Forest research in the North

off-prints from News & Views 2002–2005

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Forest research in the north

Forestry is a major business sector in the Nordic countries. Forests have a key role in the terrestrial ecosystems, and they are used by many people for recreation, hunting or earning their living.

The central role of forestry should naturally be reflected in the scale of forest research. Is this the case? News and Views have taken a tour of the Nordic and adjacent countries to examine the structure and changes of the forest research. The articles were published in Scandinavian Journal of Forest Research in 2002-2004. The continuous development, including merger of organisations, conversion of public institutes to independent companies, or financial cut-downs in the research sector, has naturally caused changes since the articles were published. But still, we hope that this series of articles will give a reasonable overview of the situation for forest research.

For those who want to be updated, we recommend to read the News and Views issues, available free for download at

www.nordicforestresearch.org

SNS's newsletter

News and Views is the official newsletter of **SNS - Nordic Forest Research Cooperation Committee**.

SNS aims to promote research and research cooperation within the Nordic countries. SNS also encourage research cooperation with the Baltic countries and north-western Russia. Two specific areas have observer status in the SNS – Faroy Islands and Åland. Therefore, these countries and regions are also described in separate articles.

Mats Hannerz and Carl-Henrik Palmér, editors of News and Views

Data about the Nordic forests

The data presented in the articles derive from various national references, and they may not be all transparent and comparable. For those who want official statistics, we recommend the European Forest Resource Database, publicly available on **www.efi.fi,** or the official statistics from EU – Eurostat (**http://europa.eu.int/comm/eurostat/**). The following statistics is derived from Eurostat:

	Forest land *1 000 ha*	**Other wooded land** *1 000 ha*	**Forests available for wood supply** *1 000 ha*	**Growing stock on forest land**[1] *1 000 m³sk*[1]	**Net annual increment**[2] *1 000 m³sk*[1]	**Roundwood production**[3] *10.000 m³*[4]
Iceland	30	100	14	800	37	0
Norway	8 710	3 290	6 609	771 448	22 041	8 302
Sweden	27 264	2 995	21 236	2 928 117	85 431	67 300
Finland	21 883	885	20 675	1 940 000	72 470	53 778
Denmark	445	93	440	55 200	3 200	1 627
Estonia	2 016	146	1 932	314 537	7 137	10 200
Latvia	2 884	111	2 413	502 000	11 050	12 916
Lithuania	1 978	72	1 686	362 637	8 504	6 275
Russian Federation	816 538	70 000	525 191	85 486 752	742 000	168 500

[1] over bark
[2] on forests available for wood supply
[3] all quantities of wood removed from the forest
[4] under bark

Faroe Islands

Miles and miles of grassland. That may be the common perception of the Faroe Islands. But, in the future the horizon may be enriched by a new element: trees.

The Faroese Government's budget for 2002 incorporates funding, for the first time ever, to promote tree planting. Individuals, firms, townships and other groups may apply.

50% grant

A 50% subsidy for plant purchases will be provided. The 2002 grant totals DKK 500 000. By the May 1st deadline, a total of eight applications had been received, seven of which were recommended, accounting for DKK 175 000.

Skógrøkt landsins is providing academic evaluations and is responsible for accepting or rejecting each grant application, while Føroya Jarðarráð (the Land Commission) administers the actual grants.

Features sought in proposed projects include:

- >1.000 m² planting area
- protection against grazing animals
- erosion control
- land beautification
- increased bio-diversity
- long-term community improvements.

Search for indigenous trees

An especially interesting project being undertaken by Skógrøkt landsins that we would like to highlight is an effort to find and re-plant indigenous shrubs and trees of the Faroes. For some years now, staff at Skógrøkt landsins have been scouring the islands to collect materials from the very scarce remnants of *Salix phylicifolia, S. lanata, S. arctica* and *Juniperus communis* communities. The intention is to propagate these plants, and to establish an *in situ* gene bank as well as to replant them.

A planting project with these species recently began in an area of 2.2 ha near the village of Kirkjubø. Some of the Faroe Islands' most important historical sites from the middle ages are located in Kirkjubø, making the village one of the islands' most frequently visited tourist attractions. In this context, we believe that plantings illustrating typical vegetation cover in the lowlands during the landnam period would be quite informative.

Contact: T. Leivsson, e-mail: trondur@skogroktin.fo

Faroe Islands joins SNS

In the Fall of 2001, the Faroese Ministry of Trade and Industry decided to use its option to have an observer on the SNS board. ***Tróndur Leivsson***, Chief Conservator of Forests, Forestry Service of the Faroe Islands, has been appointed to this post. In this capacity, he participated for the first time in the SNS board's second half-yearly meeting in Stockholm in November 2001.

New research projects

Skógrøkt landsins (the Forestry Service of the Faroe Islands) is the Faroese participant in an SNS project entitled "Plant protection by beneficial soil organisms", N-2001-12.

The Faroese Technical College in Tórshavn and Skógrøkt landsins is involved, together with Scotland and Norway, as well as Finnish business interests, in the grant application "Timber Cladding in maritime climates", which will be submitted to the Northern Periphery Programme in September 2002. If accepted, the project will run for the following three years.

Photo: Absalon Hansen

Photo: Absalon Hansen

Photo: Alan Brodie

Iceland

Forests returning to Iceland

At the time of human settlement over 1100 years ago, birch forests and woodland probably covered 25–40% of Iceland's land area. However, soon after settlement the Icelandic birch-woods were pushed back by clearings and sheep grazing. In the early 20th century they covered only 1% of the land.

Increasing forest area

Organised forestry started with the planting of a pine stand at Thingvellir in 1899. Planting increased in the 1950's, mainly with exotic conifers such as Sitka spruce, Scots pine, lodgepole pine and Siberian larch. Another leap in afforestation through planting took place in the 1990's. At present some 5 million seedlings are planted each year, and the forest area is increasing by 1,000–1,500 hectares per year. The most commonly planted species now are birch and Siberian larch, each accounting for 30% of the total, followed by Sitka spruce (12%), lodgepole pine (10%) and black cottonwood (6%). The remaining 12% of the planted trees represent over 20 species.

Icelandic forests in figures

Natural ***Betula pubescens*** scrub (<5 m tall)	100,000 ha
Natural ***Betula pubescens*** forest (>5 m tall)	20,000 ha
Plantations	20–30,000 ha

Most of the plantations are less than 15 years old. About 1/4–1/3 **consists of *Larix sukaczewii***, 1/4 of native birch and the rest is made up of about 10 other species including lodgepole pine, Sitka spruce, Engelmann spruce, Norway spruce and black cottonwood.

The figures are estimates given by Thröstur Eysteinsson. There is still no nationwide forest inventory as yet, so it will be some years before "true" figures are available.

Forest Service

The Icelandic Forest Service played a central role in the early afforestation. But, since the 1990s, planting has been handled by other organisations. Six Regional Afforestation Projects have been established to manage the government scheme for afforestation on farms. Each farm afforestation grant covers 97% of establishment costs, including fencing, roads, site preparation, planting and the first thinning. The government funding amounted to 3.5 million USD in 2001. A goal of each regional afforestation project is to afforest 5% of the lowland area (below 400 m a.s.l.) in the next 40 years. It is estimated that within 50 years the forest and woodland area will have doubled from today's 1.3% to 2.5% of the land area.

The first forestry law was passed as early as 1907, and since then the forestry goals have been to protect the native forest and to afforest treeless land. The harsh conditions on Iceland require careful maintenance. For example, harvesting is only allowed through selective thinning.

Breakthrough

Forestry has a short history on Iceland. All wood used for construction has been imported, and until very recently the Icelandic forests were used solely as a source of fuel. However, some of the stands planted with exotic tree species have reached sizes at which they need thinning. Recently, the first truck-load of slender spruce logs was taken out from a thinning and used for making fish drying-racks. The raw material for these racks has been imported from Norway to date.

"We now have large areas of forests from which we can harvest 6–8 m poles in thinnings, says Thröstur Eysteinsson. We are of course far from being self-sufficient in this product, but it is still a break-through for Icelandic forestry".

Currently, Icelandic birch is used almost exclusively for firewood.

Photo: Jörgen Hajek, Skogforsk, Sweden

Forest research in Iceland

Forest research in Iceland is mainly executed by the Iceland Forest Research, a branch of the Icelandic Forest Service. The branch office, located at Mogilsa outside Reykjavik, has 15 employees, seven of whom are researchers. In addition, research is performed by various personnel in other parts of the Icelandic Forest Service, e.g. the extension department.

Trained abroad

Since there is no forestry school and no forestry degrees are awarded at university level in Iceland, all researchers are trained abroad. Four researchers have a PhD degree in forestry, geology or related fields from Sweden or Denmark. Another three researchers have Masters degrees in forestry from Norway or the UK. The head of the research branch is Adalsteinn Sigurdsen. Practical foresters are also trained abroad. At present, 32 foresters or forest technicians are active on Iceland. Most of these have been trained in Norway, but recently large proportions have also been educated in Ekenäs in Finland.

Genetics important

The main fields of research have traditionally been provenance testing and tree improvement, since afforestation of bare land has been a major issue in Icelandic forestry. Forest genetics is still important, but the research has recently been oriented more towards ecology, e.g. the maintenance of natural birch forests.

Carbon storage

The role of the forest in carbon sequestration has also become increasingly important. One researcher is working fulltime on this issue, and several others part time.

"Carbon storage in wood has become an important argument for planting trees", says Deputy director Thröstur Eysteinsson. "We are investigating the potential of tree planting to add to our commitments set by the Kyoto agreement".

Forestry related research is also conducted by the Natural History Institute, the Agricultural Research Institute and the biology department at the University of Iceland.

Sources: "Icelandic forestry in 2002", a report from the Icelandic Forest Service, and personal communications from Thröstur Eysteinsson, Deputy Director at the IFS. Contact: throstur@skogur.is

Photo: Iceland Forest Research.

Scaffolding erected in a 35 year old Larix sibirica *stand at Mjoanes, east Iceland, as part of ICEWOODS, a new research project that will focus on changes in species composition of birds, soil invertebrates and vascular plants that have occurred following afforestation with the introduced Siberian larch as well as changes in carbon sequestration, NPP and soil efflux of carbon.*

The forest industry has long been the backbone of Finland's economy. Forest cover three-quarters of the country's land area. Thus, it is not surprising that forest research is strong in Finland. The largest research organisation is Metla, but there are several other actors that are described here.

Finland

Finnish forest research in brief

Metla – The Finnish Forest Research Institute

The Finnish Forest Research Institute (Metla), which has 800 employees, two research centres and seven research stations, is the key actor in forest research in Finland. Metla was established in 1917 and is accountable to the Ministry of Agriculture and Forestry.

The headquarter of Metla is located in Helsinki. It forms a part of the Vantaa *research centre,* and about half of Metla's staff work here. The unit in Joensuu was upgraded to a research centre in 2001. In addition, there are seven *research stations*, from Parkano and Punkaharju in the south to Kolari far north of the polar circle.

The organization also owns *research forests,* covering 90,000 ha, which provide research, conservation, recreation and nature tourism facilities.

The total annual research budget at Metla amounts to EUR 36 million, of which 70% is publicly provided. About 300 of the staff are researchers, and more than 100 hold a doctor's degree (PhD).

The research is organized into problem-oriented projects, and the foremost of these are combined into wider research programs. Currently running programs cover topics such as: pools and fluxes of carbon, utilisation of wood in relation to wood product markets, forest management planning, and alternative silvicultural practices.

Communication is highly valued at Metla, and major efforts are put into disseminating research results to both other experts and the public.

An international journal, *Silva Fennica*, is published, in collaboration with the Finnish Society of Forest Science.

Read more: www.metla.fi

Metla's research centres (large symbols) and research stations (smaller symbols).

Biodiversity research. Determining epoxyl species in decayed wood.
Photo: Metla/Erkki Oksanen

Joensuu – evolving centre in the east

Joensuu, the capital of Finland's easternmost region, Karelia, has become a vital centre for forest research. Not only for Finland, but also internationally through its ties with the European Forest Institute.

- The Forestry faculty at the University of Joensuu was established in 1982. The research it conducts is diverse, and mainly funded by external sources. The Academy of Finland has appointed one of the research groups at the university to join the "Centre of Excellence for Forest Ecology and Management". This is an association linking a network of scientists at several universities and institutes. In total, some 40 researchers and 50 PhD students are involved in the centre. Four research teams work within it, on topics such as ecosystem modelling, atmospheric impact and biodiversity.
- The Joensuu unit of Metla was formerly a research station, but was upgraded in 2001 to make it the second of Metla's two research centres. At that point, there were 30 researchers and 40 other staff working in the centre. It is now expanding and will increase to around 100 persons by the year 2005. There are four priority research areas at the Joensuu research centre: Forest management planning; Silviculture; Forest technology and Wood Science.

Joensuu campus
Photo: Ilkka Konttinen / University of Joensuu.

- **The European Forest Institute** (EFI) is an association that is governed by its 141 member organizations, which are based in 39 countries: 29 inside and 10 outside Europe. The mission of the institute is to conduct, promote and co-operate in forest research at the pan-European level, and to make the results known to interested parties. Providing information for policy-making in Europe is an important objective. Results are disseminated through publications and events. EFI publishes scientific series and a newsletter, EFI News. EFI has been heavily involved in efforts to make forest statistics comparable between countries by defining a common nomenclature. The statistics have then been used to create maps of forest resources in Europe. In 2002, 53 persons worked at the institute, which had a budget of EUR 2.9 million. One million was paid directly by the Finnish Government.

Read more: www.joensuu.fi, www.metla.fi, www.efi.fi

Helsinki University

The University of Helsinki has a strong forest research presence, based in the Faculty of Agriculture and Forestry at the Viiki campus. The forest departments are:

- the Department of Forest Resource Management, which conducts research in forest technology, forest mensuration and management, wood technology and geoinformatics.
- the Department of Forest Economy studies the marketing of forest products and the economics of forest holdings
- the Department of Forest Ecology, which has research interests covering a wide range of topics, including structure and dynamics of natural and managed boreal forests, forest ecosystem - atmosphere relations, land use and global change issues, wetland ecology, and ecosystem restoration.

Read more: www.helsinki.fi

Metsäteho

Metsäteho is a private research company that is involved in research and development related to wood procurement and wood production in all parts of the chain from the forest to the end user. The research is problem-oriented and often performed in close cooperation with the forest industry.

Active research areas include:

- Methods and economics of wood production
- Wood procurement and wood handling technology
- Operative planning
- Properties of raw material.

Environmental aspects have also become important, and Metsäteho works in areas such as Life Cycle Assessment (LCA) and Environmental management systems (EMS). Metsäteho has a staff of 25 persons and is located in Helsinki.

Read more: www.metsateho.fi

Finnish forest research cont.

Wood Wisdom

Wood Wisdom is a research programme that aims to facilitate the development of market-oriented production techniques and innovative forest products. It started as a Finnish programme, but has recently been upgraded to joint Swedish-Finnish cooperation.

The Wood Wisdom programme is a good example of a new way to cooperate on a broad front to achieve synergistic effects. The programme aims to raise the competitiveness of forestry and the forest industry. In the process, it seeks to obtain knowledge that will facilitate the development of market-oriented production techniques and innovative forest products that can compete in a changing environment.

Applied research

Wood Wisdom focuses on applied and basic research into key links in the production chain from the forest to the market, emphasising the importance of market-driven production and processing. The programme involves 30 research consortia with 120 ongoing projects and 350 researchers.

Wood properties

The biggest research task is to study how the raw material affects the properties of paper, wood products and composites, and ways that forest management, environment and molecular methods can help to mould these properties.

Better paper

The second biggest field is pulp and paper research, focusing on methods to enhance the quality of printing paper. Other important research areas include mechanical wood processing, e.g. techniques to modify wood properties and avoid discoloration.

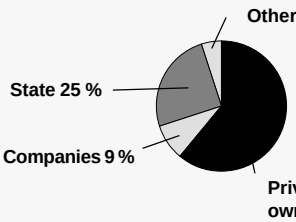
The first phase of Wood Wisdom ran from 1998 to 2001, and the total turnover for this period was EUR 35 million, of which 20 million was publicly provided. In the second phase, started in 2002, a joint Swedish-Finnish research programme is an important component (see News and Views 18.1).

Source: www.woodwisdom.fi

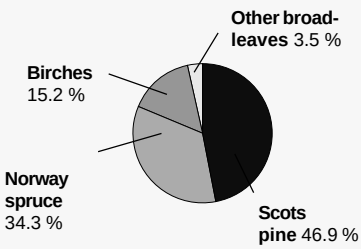
Wood wisdom will raise the value of Finnish wood. *Photo: Mats Hannerz*

Finnish forests in figures

- Productive forest land: 20.1 million hectares
- Ownership of forest land area



- Number of private forest owners: 400,000 (If families are included, 1 million own forest directly or indirectly. Finland's total population is 5.1 million)
- Growing stock total: 2002 million m³



- Annual increment: 75 million m³
- Annual harvest: 60 million m³
- Annual wood imports: 13 million m³

Forest industry

- Sawnwood production: 13 million m³
- Paper and paperboard production: 13 million tons
- Total turnover: EUR 19 billion
- Export: EUR 12.5 billion (26 % of all Finnish exports, by value)

Norway

A rural country

In the two previous issues of News and Views, forest research in Iceland and Finland have been portrayed. The subject of this issue's portrait is Norway: a narrow, hilly country, with a long coastline, where fishery and the oil industry may be the commercial sectors that first come to the outsider's mind. However, Norway is also a forested country, with a productive forest area of 7 million hectares and a forest industry that employs 30.000 people. Furthermore, it is a country where many people live outside the larger cities, and often come into contact with small-scale forestry and farming enterprises. Thus, it is not surprising that forest research plays a relatively large role in the country.

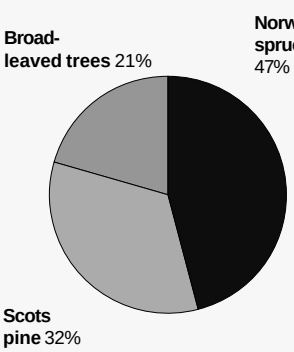
Funding

The Forest Research Council of Norway coordinates much of the national research funding. Through its forestry program, 11 million NOK per year is devoted to research. The wood program has a budget of 42 million NOK per year. Most of this sum is dedicated to product development and innovation. An important research fund is administered by the forest owners association, which supplies 10 million NOK per year for research that improves the profitability of Norwegian forestry. New money is added to the fund through a fee of 0.50 NOK per m³ harvested timber.

www.forskningsradet.no

Norwegian forests in figures

- Productive forest land: 7.5 million hectares
- 79% of the productive forest area is owned by some 120,000 private forest owners. Companies own 6%, State 9% and other owners 6%.
- Average size of property: 57 hectares
- Growing stock: 650 million m³ today (300 million in 1920)
- Annual increment: 22 million m³
- Annual harvest: 8.4 million m³
- Annual wood imports: 13 million m³



Forest industry

- Sawnwood production 2–2.5 million m³
- Total turnover: NOK 12 billion (1.6% of GDP for mainland Norway)
- Employees in the forest industry sector: 33,000 (1.8 % of employees in mainland Norway)
- Exports: NOK 13–15 billion (10 % of total exports from mainland Norway)

Source: www.skoginfo.no, www.nijos.no

The Agricultural University of Norway

Through its *Department of Forest Science*, the Agricultural University of Norway is the only academic institution in Norway that studies and offers courses in forestry at the university level.

The department has around 50 employees, 40 of whom are researchers or teachers. In September 2003, it will be merged with the *Department of Biology and Nature Conservation* to form the *Department of Ecology and Natural Research Management*, which will be a large unit with 110 employees.

The research is presently organized into three units: silviculture, forest technology, and resource economics and planning. High priority is given to the following research areas:

- Environmentally sound methods of wood production
- Conservation of biological diversity
- Balancing the production of commercial and non-commercial forest goods.
- Wood utilization, particularly saw milling, use of hardwoods, small-scale technology and special products.
- Contribution of the forest sector to business and rural development.

The department closely cooperates with the Norwegian Forest Research Institute. It is located on the same campus in Ås, outside Oslo, and uses publications from the Institute to disseminate its research results.

The budget of the Department is 21 million NOK. Two thirds comes directly from central government, and the rest from the Research Council of Norway or other sources.

Graduate studies

Each year, 25 students start the 5-year program in forestry at the Agricultural University of Norway. In addition, another 20 students who have completed a 3-year-program at regional colleges continue by taking a 2-year program at the university.

The students specialize in forest ecology, technology or economics.

Recent dissertations from the Agricultural University of Norway

- Janne Kjønaas, Carbon storage in the boreal region and strategies to counteract increases in greenhouse gases in the atmosphere.
- Ståle Størdal, The economics of timber sales – studies of the Norwegian roundwood market.

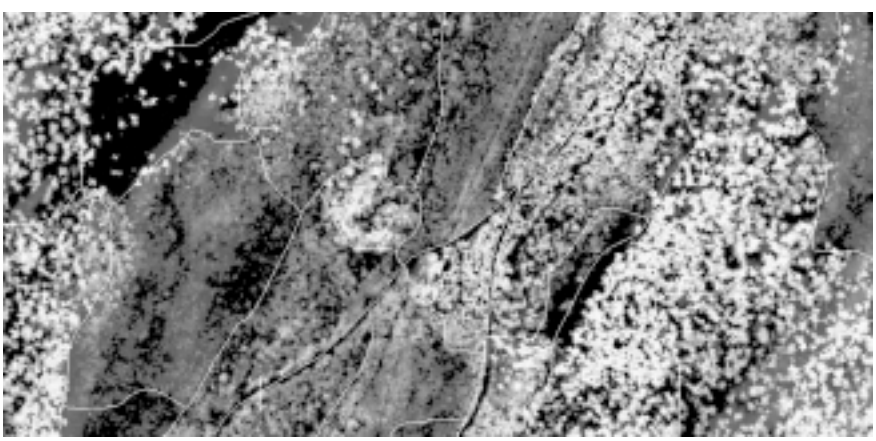
Further info: www.nlh.no

Examples of ongoing forest research at the University

Laser scanning

The Department of Forest Sciences has a broad research portfolio, in which remote sensing and other methods of inventory are strongly represented. Laser scanning is a relatively new technique that has great potential in the forestry sector. By scanning the terrain quickly and with high precision from an aircraft, much more detailed information can be obtained than is possible from satellite images. The laser equipment "reads" "swathes" of earth by generating (and monitoring) 10,000 laser pulses per second, while the aircraft flies at normal speed. With the aid of GPS in the aircraft, the position of each of the pulses is known with a precision of 30–40 cm.

For further information, contact erik.naesset@isf.nlh.no.



A forest map based on areal laser scanning. The lighter the colour is, the higher is the forest. The white lines are borders between stands.

Responses to climate change

A new program has been set up at the Agricultural University with the aim of learning more about the capacity of trees to survive and adapt to climate change. The total budget of 22 million NOK over five years is being shared by several research partners, both within and outside the Agricultural University. The research is focusing on the fundamental processes controlled by photoperiod and temperature, down to the gene level.

The contact person at the Department of Forest Science is Aksel Granhus aksel.granhus@isf.nlh.no

The Norwegian Forest Research Institute – Skogforsk

The Norwegian Forest Research Institute (Skogforsk) is an independent institute that is accountable to the Ministry of Agriculture. Skogforsk was established in 1917 and has about 120 employees, most of whom work at the headquarter in Ås, outside Oslo, but there is also a research station in Bergen. The mission of the institute is to be a leading provider of information for government, industry and the general public, working towards sustainable management of forest resources. The research is divided between two units, each covering a wide variety of research topics. Biodiversity, climate change, forest damage, genetics and physiology are important subjects in the Department of Forest Ecology and Environment. Meanwhile, the Department of Production, Techniques and Processing covers subjects such as silviculture, forest operations, logistics and economy, bioenergy and Christmas tree production.

www.skogforsk.no

Example of ongoing research at Skogforsk

Effects of climate change on spruce bark beetle dynamics

An example of the wide variety of projects currently being pursued at Skogforsk is the research related to spruce bark beetles. A general temperature increase may lead to a northward expansion of the areas in which the spruce bark beetle can complete two generations per year. This could increase the damage they do to trees. Observations from 23 years of monitoring in southern Norway are used to model the response of the beetle to climate.

Contact: bjorn.okland@skogforsk.no

The Norwegian Institute of Wood Technology (NTI)

NTI is an independent research institute, established in 1949. It serves 160 member companies representing the Norwegian sawmill and timber industries. As well as undertaking research, the NTI performs various quality control and laboratory tests. Its laboratories are accredited for testing mechanical and chemical properties of wood-based products, and it is heavily involved in quality assurance procedures related to the timber trade. The Institute has an annual turnover of NOK 27 million, and 37 employees. *www.treteknisk.no*

Norwegian Institute for Land Inventory (NIJOS)

NIJOS is the major supplier of data on soil, forest, outfield and landscape resources in Norway. Through national forest inventory and forest health monitoring programs it provides data used for planning in the forest industry and the development of environmental policies.

www.nijos.no

Clippings from Norwegian forest research

Timber imports introduce pest risks

Timber from Russia and the Baltic countries contains many species of beetles and fungi. This was a finding in a study of five boat-loads imported to Norway. Most of the species were previously known from Norway, but five of them were new.

One of the new species is known to cause damage in Finnish forests, and the researchers recommend further controls on timber imports.

Source: Aktuelt fra skogforskningen 4/03.

Trees have an effective immune defence

Conifers have a twofold defence system towards blue-stain fungi introduced by bark beetles:
a) "a standing force" consisting of thick layers of cork and lignin in the outer bark, together with terpenes, phenols and tannins in the wood.
b) an inducible system, activated when the tree is under attack. Phenols and tannins are then directed to the affected wood. Mechanical barriers containing cork are also rapidly constructed.

Source: Glimt fra skogforskningen 5/2003

Forestry affects the capercaillie population

The capercaillie (great wood grouse, *Tetrao urugallus*) is a quite common bird in the Norwegian forests. The population is estimated to amount to some 200,000 birds in the spring, though it varies substantially between years. Predators, such as fox and marten, are the major regulating factors, though harsh weather conditions may affect the mortality of the chicks considerably in some years.

Harvesting and other silvicultural activities affect the capercaillie population, but mainly indirectly through their influence on the predator populations.

Source: Glimt fra skogforskningen 3/2002

Photo: Skogforsk

Sweden

Forests and forestry play a more important role in Sweden than in any other European country except Finland. The forest industry and forestry account for more than 4% of Sweden's GDP and 15% of Sweden's total exports.

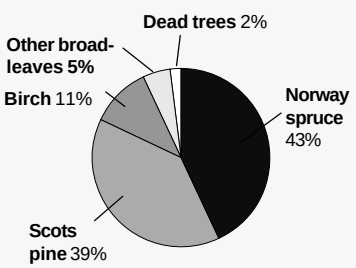
The country is the fourth biggest paper and pulp exporter in the world and the second biggest exporter of sawn softwood timber.

Forestry research is dominated by the Swedish University of Agricultural Sciences (SLU), with Skogforsk (the Forestry Research Institute of Sweden) as the second largest contributor. However, several other regional universities and institutes conduct research relevant to the forests, e.g. in the environmental field.

Research related to industrial aspects is dominated by the Swedish Pulp and Paper Research Institute (STFI) and the Swedish Institute for Wood Technology Research (Trätek), but other participant are also involved.

Swedish forests in figures

- Total land area: 41 million hectares
- Productive forest land: 22.6 million hectares
- Annual increment: 100 million m³
- Annual harvest: 75 million m³
- Growing stock: 3 billion m³



Ownership

- Private individuals: 52%
- Private forest companies: 24%
- The state (including the state-owned company Sveaskog): 17%
- Other public bodies: 7%

Forest industry

- Sawnwood production: 17 million m³

Number of sawmills (>10,000 m³/yr): 165

Pulp production: 11 million tonnes

Number of pulp mills: 45

Paper production: 11 million tonnes

Sources: www.svo.se
www.skogsindustrierna.org

Long-term field experiments form one of the corner-stones of Swedish forest research. The picture shows the first systematically laid-out plot: Lycksele no. 1.

Photo: Henrik Hesselman 1902. Copyright: SLU, Forestry Library.

Faculty of Forestry at SLU

The main actor on the forestry research stage is the Swedish University of Agricultural Sciences (SLU). The Faculty of Forestry is one of the major institutions of its kind in Europe. The main units are located in Umeå, Uppsala and Alnarp. Eight research parks provide sites for field experiments.

Each year, about 80 students start the Master's degree program in forestry, and 45 forest engineers are trained in Skinnskatteberg. About 25–30 receive a PhD degree each year.

Research ranges from cell biology to wood utilization. Basic and environmental projects account for half of the total research budget, and applied studies, such as forest management analyses, for the other half.

The faculty of today*

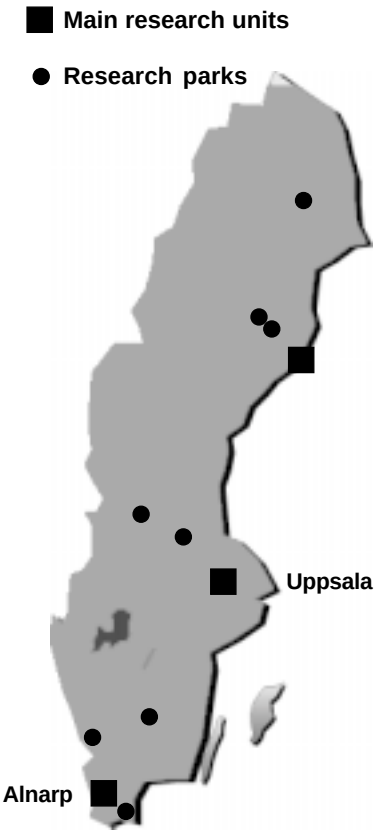
- 800 employees (280 with PhD-degree)
- 22 departments
- Total expenditure: SEK500
  - Research: 60%
  - Postgraduate education: 15%
  - Undergraduate education: 10%
  - Monitoring & assesment: 15%
- Governmental grants: 50%
- External funding: 50%

* before re-organisation

Coming re-organisation

SLU's faculties are to be re-organised, with changes taking effect from 1 January 2004. The departments will be divided amongst four new faculties. The main difference for the forestry-related departments is that several departments in Uppsala, that now belong to the Faculty of Forestry, will become part of a new faculty for natural resources and agriculture, with its head office in Uppsala. The forestry faculty will be concentrated in Umeå. More information will appear in News and Views when the structure has been fully decided.

Read more: www.slu.se



Examples of ongoing activities at SLU

RIS checks the forests

Since the first National Forest Inventory was established in 1923, the status of Swedish forests has been intensively monitored and we have learned, for example, that the growing stock has increased by 72%, from 1.76 to over 3 billion cubic metres, from the 1920s to the present day.

Both permanent and temporary plots are examined in the National Forest Inventory. On the permanent plots, the inventory is combined with data from the Swedish Forest Soil Inventory.

Every summer, more than 60 persons help to inventory the forests on about 12,000 circular plots in 1,450 tracts distributed in a regular network across the country. The inventory is coordinated and compiled by the RIS (the Swedish National Inventory of Forests), which is hosted by SLU's Faculty of Forestry.

Source: www-nfi.slu.se

Research school

A new research school in genetics is currently being launched in a co-operative initiative by SLU, Skogforsk and the Swedish Forest Tree Breeding Association. Additional support comes from the Knowledge Foundation (KK-Stiftelsen). The objective is to combine expertise in quantitative forest genetics and molecular genetics in order to create an internationally leading research program. The research school, managed by SLU, will host eleven PhD students for a period of five years starting in 2004.

"If the promising findings in biotechnology are ever to be applied, it will be necessary to combine the molecular research with traditional breeding. The students will learn both aspects in order to bridge the gap", says Professor Bengt Andersson, director of the research school.

Contact: bengt.andersson@skogforsk.se

Broad-leaved research

A new six-year research program on broad-leaved forests is being launched this autumn. The 200 million SEK-program will be led by SLU. This is to be a cooperative exercise, involving several participants, including WWF, the forest industry, the wood industry, and other universities and institutes.

"Research and development on broad-leaved forestry has been very sparse in Sweden. It is time to change that. Foresters and society are seeking alternatives to spruce", says Hasse Berglöf, forestry chief at WWF.

"The broad-leaved forests provide shelter for many threatened species and are in need of protection and restoration. At the same time, there is increased interest among forest owners to establish new broad-leaved stands", says program leader Magnus Löf at SLU in Alnarp.

Sources: www.slu.se, www.wwf.se

Skogforsk (The Forestry Research Institute of Sweden)

SkogForsk is the research institute of the Swedish forestry sector. Skogforsk carries out applied research in a variety of different fields:

- technological developments
- environmental and conservation issues
- breeding of forestry trees
- organisational issues

Skogforsk was founded jointly by the forestry cooperatives and the major industrial forest enterprises in 1992, when the Forest Operations Institute and Institute of Tree Improvement were merged.

The staff amounts to 120, 70 of whom are researchers. Half of the researchers have a PhD or licentiate degree. Most people work at the head office in Uppsala, but research stations are also found in Sävar (outside Umeå) and Svalöv. The village of Brunsberg hosts a breeding station.

The total turnover comes to approximately SEK100 million, half of which supports the framework program. The other half consists of various external grants and research commissions from the forest sector.

At one end of the spectrum of research fields covered by Skogforsk are topics such as long-term tree breeding. The tree breeding programs date back to the 1930s, continuously providing new, and better, regeneration material for forestry. At present, the forestry sector is establishing new seed orchards with improved material that will grow 20–25% better than unselected trees. At the other end of the spectrum, one can find research on such aspects as the automation of forest operations and IT-supported logistical systems.

Read more: www.skogforsk.se

A simulator is used at Skogforsk to test and develop new techniques for automating harvesting operations.
Photo: Skogforsk

Utilization of beech wood is one of many aspects covered by the new broad-leaved research programme at SLU.
Photo: Martin Werner.

Memorable years for forest research in Sweden

Forestry research and education has a long history in Sweden. Some of the landmark events were:

- **1828** The Royal Institute of Forestry (Kungliga Skogsinstitutet), a school for higher forestry education, is started with, Israel Adolf af Ström as director.
- **1902** The Swedish Institute of Experimental Forestry (Forstliga försöksanstalten – renamed Statens skogsförsöksanstalt in 1905) is established.
- **1916** The Royal Institue of Forestry is reorganized, becoming the Royal College of Forestry (Skogshögskolan) and moves to new buildings in Stockholm.
- **1945** The Swedish Institute of Experimental Forestry is renamed the Forest Research Institute of Sweden (Statens skogsforskningsinstitut).
- **1962** The Forest Research Institute of Sweden is merged with the Royal College of Forestry.
- **1964** The Forest Operations Institute of Sweden is established as a successor to several regional organisations.
- **1967** The Institute for Forest Improvement is established to conduct operational tree breeding and fertilization research.
- **1977** SLU, the Swedish University of Agricultural Research, is established with three faculties, all derived from previously independent institutions specialising in Forestry, Veterinary medicine and Agriculture.
- **1978** The Faculty of Forestry is relocated from Stockholm to Umeå, Uppsala and Garpenberg.
- **1992** The Forest Research Institute of Sweden (Skogforsk) is established as an amalgamation of the Forest Operations Institute and the Institute for Forest Improvement.
- **2004** SLU is reorganised, with the head of the faculty of forestry in Umeå.

Other important Swedish forest and forest industry research bodies

Växjö University

The regional university in Växjö in southern Sweden has recently built up competence in the field of wood utilization. Its Wood Design and Technology (WDAT) R&D programme aims at stimulating, supporting and developing the use of wood and wood-based materials in building constructions, furniture and other consumer products. The group currently has about 10 researchers and 17 PhD students.

Source: www.ips.vxu.se/wooddesign

SUFOR

SUstainable FORestry in southern Sweden is a wide research program. The objective is to provide a scientific basis for economically viable forestry, sustaining long-term forest health while maintaining biodiversity and the multi-use potential of the forest. The SUFOR staff consists of more than 40 persons, mainly from Lund University, Lund Institute of Technology and the Swedish University of Agricultural Sciences.

SUFOR began in 1997 and will continue until the end of 2004. The total grant from MISTRA (The Foundation for Strategic Environmental Research) for the full term 1997–2004 is 108 million SEK.

Source: www.sufor.nu

Luleå Technical University

Luleå Technical University has built up strong research interests in the area of wood technology.

The staff consits of over 30 people, 14 of whom have a PhD-degree and 11 are PhD students.

Source: www.tt.luth.se

Mid Sweden University

A Fibre Science and Communication Centre has been established at the Sundsvall campus of the Mid Sweden University. Some 30 professors and researchers, together with 40 PhD students, are linked to the centre. The research is conducted in close cooperation with the paper industry.

Source: www2.mh.se/fscn

STFI

The Swedish Pulp and Paper Research Institute (STFI) is the main player in Swedish pulp- and paper- related research. In 2003, STFI was merged with Packforsk (the Institute for Packaging and Logistics AB). STFI-Packforsk has a turnover of SEK250 million The head office of STFI-Packforsk is situated in Stockholm.

The company has 250 employees, of whom approximately 30 are PhD students and 20 are professors/ associated professors. The research interests include fibre & pulp, paper-making, packaging & packaging materials, new materials and composites.

Source: www.stfi.se

Trätek

Trätek, the Swedish Institute for Wood Technology Research, constitutes a collective research and development resource for the Swedish timber and wood manufacturing industries.

Trätek's activities span the full range of timber handling and processing from felling and handling in the forest, via production in the sawmill through to the manufacture and use of finished products. Research and development is conducted in the form of projects commissioned either by the industry as a whole, or by groups of companies.

Trätek is a limited company which is 60% owned by the industry through an association. Trätek has 70 employees and its activities are mainly based in Skellefteå, Stockholm and Växjö.

Source: www.tratek.se

Dalarna University

The forest and wood group at Dalarna University has a staff of about 15 people who research and teach various aspects of plant production, forest technology and wood material science. The group was previously part of the research centre in Garpenberg, which was administered by SLU until it whit-draw support in 1996, whereupon some of its activities were transferred to Dalarna University.

Source: www.du.se

Denmark

In terms of forest production, Denmark is the "little brother" among the Scandinavian countries. However, it contributes significantly to the diversity in Nordic forestry.

In Denmark, only 11% of the land area is covered with forests, and the economic importance of the Danish forests is low and declining. The wood-processing industry is characterized by small units and generally has low competitiveness.

The secondary wood-processing sectors (e.g. the furniture-making, building materials and energy sectors) are economically much more important, but also less dependent on domestic wood production.

However, if visions presented in the Danish National Forest Programme in the year 2000 are fulfilled, the role of the forests will be markedly upgraded. According to these ambitious plans, the forest area is to be increased to cover 20–25% of Denmark within a single tree generation. The forests will also be multi-purpose, supplying high quality wood, while offering diverse opportunities for outdoor recreation, conservation of biological diversity, landscape improvement etc.

Although the economic importance of Danish forestry is relatively minor, it is diverse with respect to both species composition and forms of utilization. This is also reflected in a relatively strong research input. One single actor – *Skov & Landskab*, which has 300 employees – dominates forest research in the country. Several other bodies are also involved in more industrial aspects of forest research, such as building and furniture-making.

Danish forests in figures

- Productive forest land: 486,000 hectares (11% of the land area. 0.1 hectare per capita).
- Annual increment: 5.1 million m³
- Annual harvest: 1.7 million m³
- Growing stock: 76 million m³ (63% conifers, 37% broadleaves)

Tree species, land area

- Norway spruce: 28%
- Sitka spruce: 7%
- Nordmann and noble firs: 9%
- Other conifers: 19%
- Beech: 17%
- Oak: 9%
- Other broadleaves: 11%

Ownership, land area

- Private individuals: 47%
- Companies, associations and foundations: 25%
- Public: 28%

Forest industry

- Wood consumption: 8 million m³ (6 million m³ imported)
- Sawnwood industry, value: Dkr4 billion/ year
- Furniture industry, value: Dkr14 billion/ year

Employees

- Primary forest sector: 2,000
- Wood product industry: 14,000

Source: The Danish National Forest Programme. www.sns.dk

Skov & Landskab

The main forest research body in Denmark

The Danish Centre for Forest, Landscape and Planning (*Skov & Landskab*) dominates forest research in Denmark, and also serves as a centre for education and extension concerning forest, landscape issues and planning.

Skov & Landskab has been in existence for three years as an officially recognised organisation composed of the present Danish Forest and Landscape Research Institute, the Danish Forestry College and part of the Royal Veterinary and Agricultural University. From 1 January 2004, these elements, together with Danida Forest Seed Centre, will be merged formally into the independent centre *Skov & Landskab* under the Royal Veterinary and Agricultural University. The main areas of activity are:

- Research and development
- Education, training and refresher courses
- Monitoring forest status and the National Forest Inventory
- Advisory services and dissemination
- Decision support for official bodies
- Developmental and environmental guidance

Skov & Landskab has a budget of Dkr150 million and about 300 employees. About 150 are researchers, of whom around 100 have at least a doctorate. The staff are currently based in six locations – four in Copenhagen and northern Sjaelland, and two in Jutland in the western part of Denmark. The long-term plan is to transfer most of the staff into a new building at the campus of the Royal Veterinary and Agricultural University in Copenhagen.

The new leadership team of Skov & Landskab *gathered for their first meeting. Rear row, from left: Bo Jellesmark Thorsen, Henrik Paaby, Ole Quist Jensen, Karsten Raulund Rasmussen, Kjell Nilsson and Gertrud Jørgensen. Front row, from left: Søren W. Pedersen, Søren Fløe Jensen, Lars Graudal, Jens Dragsted, Niels Elers Koch (director of the centre) and Nils Wilhjelm (chairman of the board).*

Education

The new centre has responsibility for all levels of forest education – from teaching basic grade forest workers to doctoral level studies. Each year, 30 foresters and 30 landscape architects are awarded masters degrees at the centre.

The research

The research is grouped into six departments

- Gene resources in woody plants
- Applied ecology
- Silviculture, forest operations and wood products
- Parks and urban landscapes
- Urban and regional development, landscape management and recreation

Skov & Landskab is also responsible for monitoring the status of the forests and for forest statistics.

Examples of activities at *Skog & Landskab*

Urban forestry

Since Denmark is a densely populated country, in which forests are seldom located far from the cities, research into urban forestry is also, naturally, important. Through *Skov & Landskab*, Denmark is coordinating EUFORIC: the European Urban Forestry Research and Information Centre. EUFORIC is a regional project centre of the European Forest Institute (see *News and Views 18.4*).

EUFORIC aims to strengthen the European network of urban forestry research through a range of activities, e.g. compiling a database of urban forestry research and education, disseminating research results, organizing workshops, and training.

Contact: Dr. Cecil Konijnendijk (cck@kvl.dk), www.fsl.dk/euforic

Examples of activities at *Skog & Landskab*

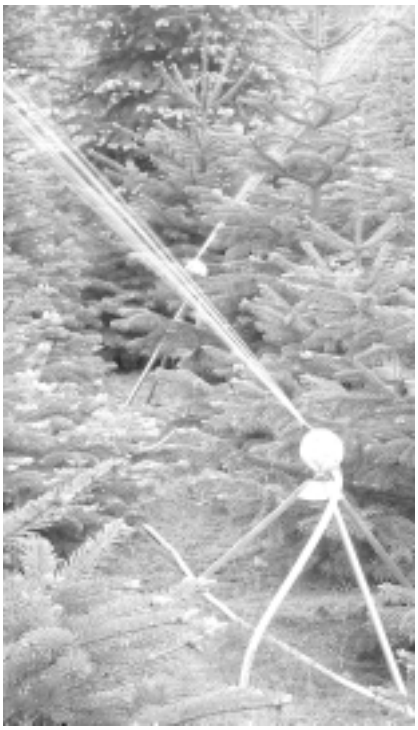
Christmas trees and greenery

Supplying Christmas trees and decorative greenery has become a major alternative source of income for many private forest owners in Denmark. Hence, research in this field is important. Since 1991, *Skov & Landskab* and its predecessor have been pursuing an objective to become one of the global leaders in research related to Christmas trees and greenery production. The centre has a budget of Dkr7 million for this purpose per year.

Research is focused on a number of specific target areas, such as provenance selection and genetic breeding, crop establishment, fertilization, damage limitation and growth manipulation. The research is partly financed by the land owners, through a fee for each hectare with greenery. The research is highly interdisciplinary, and it is divided amongst several departments at *Skov & Landskab* to guarantee scientific quality in diverse fields, such as nutrient application, insect damage and crop establishment.

The most important species are *Abies nordmanniana* and *A. nobilis*. Genetic selection and a breeding programme are ongoing, and specific seed orchards have been established to ensure that suitable seeds are available.

Contact: Dr. Ulrik Bräuner Nielsen (Ubn@kvl.dk)



Irrigation of Christmas trees.
Photo: Ulrik Bräuner Nielsen.

Forest and Water

Because of the intense use of agricultural and urban ecosystems the importance of groundwater from forests is increasing in Denmark, and new forests are being planted on arable land to protect groundwater resources used for drinking water. The quality of forest waters is generally good, but air pollution and some management practices may have negative effects on it. Over the last decade *Skov & Landskab* has initiated national and international projects, as well as long-term experiments designed to elucidate the principal factors affecting nitrate leaching from forests, especially those related to air pollution and management practices. The most recent research efforts have focused on the quality and quantity of water from new forests on arable land. Here, increased evapotranspiration may lead to lower water yields, while accumulations of nitrogen and heavy metals from the old plough layer may potentially contaminate the groundwater. The aim of the project is to provide guidance on forest management strategies that maintain and develop the protective functions of forests on water.

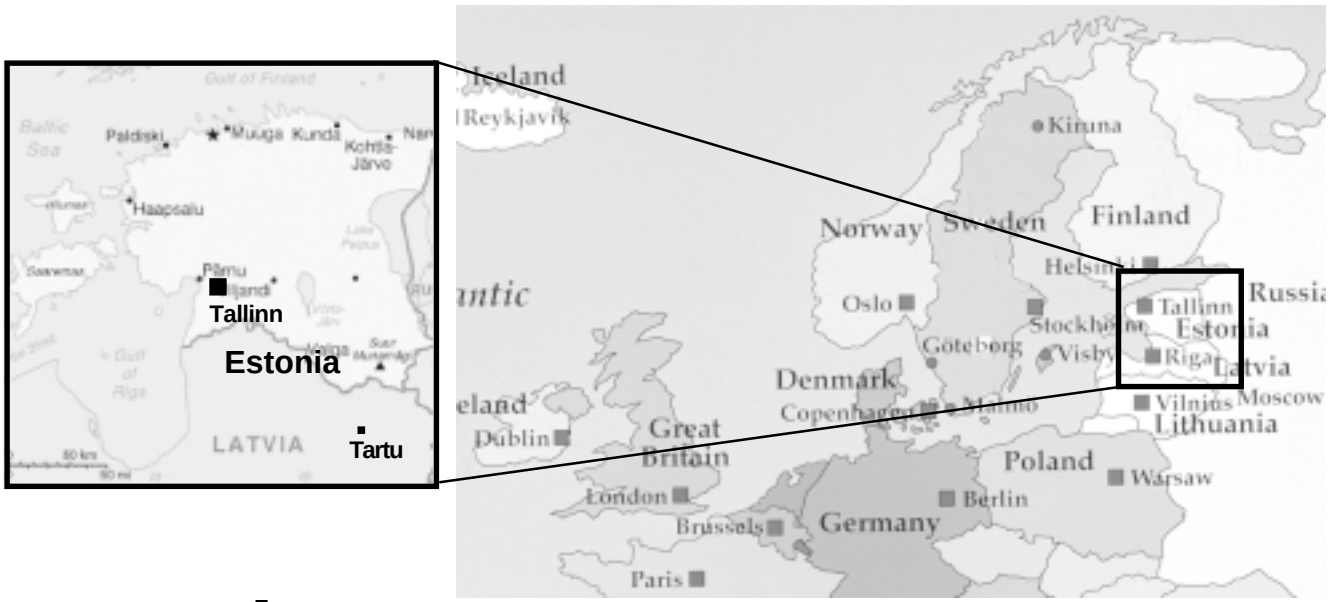
Contact: Dr. Per Gundersen (pgu@kvl.dk)

Soil water sampling at Vestskoven near Copenhagen
Photo: Lars Vesterdahl.

Danish wood material research coordinated

The current research within wood science in Denmark is divided among a number of smaller groups. At present, research is ongoing at the Royal Veterinary and Agricultural University, the Technological University of Denmark, Aalborg University and the Danish Technological Institute. However, recently the Danish Center of Excellence for Wood, an initiative to coordinate and strengthen the ongoing research, was launched. As a result of this initiative, it is expected that the area of wood science will strengthen and grow within the next five years. The present funding for research within wood science is provided by the Danish Forest and Nature Agency and the Danish Research Agency. The main focus areas for applied and basic research are wood joints and bearings, new methods for wood preservation, lignin nanostructures and wood/water relations.

Contact: Dr. Claus Felby (cf @kvl.dk)



Estonia

Estonia is one of Europe's smallest countries with a land area of 43,000 km² and a population of 1.4 million. Estonia will join the EU in 2004.

Forestry is one of the most important branches of the nation's economy. In 2001, forest products accounted for more than 13% of the total value of Estonian exports.

The area of forest land in Estonia has more than doubled since the second world war, to cover 2.3 million hectares. That is 51.5 % of Estonia's mainland territory.

Privatisation of land started soon after independence from Soviet occupation in 1991. In 2002, 37% of the forests were private, while another 25% were in the process of being privatised.

There are today about 60,000 forest owners, whose average property covers just 12 hectares. Only a few of them are members of a private foresters association. About 10% of the Estonian forests belong to foreign investors.

Pine and birch dominate

Scots pine is the most important tree species of the Estonian forests (covering 32% of the forested area), followed by birch species (31%), Norway spruce (19%), grey alder (8.5%) and aspen (5%). However, there are marked differences in the distribution of dominant tree species between private and state-owned forests:

- Conifers constitute 60% of the area in state-owned forests, where pine is the dominant species.
- Private forests have more equal shares of Scots pine (28%), birch (31%) and Norway spruce (25%). In addition, grey and black alder are important on private land, and alder is also an important species in the wood industry.

Increasing harvest

The annual harvest has increased rapidly during the last decade, from 2.5 million m³ in 1993 to 6.4 million m³ in 2000. Most of the wood is taken from final fellings, but the size of thinnings has also increased.

Multiple purposes

Four national parks have been established and state-owned forests are certified through the Forest Stewardship Council.

To a large extent the forests are used for multiple purposes, including production of timber and other goods, environmental protection, recreation and tourism.

Everyone has rights to public access and to pick wild berries and mushrooms, provided by the Forestry Act. Berry and mushroom picking is economically important in Estonia. Bilberry is the most frequently purchased berry, with crops of 3,500 tonnes in good years, and the value of bilberry exports has increased to almost 70 million EEK in good years.

Read more at:
http://www.eau.ee/~muurim/FRI.htm

http://www.eau.ee/~met/

Forest management and protection in Estonia, Estonian Ministry of the Environment, April 2003.

Forest research in Estonia

Estonian forest research has been re-organised recently. Two main actors used to be involved: the Faculty of Forestry at the Estonian Agricultural University, and the previously independent Estonian Forest Research Institute. Today, they are both part of the Estonian Agricultural University.

Several other institutes also pursue activities related to forest research, including the Environmental Institute and the Institute of Zoology and Botany, which are part of the Estonian Agricultural University.

The University of Tartu performs research in botany, ecology and physiology, while Tallinn University of Technology has a department of wood technology. The Centre for Basic and Applied Ecology is one of six Centres of Excellence in Estonia. One group hosted by the Centre is the Sustainable Forestry Group, which includes a research team from the Faculty of Forestry.

Serial publications from Estonian Agricultural University:

***Baltic Forestry*, the** Journal of Forest Science in Lithuania, Latvia and Estonia, is an international peer-reviewed scientific journal. It is jointly published twice a year by several universities and institutes in Latvia, Lithuania and Estonia.

***Metsanduslikud uurimused* – *Forestry Studies* –** is a periodic publication from the Estonian Agricultural University with articles, or at least summaries, written in English.

Estonian Agricultural University I

Forest Research Institute

Since 1998, the Forest Research Institute has been a research and development arm of the Estonian Agricultural University. It has two departments:

- The Department of Forest Biology in Tartu
- The Department of Ecophysiology in Tallinn.

The activities of the Institute include research, consultation and development, not only in fields of forest science and forestry *per se*, but also in other areas related to forests and forestry, such as nature conservation, environmental protection, wildlife management, forest entomology and pathology.

The Forest Research Institute has a staff of about 30, with 20 in Tartu and 10 in Tallin. Twelve of the researchers have doctorates (PhDs). Finance comes from the state budget, research funds and various contracts.

The Director of the Institute is Dr. Kalev Jõgiste. *Photo: Mats Hannerz*

Estonian Agricultural University II

Faculty of Forestry

The main activities of the Faculty of Forestry are based in Tartu. The Faculty has three main departments:

- Silviculture
- Forest Management
- Forest Industry.

Järvselja Training and Experimental Forest Centre also belongs to the faculty. The faculty has a teaching staff of 42 persons, some of whom work part-time and are mainly based in other organisations such as the Forest Research Institute.

The faculty examines about 60 candidates for bachelors degrees, and about 15 for masters each year. The Faculty also trains PhD students.

An external evaluation of the faculty was carried out last year, in which the quality of the research was graded ”good", and the practical implementation of the research “good to excellent". Expectations and challenges for the faculty to meet include: increasing its publication output in international journals; recruiting new PhD students and post-doctoral scientists; and increasing its level of cooperation in research.

The Dean of the faculty is Dr Paavo Kaimre. *Photo: Mats Hannerz*

Latvia

Since independence in 1991, the forest sector has grown to become one of the main contributors to the national economy of Latvia.

Several factors have facilitated this development:

- the forest resources are of high quality and easily accessible
- there is a long tradition of forestry
- the forest sector has adapted well to the market economy
- agreements have been reached between various interest groups on the long-term goals for the development of the forest industry.

The national forest policy, approved in 1998, outlines a number of goals for Latvian forestry: to preserve and increase the area of forested land and its productivity; to ensure sustainability within the forestry sector; to preserve biological diversity; to balance public and forest owners' interests with respect to social values and labour opportunities; and to ensure sufficient competence of those engaged in the forest sector.

Genetic improvement of Scots pine is an important topic at Silava. Amis Gailis and Imants Baumanis from Silava in a seed orchard. Photo: Björn Hannrup.

Administration

The Ministry of Agriculture is the central body controlling the management of the Latvian forests. The ministry supervises the State Forest Service, which is responsible for the implementation of forest policies on all forest land. The ministry also controls the state-owned company Latvian State Forests, which manages nearly half of the forested land in Latvia.

Forest science

Forest science in Latvia builds on German and Russian traditions. The foundation of the Baltic Foresters' Society in 1867 is regarded as the start of Latvian forest research. The Latvian Forest Research Station was set up in 1928.

At present, forest-related research is concentrated in the forestry faculty at the Latvian University of Agriculture (LUA) and the Latvian State Forestry Research Institute (Silava).

Wood research is conducted at the Latvian State Institute of Wood Chemistry.

The training of forest specialists takes place at LUA and at two technical colleges in *Ogre* and *Aizupe*.

Latvian forest statistics

Forest land area: 2.9 million hectares (44.5% of the total area)

Growing stock: 585 million m³

Annual harvest: 11.3 million m³

Number of private forest holdings: 117.000

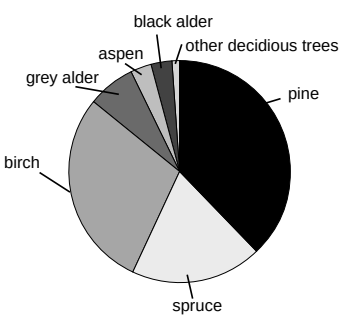
Average size of private forest holdings: 13.1 ha (2/3 less than 10 hectares)

Ownership:
State: 1.46 million ha (51%)
Private: 1.30 million ha (45%)
Others: 0.12 million ha (4%)

Roundwood exports: 4.2 million m³

Source: Forest Sector in Latvia 2003, Ministry of Agriculture

Tree species by land area:



The proportion of conifers is much higher on state-owned forest land (pine + spruce 69%) than on private-owned land (pine + spruce 44%).

Silava

The Latvian State Forestry Research Institute "Silava" is the leading forestry research centre in Latvia. It was founded in 1946 and is a member of both the IUFRO and the EFI (European Forest Institute).

The total number of research workers is currently (2004) 63, 23 of whom hold science doctorates. The headquarters of Silava is located in *Salaspils*, outside Riga. The major objectives of the institute are to research into forest ecosystems and their components and draw up recommendations for sustainable forest management and efficient utilisation of forest resources and forest products.

The institute carries out research in the following subject areas:

Forest ecology and silviculture
Examples

- Modelling the effects of stand management on hydrology from long-term hydrological observations at the forest ecology research station *Vesetnieki*
- The impact of climate change and environmental pollution on forest stand development.

Forest tree breeding and genetics
Examples

- *In-vitro* propagation methods for broadleaved trees
- Progeny testing of fast-growing aspen hybrids.

The Silava Head Office outside Riga

Forest regeneration and establishment
Examples

- Establishment of tree plantations with multiple-goals, including Christmas tree production, short-rotation bio-fuel crops, and wild cherry timber production
- Development and establishment of mycorrhizae in container stock
- Establishment of birch plantations on abandoned farmland.

Forest protection
Examples

- The risk of pests associated with logging residues
- Attracting hole-nesting birds to forests.

Game management
Examples

- Developing methods to balance animal populations and available food
- Use of repellents for protecting forest crops from browsing.

Forest operations
Examples

- Strip-road density and the impact of forest machines on stand and environment
- Planting equipment for bare-root and container stock.

Processing of forest products
Example

- Integrated research on the utilization of non-wood forest products (foliage, bark etc.). Twelve biologically active substances for use in agriculture, the food industry, cosmetics, pharmaceuticals and household products have been developed, registered and production has begun.

Hydrothermal and chemical treatment of wood
Examples

- Drying regimes for kilning sawnwood
- Low-toxicity wood preservatives and fire retardants.

Forest economics and forest policy
Examples:

- Management models for forest estates
- Models for forest valuation with respect to multiple uses.

Contact: inst@silava.lv

Forest faculty at the Latvian University of Agriculture

The predecessor of the Forest Faculty, the Department of Silviculture, was established in 1919 as a branch of the Faculty of Agronomy. It acquired its present name in 1991. Currently there are four departments in the faculty:

- Silviculture
- Forest utilization
- Wood processing
- Working environment

Undergraduate courses, leading to bachelor's degrees in wood processing, wood processing technology, forest science, forest engineering and forestry, are available.

In addition to these four-year courses, it is possible to obtain a Master's degree after an additional two years of study.

Doctoral studies, leading to a PhD, take a further three years.

The teaching staff consists of 37 teachers.

Contact: Dagnis Dubrovskis (dean of Forest Faculty): mfdek@cs.llu.lv

Lithuania

Lithuania has undergone a sharp transition from a political culture based on a centrally planned economy and one-party system to a market economy and a democratic political system.

After the declaration of independence in Lithuania in 1990 there were a number of important developments in the country's forestry: the formation of a free timber market; increasing timber export levels; new modes of ownership (private forests) and enterprise (private logging companies); and the privatisation of the forest industry.

The first description of Lithuanian forests, in the form of a forest inventory, dates back to the 16th century. The roots of Lithuanian forestry research were established in the 19th century when botanical studies of the forest were undertaken.

Indoor seed orchard with birch in Lithuania. *Photo: Vidmantas Verbyla.*

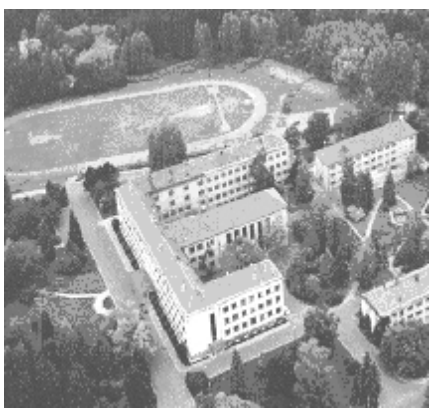
However, forest science developed during the period of independence between the first and second World Wars.

The Lithuanian Forest Research Institute (LFRI) is the main forest research organisation in Lithuania.

The Lithuanian Agricultural University (Faculty of Forestry) and the Kaunas College of Forestry and Environmental Engineering are institutions of higher education involved in forestry.

Research on stand stability, stand productivity and integrated forest monitoring is concentrated at the Faculty of Forestry. Undergraduate and post-graduate studies in forestry and applied ecology are the major concerns.

The LRFI Head Office in Girionys



Lithuanian forest statistics

Forest land area: 2.0 million hectares (30.6% of the total area)

Growing stock: 380 million m³

Annual increment: 12.0 million m³

Annual harvest: 6.3 million m³

Number of private forest owners: 180.000 (the total population is 3.5 million)

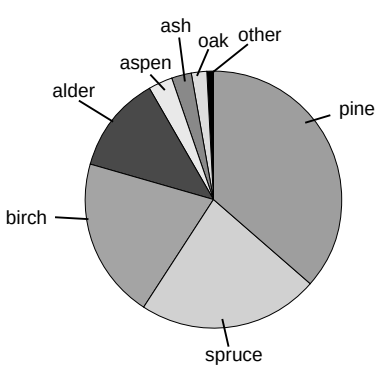
Ownership:
State: 50%
Private: 31%
Reserved for restitution: 19%

Roundwood exports: 1.4 million m³

Sawnwood exports: 1.4 million m³

Read more: www.lvmi.lt

Tree species by land area:



The Lithuanian Forest Research Institute (LFRI)

LFRI was established in 1950. During the following 50 years, the institute's scientific activities have included studies of forest biology and ecology, forest typology, forest hydrology, stand productivity and stability, harvesting, forest regeneration, forest genetics and tree breeding, forest management, forest economics, forest protection and game management.

LFRI is a state institute under the auspices of the Ministry of Education and Science. It is associated with the Lithuanian Academy of Sciences and is a member of IUFRO. Its main scientific research areas have been set by the Government, as follows:

- biological diversity and sustainability of forest ecosystems;
- reforestation, forest productivity, protection and utilization;
- conservation of forest genetic resources, forest tree breeding;
- forest policy, social and economic problems.

The research is divided into six departments:

- Silviculture
- Ecology
- Forest genetics and breeding
- Forest protection and game management
- Forest resources, economics and policy
- Molecular genetics and biotechnology.

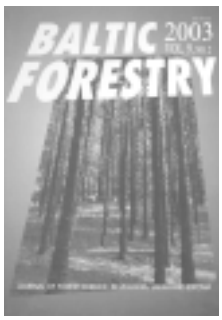
The staff numbers 86, about 45 of whom are researchers. More than 20 of these have a scientific degree. Most of the people work at the head office in Girionys, Kaunas district.

There are 20 postgraduate doctoral degree students at LFRI.

The total annual research budget of LFRI is approximately 2 million Lt (1€ =3.45 Lt), half of which is provided by the state. The other half comes from various international programmes and commissions from the forest sector.

Read more: www.mi.lt

Serial publications from LFRI



Baltic Forestry, the Journal of Forest Science in Lithuania, Latvia and Estonia, is an international peer-reviewed scientific journal (in English, with summaries in Russian). It is published twice a year, jointly by several universities and institutes in Latvia, Lithuania and Estonia.

Miðkininkystë (Forestry), the Journal of Forest Science, is published in cooperation with the Lithuanian Agricultural University (in Lithuanian, with summaries in English and Russian).

Examples of ongoing research at LFRI

Contemporary deterioration of forest ecosystems (2003–2008)

The main task of this research is to estimate the influence of drought, soil chemical deterioration, nitrogen pollution and the decline in tropospheric ozone on Lithuanian forest ecosystem components: trees (stem growth, foliage and roots), ground vegetation (diversity) and soil (chemical composition and biological activity).

Contact: Prof. Remigijus Ozolinèius, miskinst@mi.lt

Identification of genetic polymorphism and assessment of the embryogenic culture of forest trees (2001–2005)

The main research is directed towards application of isolated tissue and cell cultures, DNA fingerprints and biochemical–physiological techniques in tree breeding and biotechnology.

Contact: Ass. prof. Sigutë Kuusienë, biotech@mi.lt

Economic regulation of Lithuanian state and private forestry (2000–2004)

The main interests are: strategic planning of forestry, analysis of the problems and needs of private forest owners, the compensation system for restrictions to forest activity in protected areas and cost–benefit analysis of using wood for energy production.

Contact: Dr. Stasys Mizaras, ekonsk@mi.lt

Northwestern Russia

– Arkhangelsk region

Re-organisation

In 1999, an effort was made by the European Forest Institute (EFI) to describe forest research in Russia and to estimate research capacities. Many of the conclusions reached by the study are probably still valid. The authors stressed the difficulties involved in accessing the necessary information in countries where the economy is rapidly changing. The available information is scarce, and seldom updated.

Traditionally, the former USSR was regarded as one of the leading countries in science and research, especially basic research. Since the collapse of the USSR, the status of Russian science has changed dramatically.

Russian science used to be totally dependent on public funding. In contrast to the western countries, there were no other financial sources that could compensate for the loss when the public spending was cut.

According to the EFI report, operating in the changing circumstances facing Russian science has been tough for the researchers, especially the older ones. It noted that "The prevailing mood in the Russian research community ranges from deep pessimism to nostalgia".

The report identified several changes that had affected Russian science institutions in 1999:

- Staff losses, closure and reorganization of research institutions
- Changes in research networks
- Shifts in priorities and orientations
- Changes in forestry research priorities and spending goals

The report defined forest research organizations according to their recent publication profiles, limiting the study to those responsible for more than 10 forestry-related articles listed in the TREECD database from 1987–1999, amounting to 33 institutions, with a total of over 2000 researchers involved in forest research.

Source: Forestry research capacities in Russia, report from the European Forest Institute 1999 by Nadejda O. Bystriakova and Oleg G. Chertov. Available at www.efi.fi.

Forest research institutes in northwestern Russia:

Saint Petersburg

- Saint Petersburg Forestry Research Institute
- Saint Petersburg State Forest Academy

Petrozavodsk

- Forest Research Institute, Russian Academy of Sciences
- Petrozavodsk State University

Syktyvar

- Syktyvkar Forest Institute, Komi Republic
- Institute of Biology, Komi Scientific Centre, Syktyvkar

Arkhangelsk

- Arkhangelsk State Technical University, Forestry Faculty
- Northern Research Institute of Forestry, Arkhangelsk

Moscow

- All-Russian Research Institute of Forest Mechanisation
- Moscow State Forest University

Obtaining information on Russian research is not easy. This list should not be regarded as comprehensive, but as examples of research institutes which are open for cooperation with Nordic research organizations. We aim to complete the presentation when more information is available.

Arkhangelsk – Northern Research Institute of Forestry

The Northern Research Institute of Forestry is, beside the Forestry Faculty at Arkhangelsk State Technical University, one of the main forestry research bodies in Arkhangelsk.

Ninety-eight people are employed in the former, including 13 who have scientific doctorates, or are working towards one. The research focuses on forestry in the northern area, and the main directions are:

- Northern-taiga and pre-tundra silviculture strategies to protect raw industrial resources and the ecology.
- Systems of forest management based on analyses of the ecological and social functions of wood vegetation and its sustainability
- Forest monitoring
- Improvement of forest productivity, forest harvests, reforestation (natural and artificial) and forest amelioration
- Forest stability and forest ecological exploitation in conditions of intensive anthropogenous influence
- Conservation of biological diversity, landscape-ecological planning
- Forest certification
- Introduction of new tree species

Contacts:
Dr. Rudolf Sungurov, Director
Dr. Natalia Demidova, Deputy Director for Sciences
E-mail: forestry@arh.ru

The SNS (the Nordic Forest Research Co-operation Committee) gives financial grants to projects involving cooperation with the so-called adjacent areas, as long as at least two Nordic countries participate. The adjacent areas are mainly the Baltic states and northwestern Russia.

Facts about the Arkhangelsk region

- The Arkhangelsk Region has one of the largest forest industries in Russia.
- The forestry sector (logging, sawing, woodworking, pulp, paper and wood chemistry activities) accounts for about 50% of the regional output (6% of Russia's total).
- Shorelines on the White, Barents and Kara Seas, which are all part of the Arctic ocean, mark the region's northern borders, while the region borders the republic of Karelia to the west, the Vologodskaya and Kirovskaya regions to the south, and the Republic of Komi and the Tuymen region to the east.
- The total area of the region is more than 400,000 km², approximately corresponding to the area of Sweden.
- The major part of the region is located in the taiga zone, but tundra and forest tundra are also common.
- Over 60% of the land is covered by forests.
- The annual harvest in 2002 was 8.9 million m³, and the annual growth is 0.6–1.1 m³ per hectare.
- Reforestation is done only on a limited scale – 32,000 hectares were subjected to natural regeneration and 9,000 hectares to sawing and planting per year.

View of the taiga-tundra border land. Photo: Mats Hannerz

Siberian larch, which has a scattered but frequent occurrence in the taiga forest of the Arkhangelsk area. Photo: Mats Hannerz

Northwestern Russia

– St Petersburg
– Syktyvar
– Petrozavodsk

St Petersburg Forestry Research Institute

St Petersburg Forestry Research Institute was established in 1929 as the State Forestry Research Institute, and it was the primary research institute in the Soviet Union for a long period.

The institute has changed its name and role over the course of time. The 1990s saw harsh cutbacks in its funding, and the volume of research and development was slashed, followed by a three-fold reduction in staff numbers and the loss of a network of experimental forestry stations. Despite these difficulties, the institute has managed to maintain a leading position at an all-Russian level in a number of fields, including:

- fire control, e.g. fire prevention, detection, fire extinguishing, development of machines and tools for fire control, ecological effects of fire.
- accelerated growth of industrial coniferous plantations, including establishment techniques, use of improved seeds, soil improvement and growth models.
- chemical treatment in the forest, especially the use of herbicides.

The institute currently has about 130 employees, 10 of whom are professors and 32 have a PhD.

Publications

Proceedings of St Petersburg FRI is published annually. In addition, 4–6 monographs are published in Russian, with English summaries.

The last publication in English was "Statistical data on forest fund of Russia and changing productivity in the second half of 20th century" by V.A. Alexeyev, M.V. Markov and R.A. Birdsey, St. Petersburg FRI, 2004. 272 p.

International cooperation

The institute participates in several formally agreed international projects, with organizations such as the Finnish Forest Research Institute, the Dutch Agricultural University and Research Centre, Wageningen, the Lithuanian Forest Research Institute, the University of Helsinki (Finland) and the Swedish University of Agricultural Sciences.

Source: Dr Anton Doroshin
www.spbniilh.ru

Read more about forest research in the North in previous issues of News & Views:

- Iceland No. 2, 2003
- Finland No. 3, 2003
- Norway No. 4, 2003
- Sweden No. 5, 2003
- Denmark No. 6, 2003
- Estonia No. 1, 2004
- Latvia and Lithuania No. 3, 2004
- NW Russia I No. 4, 2004

www.nordicforestresearch.org

The picture shows the classically-inspired Winter Palace (built 1754-64)

St Petersburg State Forest Technical Academy

St Petersburg State Forest Technical Academy is the oldest and largest forest educational institution in the world, funded from 1803 by Tsar Alexander I.

"The Academy is widely recognised, even in the most remote regions of Russia, to be staffed by highly-trained experts and excellent teachers, incorporating 200 years of pure forest science and practical forestry", says Professor V. I. Onegin, Rector of the academy.

Its name has changed several times during its history, but its main purpose has remained the same: educating forest specialists.

Professionals are trained in the fields of forest ecology, forestry, wood processing, forest chemistry, and pulp/paper processing. In addition, the academy conducts basic and applied research.

The research is carried out by professors and scientists, among whom 84 are doctors of science and 350 are doctoral candidates.

For many years the Academy has fruitfully cooperated with leading universities and scientific organisations in Finland, USA, Germany, France, Sweden, China and other countries.

Source: Olga Shaitarova & Evgeny Kuznetsov. www.ftacademy.sp.ru

Karelia – the Petrozavodsk State University

The Forest Engineering Faculty of Petrozavodsk State University is the only university department in the republic to offer professional forestry courses towards the degrees of Engineering Diploma (MSc), Science Candidate (PhD) and Doctor of Science (DSc). Currently, 230 students are in their first year.

The faculty conducts research in a large range of forestry topics. Several projects are being pursued in cooperation with foreign organizations, such as Joensuu University and Helsinki University in Finland, and the Swedish University of Agricultural Sciences. The institute would welcome further cooperation, especially in the field of forest engineering.

Some examples of ongoing research projects:

Planning and manufacturing forest machines

The goal of this project, which is being run in cooperation with the University of Joensuu, is to develop digital models, and related software, of their performance to ensure the effectiveness of forest machines at the planning stage and their presentation as algorithms and programs. In addition, failures during use are investigated. The researcher with overall responsibility in this field is Professor A. Pitukhin.

Species diversity and game numbers in the taiga

This project is concerned with characterization of the species diversity of the undisturbed taiga in Karelia, and compares the number of game species in the taiga of Karelia and Finland. The project is led by Yu Kurhinen in cooperation with counterparts at the Game and Fisheries Research Institute in Finland.

Development of forests under natural conditions

The species composition, resistance and structure of primeval forests, as well as their regenerative processes, are being studied here. The project is led by V. Sakovets at the Forest Research Institute, the other of the two research bodies in Karelia. The project involves cooperation with the Finnish Forest Research Institute.

Source: www.karelia.ru/psu

About Karelia

The republic of Karelia is a vast and sparsely populated region in the north-west of Russia. Its total land area is 18 million hectares, 51 % of which is covered with forest.

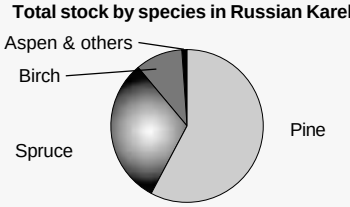
A large proportion of the land is covered by water bodies, such as the great lakes of Ladoga and Onega.

The population is about 760,000, 40% of whom live in the capital Petrozavodsk.

The average population density is only four inhabitants per km².

The forest industry is the most important economic sector, accounting for 44% of the total industrial production (by value) in the republic.

Total stock by species in Russian Karelia



Komi Science Centre

The most easterly part of European Russia – the Komi Republic – is the home of the Institute of Biology, Komi Science Centre of the Russian Academy of Sciences. Its office is in Syktyvkar, capital of the Komi Republic.

The institute was founded in 1962 and currently has a staff of about 340 employees. The institute has several departments and laboratories, covering the fields of botany, soil science and animal ecology. The forest research is carried out by the Forest Biological Problems of the North Department, which has 24 employees. The main research areas are:

- forest ecology
- tree breeding and forest genetics
- forest health
- tree physiology

The Institute of Biology participates in several international projects together with bodies in the Netherlands (RIZA), Switzerland (WSL/FNP), Finland (Metla), Sweden (SLU and Skogforsk) and several Norwegian universities and institutes.

Larch seedlings aimed for establishing a progeny trial in cooperation with Scandinavia. *Photo: Jaap Buitink.*

Source: Aleksey Fedorkov, e-mail: fedorkov@ib.komisc.ru

PROCES – the centre of a network

The European Forest Institute (EFI) has a regional project centre in Russia, with the acronym PROCES.

This forest research and training centre was established in 1999 and is located within the St Petersburg State Forest Technical Academy, but its work is carried out under the scientific umbrella of EFI.

PROCES' main tasks are to:

- conduct research in the field of sustainable forest management
- create a scientific network for universities, research institutes and other organizations linked to the forest sector.

Research at the centre:

Initially, a project was set up to analyse and model the development of the forest resources in European Russia. Two main sub-projects are running at present:

- Forest resource scenario modelling for the European part of Russia. The project leader is A. Lioubimov at SPb SFTA.
- Economic evaluation and implementation strategies for forestry scenarios relevant to the European part of the Russian Federation. The project leader is Professor Anatolij Petrov of the All-Russia Research Institute for Silviculture and Forestry Mechanisation.

Other projects:

- Planning and management systems for the St Petersburg Forest Greenbelt, led by Cecil Konijnendijk at the Danish Forest and Landscape Research Institute, Denmark.
- Risk assessment in forest scenario modelling, led by Andrey Selikhovkin at SPb SFTA.

Since networking is one of the main intended functions for PROCES, many partners within and outside Russia are linked to the centre. The highest priority partners are located in the European part of Russia, Ukraine and Byelorussia, but the centre also has partners in Finland, Germany, Sweden, Norway and the Baltic countries.

www.efi.fi/rpc/proces

Call for cooperation

The EFI Regional project centre in St Petersburg is interested in cooperating with research and educational institutes, commercial companies, other organizations and individual persons in activities related to various scientific and educational projects, publications, seminars, workshops and conferences. Interested? Send an email to: proces.fta@home.ru

The province of Åland

The province of Åland, a group of islands between Sweden and the mainland of Finland, is a de-militarized, Swedish-speaking part of Finland with a wide degree of autonomy.

The small province, with its 26,000 inhabitants, is a minor actor in the Nordic forest sector. Nevertheless, productive forests cover 40% of its land area, and the forest plays important social, economic and ecological roles; in terms of income, biodiversity and recreation for instance. Åland has a permanent observer position on the SNS board.

Regional forest program

A regional forest program for Åland was recently started by the local government (Ålands landskaps-styrelse). The program, covering the period 2002–2006, was established to ensure sustainable economic, ecological and social development of the forest resources. A document describing the program, available on the internet (see below), provides valuable background facts about the forests and forestry on Åland.

Since the 1950s, the Finnish Forest Research Institute (METLA), in collaboration with the forest agency of Åland, has been responsible for the majority of the forest research in the province.

Source: Regionalt skogsprogram för Åland 2002–2006, Ålands land-skapsstyrelse. (download a pdf from http://www.ls.aland.fi/naringsavd/skogsbruksbyran/skogsbruk.pbs)

Contact: Mikael Sandvik (head of the forest agency on Åland), mikael.sandvik@ls.aland.fi

Åland's forest in figures

Forest area: 61,700 hectares

Ownership: 91 % of the forest area is privately owned, and the average size of the holdings is only 23 hectares

Standing volume: 9 million cubic metres (almost a third of which is older than 80 years

Annual volume growth: 317,000 cubic metres.

Annual harvest: 189,000 cubic metres (2003)

Average growth: 4.8 cubic metres per hectare and year

Tree species, % of volume:
Scots pine 55%
Norway spruce 22%
broadleaves 23%

Industrial use: The harvested timber is used mainly by two companies

Economic impact: The forest sector is small in terms of employment; only 0.6 % of all employees on Åland work in the sector. METLA estimated that 161 people are engaged full-time in it: 60 in forestry and 101 in forest industries

Sky, sea and forest - a picture of Åland. *Photo: The government of Åland*