News and Views 2 1999

New forest programme launched in Finland

A 20% increase in cutting, a doubling in export-value and a 5% increase in use of forest fuels–all by 2010; these are the tough goals for a new national forest programme in Finland. The annual yield from forestry is also expected to go rise steeply: from today's €97, to €103–104 per hectare.

The programme has been jointly developed by the Finnish government, the forest industry and a number of interest groups.

More intensive silviculture

The programme assumes there will be a more intensive silviculture, especially in young stands. The goal for precommercial thinnings is 250,000 hectares per year, compared to today's 150,000 hectares. Early commercial thinnings are also expected to increase from 100,000 to 250,000 hectares per year, and ditching from 75, 000 to 110,000 hectares in this period.

Knowledge-transfer

The programme implies there will be financial support for forest management plans developed for privately owned estates. The government will also increase efforts to transfer knowledge to private forest owners.

Wood mechanical industry

One key area for increasing the export value from the Finnish forest industries is the wood-processing sector, i.e. sawmills, furniture factories, joineries, pre-fabricated housing industries, etc. The programme's supporters believe that a more market-oriented development is a necessity, and stress the importance of supporting networks of small and medium sized enterprises in the wood-processing sector.

Effects on employment

The programme is expected to lead to 10,000–15,000 new jobs in the forestry and forest industries. But, on the other hand, the productivity is predicted to rise, so the predicted net effect is a decrease from 95,000 to 80,000 employees in the Finnish forestry sector.

Environmental concern included

Within the national forest programme, there is also a plan to enhance the sustainability of the forests. One ambition is to increase the area of protected forests in southern Finland, another is to encourage biodiversity in the productive forests.

Innovation Forum

To facilitate the goals of the programme, an Innovation Forum has been formed. The forum is designed to build bridges between research and industry, and to promote exchange of information between producers and users of new knowledge. The forum will also define goals for future development.

The programme stresses that new research projects must be identified from a user-perspective. Industry must define its needs for new information. This will also, it is believed, provide a guarantee for better commercial use of new research findings.

The programme will soon be available in English, Swedish, German and French.

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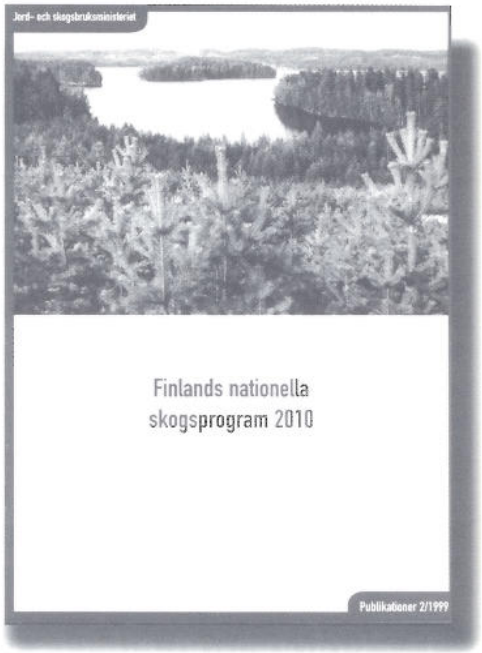

Current Finnish forestry stastics

Total land-area:	304 600 km²
Forest land:	201 300 km²
Ownership by forest area	
Private forest owners	62%
Forest companies	8%
State	25%
Others	5%
Growth and cutting	
Annual increment	75 mil. m³
Annual cutting	55 mil. m³
Percentage of tree species by volume	
Pine	46%
Spruce:	36%
Broad-leaved trees	18%

New light on temperature and day-length effects

The provenances used in Nordic forestry are adapted to current combinations of day-length and temperature. But if and when the predicted global climate change comes true, they will face totally new conditions. The temperature will change, but the day/night rhythm will, of course, be the same. How will this affect our trees? Will, for instance, the bud burst occur too early in the spring, causing a drastic increase in frost-damage? Or, perhaps too late, leading to a decrease in growth?

These were the issues examined by an SNS-funded research-project called "Thermal time-photoperiod regulation of the annual cycle in relation to the climate change". The project was designed to improve our understanding of mechanisms underlying growth-rhythms of the two most important tree-species in Nordic forestry: Norway spruce and Scots pine.

The project was divided into three sections, investigated by teams based in Finland, Sweden and Norway. Here are some results from the project:

In a harsh climate, a too early bud burst is fatal.

1. Photoperiod affects bud burst of Norway spruce

The Finnish contribution was a project named "Timing of bud-break and growth cessation." It included, amongst other things, greenhouse-studies of Norway spruce cuttings.

The prevailing theory is that the timing of growth onset is regulated solely by air temperature. But in these studies, light was also found to be important for 10-year old spruce cuttings:

- Shortening of the photoperiod seemed to retard bud burst. Little or no ontogenetic development took place during mild periods before the winter solstice, thus preventing a premature growth.
- Fluctating temperatures and continously lenghtening photoperiods hastened bud burst.

However, the experiment suffered from a scarcity of cuttings, and the results need to be confirmed in further experiments.

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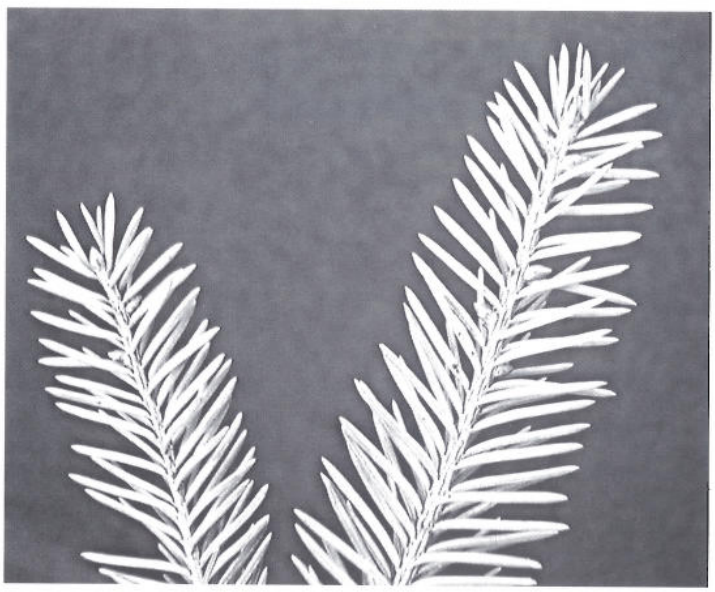

Norway spruce twig waiting for the summer. New research findings indicate that not only temperature but also day-light regulates the bud-break in spring.

2. Two "watches" for Norway spruce time-keeping?

The Swedish contribution was entitled: Molecular and physiological mechanisms regulating in-wintering in contrasted populations of Norway spruce.

To investigate the putative role of phytochromes in regulating budset in Norway spruce, experiments with red och far-red light were conducted with five populations from southern to far-northern Sweden and one population from Romania. Seedlings of different origin, raised under continuos metal halogen light, were transferred to a regime with 8 hours of full light and a day extension with 16 hours of either cool white light, with a red:far-red ratio of 7.5, metal halogen light, with a red:far-red ratio of 2.0

The northern populations set buds in the cool white light regime, while populations southwards from south of 61°N did not set bud in either regime. Far-red light is increasingly required to prevent too early budset as the latitude of origin of the populations increases north of about 61°N.

A requirement for far-red light is charasteristic of plants showing a "light-dominant" photoperiodic response, measuring day-length rather than nightlenght; southern populations measure nightlenght, as is shown by night-break experiments. It is likely that nights shorter than 3–4 hours cannot be measured properly by the night time-keeping mechanism, so Norway spruce populations from the north have to switch to day time-keeping.

The project also included studies to identify the genes engaged in photoperiod regulation.

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Norway spruce have two different methods of time-keeping: day-lenght and night-lenght.

3. Norway spruce trees prepare their progenies for the environment

Norway spruce can actually adjust its progenies for the environment experienced by the mother. Giving them a growth rhythm appropriate to a harsh climate, for instance. And another growth rhythm for a warmer site.

Initially, this subject attracted attention because progenies from northern parents "born" in a southern seed orchard lost the expected northern traits, and showed a growth rythm simular with progenies of more southern origin.

The major objective for the third sub-project, the Norwegian "Effects of temperature and photoperiod during early stages of sexual reproduction on the growth rhythm and hardiness of the offspring" was to gain a clearer understanding of how this system works.

Earlier research has shown that heat and daylenght treatments during male flowering have no influence on the progenies. New experiments gave no differences in the progenies frost hardiness when temperature treatments were given after pollination. This indicates that female meiosis may be the critical period for environmental influence, activating regulatory mechanisms affecting the expression of genes controlling adaptive traits.

The findings demonstrates that Norway spruce has a very high potential to adapt to new environments.

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A female Norway spruce flower.

The Nordic Forest Research Co-operation Committee, SNS:

New joint research projects supported by SNS

The executive committee of the SNS has decided to give financial support to five new projects starting in 1999. The projects have been selected by the standard evaluation procedure, in which scientific quality, relevance for Nordic forest management and potential for Nordic synergy were the main criteria. All projects have a duration of three years (1999-2001) and are granted substantial national co-funding. Three of the new projects are described here. The other two will be presented in a forthcoming issue of the journal.

SNS

1. Forest management for environmental services

The UNCED in Rio de Janeiro in 1992, and the subsequent Helsinki Resolution, have highlighted the necessity of developing forest management practices that take into account not only production requirements, but also society's needs for services like landscape buffering, recreation opportunities, the protection of valuable biotopes and good quality water, etc.

This project focuses on the choice of silvicultural systems and regeneration treatments that promote the avaliability of such environmental services.

The aim is to undertake inter-disciplinary analysis of the influence of alternative forest management practices upon regeneration, vegetation development and water chemistry. Shelterwood and various forms of selection cutting will be compared to clear-cutting. The technical demands for implementing the various practises will also be investigated.

The study is organised around two geographical transects: E Norway - central Sweden - NW Russia, and W Denmark - Latvia. The northern transect will include native spruce stands, whereas the southern transect will include both native deciduous and conifereous species.

Project: Forest Management for Environmental Services ("SNS-69")

Co-ordinator: Dr. Agro Niels Heding at the Danish Forest and Landscape Research Institute, Hörsholm, Denmark. nils.heding@sdsdsds

Participating countries: Denmark, Latvia, Norway, Russia and Sweden.

SNS grant: appr. €49 000 per annum.

Shelterwood – an alternative for regeneration of spruce?

2. Climate effects on carbon and nitrogen

Climatic changes, whether natural or anthropogenic, are likely to exert significant influences on the concentration, fluxes and storage of carbon and nitrogen in forest ecosystems, implicitly affecting tree growth and biomass. Whereas most research tends to suggest that changes in temperature and precipitation may have strong effects on the microbial and hydro-chemical processes involved, it still remains unclear whether an increased concentration of carbon dioxide will lead to increased or decreased sequestration of organic matter in soil.

The objective of this project is to quantify concentrations and fluxes of dissolved organic carbon and nitrogen, as well as storage of organic carbon and nitrogen in solid form in forest soils. The emphasis lies on synthesis and modelling, utilizing data available from a number of field sites along North-South and East-West transects across the Nordic countries. Further, the interplay of climatic stresses with other stresses, such as acidic precipitation and increased nitrogen load will be studied. The project will collaborate with the EU-funded project PROTOS.

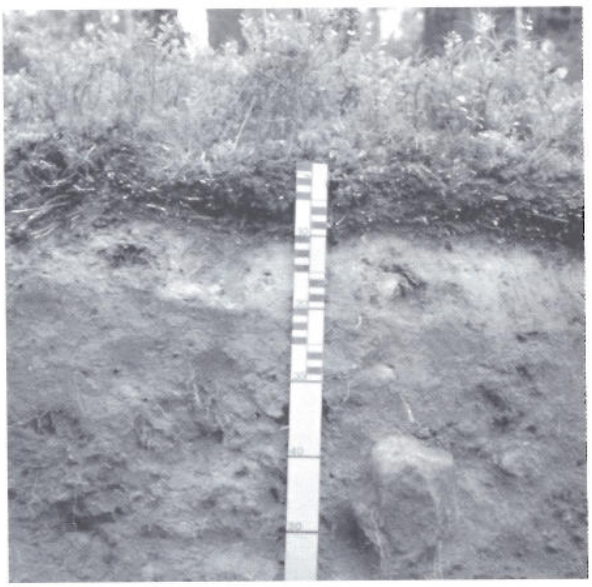
Project: Climatic Effects on Pools of Organic Carbon and Nitrogen and Fluxes of dissolved Carbon and Nitrogen in Forest Soils ("SNS-70")

Co-ordinator: Dr Nicholas Clarke at the Norwegian Forest Research Institute, Ås, Norway nicholas.clarke@nisk.no

Participating countries: Denmark, Finland, Norway and Sweden.

SNS grant: appr. €38.000 per annum.

A Nordic forest soil contains large amounts of carbon and nitrogen. Will climatic change lead to an increased release of these compounds to the atmosphere?



3. Insects vs. wind-pollination: effects on genetic variation

The genetic structure of insect-pollinated trees has been poorly studied because of their relatively low commercial importance. In this project, genetic variation in the insect-pollinated broad-leaf species, *Acer platanoides*, will be studied, using the wind-pollinated species, *Betula pendula*, as a reference. The two species also differ in traits like distribution, population size and habitat specificity.

The project will address the hypothesis that differences in life history traits have caused different ratios of genetic variation among and within populations, and different degrees of phenotypic plasticity.

An integrated study of adaptive and fitness traits, as well as genetic markers, is planned. Annual growth rhythm, growth capacity and bio-mass will be measured in field tests and in the phyto-tron. Genetic variability will be investigated, using neutral isozyme markers. The aim is to generate valuable knowledge for the design and implementation of gene conservation strategies and tree breeding.

Project: Importance of Life History Traits for Gene Conservation ("SNS-71")

Co-ordinator: Professor Gösta Eriksson at the Swedish University of Agricultural Sciences, Uppsala, Sweden. gosta.eriksson@sgen.slu.se

Participating countries: Denmark, Finland, Norway and Sweden.

SNS grant: appr. €50 000 per annum

Norway maple, Acer platanoides, *is an insect-pollinated species– silver birch,* Betula pendula, *is wind-pollinated. How have these different pollination strategies affected the genetic variation in today's populations?*

Reforestation on Iceland

Tradition says that when Iceland was settled, at the end of the 9th century, the land was covered with woods "from the mountains to the sea." Long centuries of sheep-grazing and use of wood for fuel have done away with most of Iceland's woods, but thanks to afforestation programmes Iceland may be a densely-wooded landed once more within a matter of decades.

The South Iceland Woods reafforestation programme, launched in 1998, aims to plant 35,000 hectares of woods, and another 10,000 hectares of trees as wind-barriers.

The main species planted are birch, sitka spruce, poplar, larch, pine, and willow.

In 1998, about 100 farmers participated in the programme. The target for the year 2000 is that 150 farms in South Iceland will be taking part in afforestation.

In 1998 about half a million saplings were planted. By 2002, an annual planting rate of 1.6 million saplings is planned.

The South Iceland Woods programme meets 97% of the costs of the afforestation. In some cases the aim is to produce economic timber plantations, while in other areas the aim is simply to establish vegetation in barren areas.

In places where trees are planted to create wind-barriers, South Iceland Woods meet 65–70% of the costs.The farmers who participate in the programme undertake to cultivate woods on the areas specified, which means that they must plant new trees as old ones are felled.

The state's contribution to the costs of afforestation is classified as a long-term loan, to be repaid by a percentage of the profit yielded when trees are harvested.

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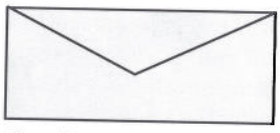
From a forest plantation on Iceland. Behind: A landscape long time ago covered with woods.
Photo: Bengt Ek

Letters to the editors



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