaped.

Improving the life of eagles

Listed in Annex I of the Birds Directive, the golden eagle is defined as vulnerable in the Finnish classification of threatened species.

To strengthen the golden eagle population, four artificial nests were taken to protected areas.

Valuable information from follow-up studies

Follow-up studies are conducted to find out how the various restoration measures help forests and mires return to their natural state. The collected data is used to establish methods that are the most effective ecologically and economically, and to identify erroneous practices.
In areas of restored forest, changes in the vegetation and tree stand as well as species living in and on decaying and burnt wood are monitored. The progress of the reforestation of forest roads is also followed. In restored mires, attention is paid to the rate of decay of peat and changes in groundwater depth.

The results of increasing decaying wood and controlled burnings can be seen relatively quickly. The studies have shown for example that ring barking around the entire tree trunk from relatively wide area is too harsh method for creating slowly decaying wood. A strip of bark should always be left for nutrients to flow. The

Golden Eagle. Photo: Jari Peltomäki

monitoring of bracket fungi showed that after restoration the number of species increased apart from some burnt sites where the fire was exceptionally intense. Several insects dependent on forest fires arrived at the burnt areas after the flames had subsided. The most significant species encountered in the areas was the endangered beetle Phryganophilus ruficollis, which is protected under the Nature Conservation Decree.

The success of the mire restoration measures cannot be confirmed until after decades. At the moment it can only be said that everything seems to go like planned. The water level rose to the natural level right after the restoration and has stayed there

Burning the forest. Photo: Juha Siekkinen

ever since which indicates that the mires are returning to their natural state little by little.

For better understanding

Habitat restoration measures generate a lot of interest, as well as strong views. In order to give as true a picture of restoration as possible, a wide range of information must be provided on the methods and objectives.

As the name suggests, the Green Belt Life project was full of life throughout its operation! Habitat restoration was introduced in many ways through a variety of channels. This also brought the magnificent nature reserves covered by the project to public attention.

The project organised public meetings and discussions at various locations and was active in providing information on restoration measures. Outcomes of the project include leaflets, both popular and scientific publications, photographic exhibitions, seminars, nature trails, information boards and even a film called "A Change for the Better".

Cross-border cooperation as a resource

Cross-border cooperation is an essential part of operating within the Fennoscandian Green Belt. It is the extra spice which gives the right flavour for everything.

The project sites are part of three twin parks of Metsähallitus: the Oulanka and Paanajärvi National Parks, the Kalevala Parks and the Friendship Nature Reserve. The project surveyed flying squirrel populations in the Paanajärvi National Park, examined the fire history of forests in the Kalevala National Park and participated in seminars and training events between the twin parks.

Researchers looking for bracket fungi. Photo: Juha Siekkinen.

PROTECTED AREAS ALONG GREEN BELT FENNOSKANDIA

		km²
NORWAY		
1	Færdesmyra Nature Reserve	14
2	Neiden og Munkefjord Nature Reserve	12
3	Store Sametti-Skjelvatnet Nature Reserve	7,3
4	Gjøkvassneset Nature Reserve	0,1
5	Øvre Pasvik Landscape Protection Area	5,4
6	Øvre Pasvik National Park	11,9
7	Pasvik Strict Nature Reserve	1,9
FINLAND		
8	Vätsäri Wilderness Area	155
9	Sarmitunturi Wilderness Area	15
10	Urho Kekkonen National Park	250
11	Värriö Strict Nature Reserve	12,5
12	Sukerijärvi Strict Nature Reserve	2,2
13	Oulanka National Park	27
14	Kalevala Park (under establishment)	33,5
15	Friendship Park	27,9
16	Ulvinsalo Strict Nature Reserve	2,5
17	Ruunaa Nature Reserve	7,4
18	Patvinsuo National Park	10,5
19	Koivusuo Strict Nature Reserve	2,2
20	Petkeljärvi National Park	700
21	Siikalahti Bird Wetland	445
RUSSIA		
22	Pasvik Strict Nature Reserve	14,7
23	Laplandsky Strict Nature Reserve/Nature Biosphere Reserve	278,4
24	Kandalakshsky Zapovednik	705
25	Paanajarvi National Park	104,4
26	Kalevalsky National Park(under establishment)	95,9
27	Kivach Zapovednik	104,6
28	Kostomukshsky Strict Nature Reserve	47,5
29	Nizhnesvirski Zapovednik	416
30	Ingermanlandsky Strict Nature Reserve (under establishment)	14,2

This map indicates roughly the location of the protected areas. For detailed maps see: http://g.co/maps/b4a23. The map Green Belt (Fennoscandia) is open for editing on Google maps.

Naturbase
For detailed information on protected areas in Sør-Varanger municipality in Finnmark, Norway: naturbase.no.


Norway
Sweden
Finland
Russia
Estonia
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