Editor's summary

The following is the editor's condensed summary of the articles in the current issue, which has a purely Nordic flavour, with authors representing all five of the Nordic countries.

The diversity of tree-living fungi is more dependent on the amount of coarse woody debris than a fertility gradient, according to new findings. Photo: Martin Werner

• Root rot spreads faster in the trunks of fast-growing genotypes. This was shown in a field experiment with 17-year-old Norway spruce cuttings reported by **Gunilla Swedjemark** and **Bo Karlsson**. Previous experiments on cuttings had not detected a positive relationship between tree growth and fungal growth.

• Subalpine firs (*Abies lasiocarpa*) have become popular in the Nordic countries as sources of greenery and for use as Christmas trees. **Ole Hansen** and a group of Nordic researchers studied 3-year-old provenance trials in Denmark, Norway and Iceland with respect to factors important for Christmas tree production. They suggest that southern provenances from New Mexico and Arizona are the most likely to provide good Christmas trees.

• The effects of spacing in pre-commercial thinnings in Scots pine have been widely studied in the Nordic countries. Fewer studies have concerned the time of thinning, and the combined effects of thinning timing and spacing have never been experimentally studied. At least, not until the study presented here by **Matti Varmola** and **Hannu Salminen**. They demonstrate significant effects on growth, timber assortments, branches and crown structure.

• Stands with a mixture of birch and spruce have previously shown higher yields than pure spruce stands. The mechanisms responsible for this mixture effect are unknown, but processes involving organic matter cycling and nitrogen release have been implicated. **P-O Brandtberg** and **Helene Lundkvist** found that carbon respiration may be higher in organic matter from mixed stands. However, no difference in nitrogen release was found.

• Is species diversity always higher on fertile sites, or may other factors be equally or more important? This is, roughly, the question posed in a study on polyporous fungi by **Anna-Liisa Sippola** and colleagues. They found that the diversity of these often tree-living fungi did not follow the fertility gradient. The amount of coarse woody debris was more important.

• Laser-scanning from the air is now the "hottest" method for producing 3-D images of the forest. **Erik Naesset** evaluated the suitability of a two-phase method involving small-footprint laser scanning for inventorying a 6,500 ha forest area. He found that the method gave greater precision than traditional field measurements combined with aerial photography.

• Different groups have different opinions about the use of the forests. But how can consideration of these opinions, and the roles of the groups, be incorporated into the planning process? **Pekka Leskinen** and his colleagues tested a new survey technique to determine the objectives of stakeholder groups as diverse as forest companies, reindeer herders, environmental organisations and many more. They showed that some groups had objectives that were not properly met by the regional planning process. However, one objective, to utilise the forests more efficiently without increasing cuttings, was supported by all groups.

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You can freely download the News and Views section as pdf-files. Check the SNS homepage **www.nordicforestresearch.org** under News & Views.

Use these, for instance, to get an overview of Nordic forest research.

A synopsis of the research in each of the Nordic countries is presented in issues 2-6 (2003).

New SNS-supported projects, p 98–101

Seven new SNS-supported projects

A number of projects with participants from all the Nordic countries as well as from the Baltic states were granted SNS funding totalling 4.2 million NOK at the SNS meeting in Estonia in October 2003.

Two of the projects were continuations of previous projects, and five were new. They are described on following pages.

A list of all current and completed research projects can be found at the SNS homepage **www.nordicforestresearch.org**

Criteria for SNS support for research projects

SNS supports research related to forestry, forests and other wooded areas (landscapes, parks, urban trees and marginal land), the utilisation of wood and other forest products, as well as the non-commercial value of the forests.

Support is given to research collaboration involving at least three Nordic countries. Countries in the so-called Adjacent Areas (mainly Estonia, Latvia, Lithuania and northwestern Russia) may also be included, as long as at least two Nordic countries participate.

Grants will be allocated in order to create "Nordic synergy". To gain support from SNS, the research collaboration should give added value, compared to unilateral research.

SNS gives financial support to the following types of research collaboration:

I Research projects

II Preparatory studies for larger projects (pilot projects)

III Networking activities

IV Preparation of applications to the EU framework programme

National sources must provide at least 67% of the projects' funding.

Details can be found on the SNS homepage.

1. NOLTFOX – Nordic database of long-term forest experiments

In order to facilitate access to information on long-term Nordic field experiments related to forests and forestry, a database was created on the initiative of SNS in 1999. Forest research organisations of the five Nordic countries participated in this co-operative exercise.

During 2001–2002 the NOLTFOX database took form and was publicly launched (**http://noltfox.metla.fi**). An international evaluation (2003) proposed further expansion of NOLTFOX, including the incorporation of links to both literature and results available in other web-based databases relevant to long-term field experiments. The Baltic countries were also to be included.

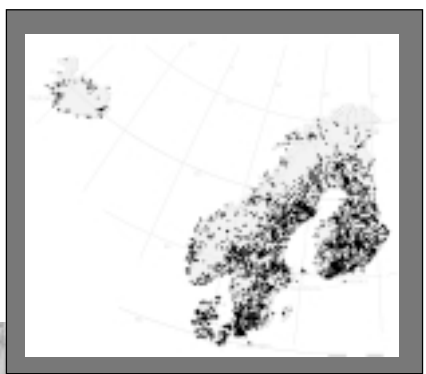
Based on the proposals arising from the evaluation, a new three-year project to further develop the NOLTFOX database has been accepted by the SNS board, aiming to:

- expand the database to promote evaluation of forest field experiments as an important basis for developing sustainable forestry guidelines
- increase scientific co-operation, knowledge and awareness of existing research, facilities and long-term forest field experiments within and between the Nordic and Baltic countries and in an international context.
- reduce sub-optimal use of resources by concentrating activities on high quality field experiments and promoting effective use of existing experimental data.

Contact: Fredrika von Sydow (fredrika.von.sydow@sfak.slu.se)

Facts SNS-95: The project has been granted 300,000 NOK for each of the years 2004, 2005 and 2006.

The project manager is Fredrika von Sydow at SLU in Sweden. All Nordic countries are taking part in the project.



Below: *From the establishment of a fertilization trial– one of the over 10,000 experiments i the NOLTFOX database. The map to the right shows the location of 1,000 of them.* *Photo: Areca.*

2. Carbon storage in forest biomass

How much carbon can a Nordic forest stand store? A new project aims to synthesize the available knowledge.

In order to fulfil the obligations of the Kyoto Protocol, good and verifiable estimates of carbon stocks and sequestration in forest biomass are needed. A central part of the estimation relies on representative biomass expansion factors or functions to derive total biomass from inventory data on merchantable biomass.

Biomass expansion factors are defined as the ratio of total mass to merchantable fresh stem volume, and species – specific factors (constants) may be incorporated into functions by including relationships with age or tree size. Expansion factors are recognised as important sources of uncertainty in estimates of carbon storage in stand biomass, but background data for expansion factors nevertheless remain scarce in many countries.

The aim of this project is to synthesise the knowledge available on biomass expansion functions in order to establish common and comparable methods for estimating carbon stocks and sequestration in stand biomass in the forest ecosystem. The starting point will be information on above- and below-ground carbon storage in Norway spruce stands – a species common to all the participating countries. In a second phase the project may include Scots pine.

The project will establish common methods and protocols for estimating biomass carbon levels to be included in forest carbon budgets. A particular target is to develop comparable biomass expansion functions for the Nordic and Baltic countries. One of the deliverables will be a PC-tool.

Contact: Inge Stupak Møller (ism@fsl.dk)

Facts SNS-94: The project has been granted 450,000 NOK for each of the years 2004, 2005 and 2006.

The project managers are Inge Stupak Møller & Karsten Raulund Rasmussen at Skov & Landskab in Denmark. Other participants come from Estonia, Finland, Iceland, Latvia, Lithuania, Norway and Sweden.

The growing Nordic forest – a substantial sink for carbon dioxide. Photo: Mats Hannerz

3. Plant protection by beneficial soil organisms

Benefical soil fungi or bacteria may become environmentally sound alternatives to chemical seedling protection.

Insects and diseases attacking the root systems of seedlings cause major problems throughout the world. In Nordic forestry these problems are most significant in tree seedling nurseries and in afforestation, especially in Iceland. Previous research has shown that

A) beneficial soil biota can be used to control soil-dwelling larvae

B) soil-dwelling larvae can be successfully controlled by insect-pathogenic fungi and

C) ectomycorrhizae can be used to control root diseases.

The hypothesis is that by inoculating seedlings in the nursery with beneficial organisms they can be protected by environmentally sound methods from diseases and soil-dwelling larvae in both the nursery and the field. The hypothesis will be tested by selecting, developing and applying beneficial biota to a model system.

Contact: Dr. Gudmundur Halldorsson (gudmundur@skogur.is)

Facts SNS-93: The project has been granted 250,000 NOK for the year 2004.

The project is an extension of a currently running 2-year project.

The project manager is Dr. Gudmundur Halldorsson of Iceland Forest Research. Other participants come from Denmark, Finland and the Faroe Islands.

Root-attacking *insects may be a threat to this newly planted seedling, but it may be protected by insect-pathogenic fungi or bacteria.* Photo: Anna Norén

4. Identification of ectomycorrhizal fungi in Nordic forests

There are more than 1,100 known species of fungi living in symbiosis with the tree roots in the Nordic forests. Their diversity and composition is now to be studied.

The Nordic countries possess huge land areas covered by natural and managed forests. The forest trees depend on the below-ground community of ectomycorrhizal (EM) fungi living in obligate symbiosis with roots of the forest trees. About 95 % of the fine-roots of the forest trees are colonized by EM fungi which mediate nutrient acquisition and protect the trees against environmental pollution and root pathogens.

Approximately 60 genera, including at least 1,100 species, of known EM fungi occur in the Nordic countries, but this number increased steadily after we started to identify fungi from EM roots by molecular tools.

As climatic changes and human activities drastically influence our natural ecosystems, it is of immense importance to study the biodiversity and species composition of EM fungi to better understand the functioning of the forest ecosystems.

The SNS-project "Identification of ectomycorrhizal fungi in Nordic forests" is an integral part of the NorFa initiative "Identification and ecology of ectomycorrhizal fungi". You can find more about the project at: **(http://www.systbot.gu.se/research/unite/)**.

In a parallel project, NorFa is constructing a database designated UNITE (User-friendly Nordic ITS Ectomycorrhiza Database). UNITE **(http://hermes.zbi.ee/)** will contain well-annotated ITS sequences of Nordic EM fungi. Unknown sequences can be identified by comparing them with sequences in the UNITE database through interactive sequence homology searches and/or phylogenetic analyses. When complete, the UNITE-base will facilitate easy and confident identification of EM fungi extracted directly from roots, mycelia and soil samples.

The goal for this SNS-supported project is to develop the UNITE database as comprehensively as possible, thus providing a powerful tool for identifying and mapping the biodiversity and genetic resources of beneficial root symbiotic EM fungi in the northern forests.

Mycorrhizal fungi colonize almost all tree roots in the forests. At least 1,100 species are known in the Nordic countries. More may be found in the new SNS project.
Photo: Skogforsk

Contact: Dr. Trude Vrålstad, (trudevr@ulrik.uio.no)

Facts SNS-92: The project has been granted 400,000 NOK for each of the years 2004, 2005 and 2006.

The project manager is Dr. Trude Vrålstad from the University of Oslo, Norway. Other participants come from Gothenburg University (Sweden), SLU (Sweden), Iceland Forest Research and the Universities of Helsinki (Finland), Tartu (Estonia), and Copenhagen (Denmark).

5. Wood hemicelluloses for surface modification of fibres, paper and boards

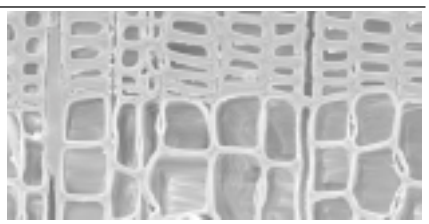
Hemicelluloses in the wood are under-utilized today, but may, in the future, replace oil-based products.

The goal of this pre-project is to evaluate possibilities for converting hemicelluloses separated from forest sources or waste streams from pulp and fibre production into novel surface materials for soft tissues and food packaging.

Hemicelluloses are the second most abundant polysaccharides after cellulose, comprising about one third of wood material. However, compared with cellulose and starch, utilization of hemicelluloses has largely been neglected. The target is to increase their use, for example to replace some currently used oil-based materials.

The project will include preliminary experiments with different types of hemicellulose in order to evaluate their potential, and to establish a larger collaborative project in the next phase of the program.

Contact: Professor Maija Tenkanen (maija.tenkanen@helsinki.fi)



Hemicelluloses are a substantial part of the wood fibres. Modified hemicellulose can be used to improve the properties of soft tissues or packaging paper.

Facts SNS-91: The project has been granted 200,000 NOK for the year 2004.

The project manager is Professor Maija Tenkanen at the University of Helsinki (Finland). Other participants come from Chalmers University of Technology (Sweden) and Forest Products Industry (Denmark).

6. Risk management in forestry

Forest owners' risk aversion may be an important factor when determining the optimal rotation time. This hypothesis is to be studied in a new project.

Future timber markets will probably be more risky, therefore it is important to gain knowledge about how risk may affect harvesting and management behaviour. However, the effects of variations in forest owners' risk aversion have not been formerly analysed in the optimal rotation literature. Results from such analyses will benefit both advisers and the industry by increasing our understanding of how forest owners behave in uncertain markets. The objectives of the preparatory study are to:

- Assess how optimal rotation is affected by price uncertainty, the forest owner's risk aversion and natural disasters, and to evaluate a stochastic dynamic programming approach named multi-level hierarchic Markov programming (MLHMP) to solve this problem.
- Formulate a proposal for a larger research project concerning risk management in forestry for the period 2005–2007.
- Establish a network between the participating researchers, and link research on animal science, agricultural economics and forest economics to risk management in forestry.

Contact: Dr Ståle Størdal (stale.stordal@ostforsk.no)

Facts SNS-90: The project, which is a preparatory study, has been granted 200,000 NOK for the year 2004.

The project manager is Dr. Ståle Størdal at Eastern Norway Research Institute (Norway). Other participating organisations are KVL (Denmark) and the University of Helsinki (Finland).

Storm felling is only one of many potential risks affecting the decisions of the forest owner. Photo: Mats Hannerz

7. Family forestry – future challenges and needs

Future strategies and business opportunities for family forestry will be analyzed in a new project.

The current status of family-run forestry concerns is very similar in all the Nordic countries. A joint effort related to issues affecting them would facilitate identification of their major problems, and attempts to solve them.

This pilot project aims to identify the future roles and challenges for family forestry in both the Nordic and Baltic countries. The background material required to identify the major problems and possible ways to address them will be acquired by collecting currently available knowledge from previous research projects, arranging a workshop and conducting a survey aimed at family forest owners.

The project will deal with subjects like forest owner strategies and business opportunities, self-employment, decision support, information channels, and presentation.

The pilot project will provide foundations for new research proposals.

Contact: Jan Bjerketvedt (jan.bjerketvedt@skogforsk.no)

Facts SNS-89: The project has been granted 100,000 NOK for the year 2004.

The project manager is Jan Bjerketvedt at Skogforsk (Norway). Other participating organisations are TTS-Institute (Finland), Skov & Landskab (Denmark) and SLU (Sweden).

Family forestry. Photo: Mats Hannerz

Unique instrument for measuring wood and fibre properties installed in Stockholm

– Most methods previously used to measure spatial variations of fibre properties in wood are tedious and very costly. SilviScan technology offers much more efficient characterization with sufficient resolution for most cases, according to Sven-Olof Lundqvist at STFI-Packforsk, during a demonstration of the equipment recently installed in Sweden.

The SilviScan is an instrument for measuring wood and fibre properties. The instrument integrates three different kinds of measurement capability (see table). Radial variations are determined for wood density, fibre width and micro-fibril angle. From these data many other properties can be calculated or estimated, such as fibre wall thickness, coarseness and wood stiffness.

The SilviScan instrument is designed for high efficiency, allowing the analysis of reasonably large numbers of samples, which is often essential for representative results.

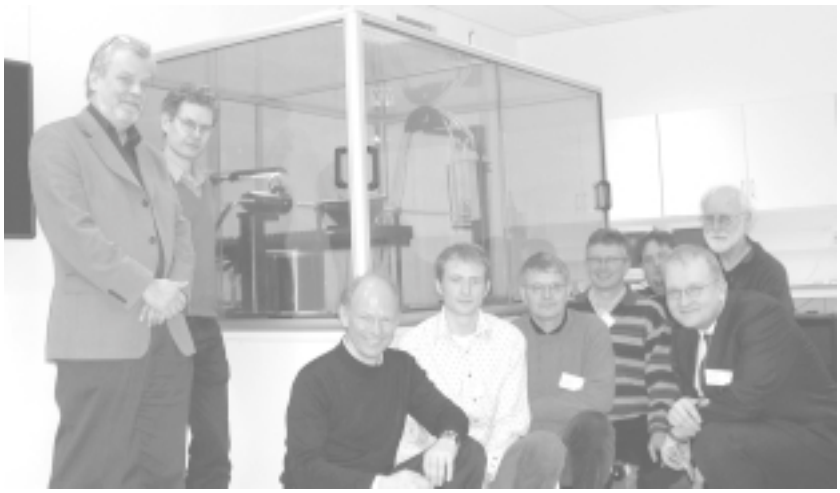
The SilviScan technology was developed by CSIRO in Australia, and Dr Robert Evans was awarded the Marcus Wallenberg prize ("the Nobel Prize of the forestry sector") in 2001 for its development.

The new instrument at STFI-Packforsk is the first SilviScan outside the labs in Melbourne.

Universities, institutes and private companies can make use of the Swedish instrument on a contract basis or as partners in cooperative projects.

Contact: Sven-Olof Lundqvist (svenolof.lundqvist@stfi.se)

A group of partners in the SNS-supported project "Structural timber quality in Norway spruce" in front of the SilviScan instrument. Sven-Olof Lundqvist of STFI-Packforsk at the front. *Photo: Björn Hannrup*



Measurement capabilities integrated in the SilviScan instrument and some of the variables that can be measured with it.

Measurement technique	Primary variables	Inferred parameters
A. Image analysis	Fibre width: radial tangential Ring orientation Ray orientation	Fibre wall thickness Coarseness and other fibre properties
B. X-ray absorption	Wood density	Wood stiffness Compression wood and other wood properties
C. X-ray diffraction	Microfibril angle Fibre orientation Crystallite width	

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