

Editor's summary

The following is the editor's condensed summary of the articles in this issue.



Photo: Skogforsk

- Tree improvement is a long-term process. Several decades may pass before the results of one's efforts can be realized and evaluated. **Bengt Andersson** and his colleagues have comprehensively evaluated the performance of genetically improved Scots pine in northern Sweden. After analyzing 36 field tests, they found the selected trees were 10% taller than unselected trees at 9–13 years age, but there was no significant difference in survival. The relative height superiority of the selected trees was consistent over a large range of site conditions.

- Researchers have long been interested in the regulatory roles of temperature and photoperiod in the growth phenology of trees. Such information is becoming increasingly important in order to predict the effects of expected global changes in temperature on forest tree survival and growth. **Olavi Junttila** and his colleagues here present results indicating that induction and depth of dormancy in birch is affected not only by photoperiod, but also by temperature.

- Spruce trees felled by flood erosion following heavy rain become suitable breeding substrates for bark- and wood-boring beetles. In the following years, attacks by these bark beetles may kill standing trees. These were some of the findings of **Martin**

Schroeder and **Åke Lindelöw**, who studied trees along streams with and without exposure to flooding.

- The composition and fragmentation of forests may have profound effects on their biodiversity and species composition. **Gunnar Jansson** and **Henrik Andrén** studied variations in bird species populations with respect to habitat composition in managed boreal stands. A high proportion of old (>40 year) forest and a sufficient proportion of mixed conifer-broadleaf stands were found to be prerequisites for high species diversity. The mixed forests were especially important in areas where broadleaves were relatively scarce. The authors also found that a particular species of bird, hazel grouse, was an indicator of high bird diversity.

- Environmental pressures have reduced the frequency of clearcuts in Norway. Instead, harvesting is often based nowadays on shelter wood cuttings or partial cuttings. Partial cuttings are often combined with natural regeneration, but on some sites, planting may be necessary. To improve our understanding of factors that promote satisfactory regeneration with planting in partial cuttings, **Aksel Granhus** and his colleagues conducted a study in south-eastern Norway. They found, among other things, that the inverting method of scarification was good for the plants.

- Site preparation and planting were also the subjects of a Danish study. **Kjell Suadicani** compared different methods of regeneration under a spruce shelter-wood. The comparison included analyses of seedling establishment, damage to shelter trees, technical options and costs. All the tested methods for mechanical site preparation were technically feasible, but differed in costs.

- Nitrogen in the soil is made available to trees mainly through mineralization and nitrification. These processes are driven largely by bacteria, fungi and soil animals. However, the tree roots themselves may also play a role in

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Forest research in the North Finland

In the series Forest research in the north, attention has turned to Finland. In the previous issue of News and Views, the country portrayed was Iceland. Of all the Nordic countries Iceland has the shortest history of forestry, and its forests have the most marginal economic role. In contrast, forests are dominant in Finland, and the forest sector plays a major role in the country's economy.

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converting nitrogen into ammonium and nitrate. **Micheline Colin-Belgrand** and her colleagues experimented with soil from beech and spruce stands. After developing an appropriate incubation method, they found that tree roots seem to have a strong influence on N transformation.

- Forests accumulate and store carbon in biomass and soils, and forest products can replace fossil fuels. Forest management strategies may

therefore have a significant impact on the atmospheric carbon budget, and thus on global climate change. **Erik Ericsson** simulated the effects of changing the rotation period in central Swedish forestry. He found that a prolonged rotation would increase the accumulation of carbon compared with current rotation times. On the other hand, a shorter rotation would increase the potential to substitute fossil fuel with forest residues.

- Measuring stand parameters from the ground is expensive, and difficult to practice in remote areas. Forest mensuration by the use of aerial photographs and satellite images is thus attractive, as long as it can deliver sufficiently reliable data. **Hailemariam Temesgen** compared two methods to estimate stand data from aerial attributes. Following the study, conducted in British Columbia, he concluded that the Most Similar Neighbor method gave reliable results.

Canada and Sweden cooperate on tree genomics

“Canada and Sweden are known not only for their vast forests but also for the quality of their research and their genomics discoveries in particular,” said the Swedish Prime Minister, Göran Persson, recently.

“Today, researchers from both our countries have chosen to combine their strengths in both of these sectors to achieve more than they would if they worked separately and to become world leaders in a crucial sector for our economy: forests”, said the Swedish Prime Minister, during a visit to Ottawa recently.

The cooperation agreement has been made between the Forest Genomics Group of the University of British Columbia and the Swedish Tree Functional Genomics Consortium.

The Swedish part of the project, which will be funded by the Wallenberg foundation and the Swedish Foundation for Strategic Research, will be performed at the Umeå Plant Science Centre (next page).



Professor Stefan Jansson (to the right) hands over a CD with poplar gene information to Dr Brian Ellis at Genome Canada in the presence of Prime Minister Göran Persson (Sweden) and Secretary of State Dr Rey Pagtakhan (Canada). Photo: Genome Canada.

What is genomics?

Genomics is a discipline that aims to decipher and understand the entire genetic information content of an organism (Genome Canada).

CD-ROM with genes

An example of what the project involves is provided by Stefan Jansson of the Umeå Plant Science Centre, Sweden. “Today, we are really pleased to bring to our colleagues a CD-ROM containing 100,000 ESTs (expressed sequence tags) from the poplar genome, the first of many such exchanges to take place between our two groups.”

“The ESTs gathered by each team are complementary, so by pooling resources, both teams can assemble a joint *Populus* EST collection. This information will provide the two teams with an effective tool to examine tree biology and genetic responses to stresses, pests and the environment.”

Source: Newsletter 5 from NIS, nis@forestry.se

At the forefront of tree-gene mapping

In northern Sweden, the secrets of the tree's genes are unmasked, step by step, by a group of scientists, working with cutting edge technology. The ambition is to identify the genes that control fibre properties and growth.

Umeå Plant Science Center (UPSC) was formed in 1999 by the Department of Plant Physiology, Umeå University, and the Department of Forest Genetics and Plant Physiology at SLU. Its 150 researchers, professors and PhD-students, originating from 20 countries, work on experimental plant biology, and molecular genetics, genomics, has a central role.

Focus on poplars

The researchers started the gene-mapping program in poplar and aspen in 1997. Today, the Poplar Genome Project is the most comprehensive tree genome program in the world. Over 50 researchers are involved in the program which is conducted as a collaboration between UPSC and the Royal Institute of Technology in Stockholm.

The program strives to map the genes in aspen and poplars. In addition, the function of particular genes is described with the aid of specially developed microarrays. The microarrays can be used to study whether genes are active or not. The researchers hope to identify the genes that control traits such as fibre properties and growth.

Recently, the researchers identified 2,400 genes that are active in autumn leaves, but there is still a long way to go before the genes that control the process of leaf senescence can be defined.

International co-operation

Under the lead of the US Department of Energy, a project to map all the genes in poplar (a female *Populus balsamiferae*) is now underway. UPSC is cooperating with researchers in the

USA and Canada in this 40 million US dollar project. To date, half of the tree's 40,000 genes have been identified.

The Swedish, Canadian and US researchers use different techniques to identify the genes, and by combining their results, more of the poplar's genome can be mapped.

Pine and spruce 10 years away

Most of the gene identification work has focused on aspens and poplar. Stefan Jansson at UPSC believes that it will be 10 years before the same research can be done on spruce and pine. – These trees have 100 times as much DNA as aspens, and will consequently require much more work to process the information.

Commercial exploitation

The findings from the genomic research are being commercially exploited by the company SweTreeGenomics, which seeks patents for new genes and methods. An example is the gene GA20 Oxidase, which controls the production of a growth hormone.

Source: www.upsc.nu,
Stefan.jansson@plantphys.umu.se

Soon, the genes controlling the tree's growth and wood properties may be identified. Photo: Lars Rytter



New dissertations

Establishment of Norway spruce

Kjersti Holt Hanssen defended her thesis at the Agricultural University of Norway recently. The main objective was to examine the impact of different microhabitats on the regeneration of Norway spruce on small clear-cuts, and to study the regeneration of Norway spruce under different harvesting and scarification treatments. She found, among other things, that germination of spruce seed was very poor in all the intact substrates tested, with the exception of *Sphagnum*. Scarification on the other hand, strongly improved seedling establishment.

Contact: kjersti.hanssen@isf.nlh.no

Uptake of organic nitrogen

The role of organic nitrogen as a nutrient source for forest plants has become increasingly recognized. Jörgen Persson showed in his doctorate at SLU that amino acid uptake can make important contributions to the nitrogen nutrition of plants in boreal forests. The uptake was found to be regulated by a number of factors, including the N- and C-status of the plants and access to the substrate.

Contact: jorgen.persson@genfys.slu.se

Selective logging in tropical rain forest

The polycyclic selective logging system is the most widely applied system in tropical forests. It is practiced in many natural forests of southwestern Ethiopia but, until recently, it had not been systematically studied. A thesis by Tarekegn Abebe at SLU has now examined the effects of commercial selective logging on the residual stand and the regeneration. It was shown that selective logging can be used effectively if forests are sustainably managed. This is not always the case today.

Contact: tarekegn.abebe@resgeom.slu.se

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.



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 epoxy 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.

- **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



Joensuu campus

Photo: Ilkka Kontinen / University of Joensuu.

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.

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

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.

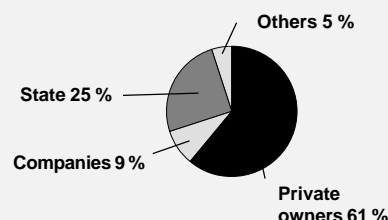
The first phase of Wood Wisdom ran from 1998 to 2001, and the total turnover for this period was EUR 35 million, of which 20 million was publicly provided. In the second phase, started in 2002, a joint Swedish-Finnish research programme is an important component (see News and Views 18.1).

Source: www.woodwisdom.fi

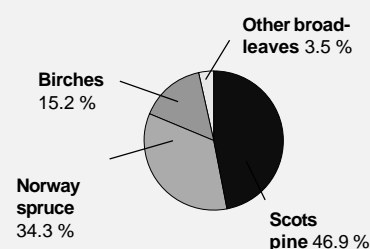


Finnish forests in figures

- 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)

Contact News & Views

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- short
- relevant to the Journal
- interesting for the readers.

Examples: comments on papers published in the Journal, views on ongoing research, trends in research policy, opinions about forestry practice etc.

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