7.3.3 Fertilization

In the mid-1960's a fertilization program was started. It peaked in the 1970's, has since declined somewhat, but is projected to increase in the future, at least in Finland. Presently, about 150,000 hectares per year in Sweden (mostly in the central and northern areas) and about 100,000 hectares per year in Finland are fertilized (Figure 22). Approximately 2 million hectares had been fertilized in both countries by the early to mid-1980's. In Sweden there are restrictions on fertilizer use, particularly in the south, due to soil acidification.

Fertilization is mainly directed to maturing stands. The common practice seems to be to fertilize after the first thinning at around age 50 years and every 7 to 10 years thereafter. Pine stands on medium sites appear to be the most common target.

Application is primarily by aircraft, but ground methods are also used. The typical application rate is 150 kg/ha of pure nitrogen applied as 450 kg/ha of ammonium nitrate. The increase in growth rates as a result of fertilization range from 10 to 30%. Overall, the growth effect is estimated to contribute about 2 to 3 million m³ to Sweden's annual increment.

7.4 Mixed Wood Management

About 15% of Sweden's and 18% of Finland's standing timber volume is deciduous. In both countries, birch is the dominant deciduous species, accounting for almost 75% of Swedish and more than 80% of Finnish deciduous standing volume. In Finland, aspen and alder account for 3% of total standing timber volume. In Sweden, beech and oak account for slightly less than 2%. The proportions of deciduous and coniferous standing volumes have been relatively constant for many years.
Birch is by far the most commercially important of the deciduous species, finding use mostly in plywood and pulp. Birch is the primary species in plywood production and makes up 80% of the pulp used to produce fine papers. Pulp production accounts for 90% of deciduous wood consumption in Sweden and probably a similar amount in Finland. Presently, deciduous species account for almost 13% of total roundwood consumption in Sweden and contribute about 20% of annual Finnish harvest volume. Although Swedes do not anticipate an increase in the importance of deciduous species, Finns believe their use in pulp will grow by 2.4% per year between 1980 and the year 2000. By way of comparison, in British Columbia in 1987/88, deciduous species made up less than 1% of the harvest, but by 1995 are predicted to make up some 5%.

Despite the relative importance of deciduous species in commercial production, neither the Swedes nor the Finns seem to concern themselves very much with deciduous management. A few foresters seem to hold deciduous species in contempt.

During the 1960's and 1970's, Swedes did not increase the total area of young stands cleaned each year. This led to what Swedes describe as a critical situation around the late 1970's and early 1980's when cleaning was urgently required to decrease the admixture of naturally regenerated and rapidly growing deciduous species. This crisis led to a 1979 amendment to the Forestry Law making pre-commercial thinning a compulsory measure. Cleaning is now seen only second in priority to stand establishment as the nation's highest silviculture priority. Although speculation on our part, it may be that this cleaning fervour caused the virtual banning of herbicides in forestry. Initially, cleaning was accomplished with herbicides. Herbicides, however, were bitterly opposed by a public who often travelled in the woods and consumed liberal amounts of berries and game. This opposition eventually led to the banning.

Scandinavian foresters are not totally opposed to deciduous growth in coniferous stands. The deciduous species reduce frost pockets and provide an alternative source of food for browse. Some deciduous stems are often left after cleaning, to be taken during the first thinning (Figure 23).
Overall, however, mixed wood management does not seem to be a priority. The reason for this appears to be a large supply of very low-priced birch from the Soviet Union. So long as such a supply exists, Scandinavians will probably focus on producing the more valuable conifers in their own forests and satisfy much of the demand for deciduous species through imports.

7.5 Silviculture Costs

As in British Columbia, silviculture costs vary significantly in Scandinavia depending on site condition, labour availability, restrictions on forest management practises, and other factors. Table 6 presents estimates of average cost for five common silviculture treatments.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cost (Cdn. $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site preparation</td>
<td>$170/ha</td>
</tr>
<tr>
<td>Reforestation</td>
<td>$700/ha</td>
</tr>
<tr>
<td>Cleaning</td>
<td>$180/ha</td>
</tr>
<tr>
<td>Thinning (including planning and wood delivery)</td>
<td>$24/m³ or $1500/ha</td>
</tr>
<tr>
<td>Fertilization</td>
<td>$180/ha</td>
</tr>
</tbody>
</table>

7.6 Applicability to British Columbia

Several features of Scandinavian forestry which distinguish it from the British Columbian situation suggest that the Scandinavian silviculture regime cannot presently be applied in its entirety in British Columbia. At the root of many of these distinguishing features is time.

Because of 700 years of extensive forestry and almost 50 years of intensive forestry, much of the Scandinavian working forest is a managed forest, there being little old growth left. These managed forests are young and thrifty and their growth patterns are well understood. The management emphasis is on
maximizing growth (quality and quantity) in stands which, because of their young age and vigour, are capable of responding to silviculture treatments such as thinning and fertilization. Money, which might otherwise go into transportation costs for the final products, can be spent in the forests because markets are nearby. British Columbia, in contrast, has a relative abundance of unmanaged and overmature forests which will economically supply our forest industry for several years to come. Management of these components of our working forest focuses, first, on minimizing losses related to decay, disease, and infestation through orderly harvesting and, second, on converting these harvested sites into productive forests through application of basic silviculture treatments.

While there is some second growth harvesting in British Columbia, the industry is not yet dependent on managed forests for a commercial timber supply, nor would extensive thinning be economically attractive. Although there are many second-growth forests in British Columbia, they have not been intensively managed over a long time and the impacts of silviculture treatments on growth and yield are not well understood. It will likely be some time before wood supply from thinning becomes an appropriate alternative to old-growth harvesting within British Columbia’s working forest. The current chip surplus makes the creation of additional pulp material financially unattractive. Until there is a shortage of pulp fibre, it is unlikely there will be significant commercial thinning in British Columbia.

In addition to forest structure, the longer history in Scandinavia has allowed better integration of forestry, manufacturing, and marketing. Scandinavians understand what quantity and quality of wood their forests cannot yield under various management regimes. They have matched this to their markets and manufacturing capabilities, and they manage their forests accordingly. In British Columbia, the industry must take the raw material which an unmanaged forest yields. Some qualities are better, yet many are worse, than what a managed forest would produce. As we move to a more managed forest, the opportunity will exist to better integrate timber management with manufacturing capability and market demand, bearing in mind that flexibility should be a key element when producing forests for the future.

8 PROTECTION

Forest protection issues in Scandinavia are different from those in British Columbia.

8.1 Wildfire

While British Columbia concerns focus on wildfire and insect attack in over-mature forests, the primary concern in Scandinavian is forest damage caused by animals and by airborne emissions and acidification.

Although wildfire was at one time a significant problem in Scandinavia, it is so miniscule an issue now that forest fire statistics are no longer kept in Sweden. Abundant summer rainfall, a humid climate, and well-developed access roads help to minimize wildfire problems. Swedes have replaced a large fire control organization with private flying clubs who control fire on a contractual basis at a low cost to the public.

8.2 Insects

Insects pose a much greater threat in Scandinavia than wildfire. Those causing the greatest problems include the pine weevil, the pineshoot borer (Tomicus spp) and spruce bark beetles (Pityogenes chalcographus and Ips typographus). The pine weevil attacks young seedlings and is combated through proper site preparation and, in some cases, the use of insecticides in the nurseries, although there is some objection by planters to this practise. Swedes report their greatest insect problems come in older stands following windthrow. The largest attack occurred after heavy wind storms in 1969, when both spruce and pine were attacked. An extensive control program, including the use of more than 350 000 pheromone traps, was instituted. The attack was brought under control but Swedes do not know whether to attribute their success to control measures or to natural causes.

Major insect outbreaks peaked in the late 1970's, just as Sweden introduced detailed rules in the Forestry Act for prevention and control. These rules include measures to be taken:

- in forests damaged by storm, snow, fire, or otherwise;
with cleaning, clearing, and logging residues;  
on extraction of timber to roadside;  
after severe insect attacks; and  
when storing timber.

It may be no coincidence that insect problems in Sweden have declined since the introduction of these rules. A description of these measures is attached in Appendix 3 to this Report.

An insect worthy of special mention is the pine wood nematode. All Scandinavian countries presently have a ban on the import of wood chips from the southern United States because in 1984 the pine wood nematode was discovered in a chip shipment destined from there to Finland. In 1990, the nematode was discovered in a shipment of white pine lumber from the Maritimes to Finland. This could have serious implications for Canadian lumber shipments not only to Scandinavia but also to the more important markets of the United Kingdom and continental Europe.

8.3 Diseases

Only two diseases were reported: a needle cast and a disease caused by the fungus Gremmeniella abietina, which is primarily a concern with lodgepole pine. Weakened lodgepole pine are thought to be the most prone to infection. Some foresters in Sweden claim that lodgepole pine is weak because it has been planted on sites to which it is not adapted, such as wet or high elevation sites. They believe lodgepole pine could fail on those sites, with or without the fungus. The SCA company, the strongest supporter of the lodgepole program, believes that lodgepole pines have been weakened by a recent heat sum problem in Sweden. SCA believes that if temperatures experienced in 1987 became the norm, Sweden’s tree line would drop 300 metres.

8.4 Animals

Other protection problems pale in significance when compared with browse damage caused by moose and roe deer (Figure 24). The problem has become so severe on Scots pine in southern Sweden that it limits planting of this species. Foresters blame the situation on a high moose population caused by two factors. First, there is a great deal of browse material available because of the non-use of herbicides and because cattle are not permitted to graze in the forest. Second, many small clearcut areas regenerating rapidly provide excellent moose habitat. The moose population in Sweden has grown from only 10 000 animals in the 1940’s to about 300 000 animals today, about one moose per 100 hectares of forest land. Hunters take about 130 000 moose and a similar number of deer each year and foresters believe that number should be increased.

FIGURE 24. Typical browse damage in young stand established by natural regeneration.
8.5 Air Pollution and Soil Acidification

Since 1980, Scandinavians have become increasingly concerned about forest damage caused by air pollution, primarily sulphur dioxide and nitrogen oxides originating from continental Europe. The problem seems to be most severe in southern Sweden but is being monitored across the country in forest inventories. A national survey in 1984 showed that spruce forests over 60 years of age in southern Sweden suffered from extensive needle loss. In the southernmost regions, 20% of the trees in middle and older-aged spruce forests have needle loss exceeding 20%. About 1% of spruces have needle loss exceeding 60%. The problem has now spread to the spruce forests of inland northern Sweden where the trees are older and often exposed to stress under severe climatic conditions.

The only real solution to this problem is to reduce harmful emissions, but that is difficult when the vast majority of emissions originate in other countries. In the meantime, good silviculture and forest hygiene are emphasized. Young stands are cleaned and thinned before they become so dense that tree crown resistance is weakened. Nitrogen fertilization is restricted in southern Sweden. Soil liming is being used, but with mixed results and adverse impacts on tree propagation. Finally, damaged stands are logged on a priority basis.

9 TIMBER MANAGEMENT

9.1 Inventory

In Sweden, national forest inventories are conducted by the Department of Forest Survey of the Swedish University of Agricultural Sciences. In Finland, inventory work is performed by the Finnish Forest Research Institute. The first national inventory was carried out in Sweden between 1923 and 1929. It was a systematic strip inventory, measuring all trees within 10-m-wide strips. The second national inventory was carried out between 1938 and 1952, primarily using circular sample plots of 6.64 m in radius. In Finland, systematic forest inventories have been continuously underway since the 1920's and cover the entire country.

The present Swedish national inventory is a low-intensity sample conducted across the entire country, producing annual estimates of volume and growth. Although the survey is carried out by the university, its annual cost of approximately Cdn. $3 million is paid for by the government, notwithstanding the large proportion of private ownership.

Placing inventory responsibilities with the university has the advantage of building close ties between faculty members, students, and the forestry community. It also lends credibility to the results because the university is seen to be independent of the government and the forest owners. Although independent, the university does work closely with the forestry community. The result is an inventory in which all people seem to have confidence.

In addition to the general inventory, there are operational inventories for management planning which the Swedes estimate cost about Cdn. $12 million per year.

9.2 Allowable Annual Cut

Both the Finns and the Swedes use the concept of potential cut rather than allowable annual cut, the Swedes having made the switch in terminology about 40 years ago.

Potential cut is determined through computer modelling conducted by the organizations also responsible for the general inventories. Again, in Sweden the cost of modelling is paid for by the government. The Swedes have conducted remodeling every 5 or 10 years since the 1950's, the last study being done in 1985 and the next scheduled for 1992.

The modelling process appears to be much more simple than that employed in British Columbia. There are two reasons for this. First, when compared with Scandinavia, British Columbia has a greater number of potential uses of the forest which must be taken into account in the modelling process. Second, in Scandinavia modelling is not used to set an enforceable allowable cut, but only to demonstrate the potential cut.
9.3 Timber Supply

There are some remarkable facts about Sweden and Finland's timber supply.

- The total volume of growing stock is the largest it has ever been and it continues to increase.
- Annual growth rates are the highest they have ever been and they continue to increase.
- The annual cut is less than the potential cut and has been for some time (Figure 25).
- The demand for wood exceeds the annual cut, the difference being made up with imports, which are often less expensive than the incremental domestic supply.

By comparison, British Columbia is, on average, cutting its full allowable annual cut (as determined by current utilization standards) and does not rely on any significant degree of wood imports. However, while Sweden and Finland anticipate higher allowable or potential cuts, British Columbia may be facing a long-run sustained yield of less than the current allowable annual cut. There are at least two apparent reasons for this dichotomy. First, Scandinavia has largely made the transition from old growth to managed forests. Second, having made that transition earlier than British Columbia, the Scandinavians also recognized earlier than British Columbia the need for intensive forest management to offset potentially lower yields per unit area as a result of harvesting stands before growth has completely stopped. This intensive regime includes early replacement of the most decadent stands, early elimination of backlog NSR, reduction of regeneration delay, use of faster-growing species, cleaning, and fertilization. The Scandinavians might also include thinning in this list, while others would argue that thinning contributes to wood flow, but does not increase potential cut.

![Chart showing annual cuts and increment since the 1940s](chart)

**FIGURE 25.** Sweden's annual cuts and increment since the 1940s. Source: National Board of Forestry, 1988.

9.4 Private Owners

The greatest problem in Scandinavian timber supply is that the potential cut is not being harvested. This shortfall between potential and actual cut is occurring on land owned by individuals. State-owned and company-owned forests are being cut at, and in some cases slightly above, the modelled potential cut. But so much land is owned by individuals that the harvest rate on that land can have a heavy impact on the country's overall deficit between potential and actual cut.

One cause for this deficit on private land is changing lifestyles. Years ago, the land was owned by farmers who lived on or near the land, relied on timber harvesting for income, and had managed their forests as part of their lifestyle and livelihood for many years. The Scandinavian population today is increasingly urban. The urban dwellers generally have jobs unrelated to commercial timber production, but living in the city as they
do, they value the forests for recreational purposes. More and more forest land is coming into the hands of urban people through inheritance. Unlike their family before them, they do not live on or near the land, they do not rely on timber harvests for income, and they have not worked at forest management. These factors, combined with their view of the forest as a recreation site only, have adversely impacted on the harvest contribution from private lands. A second cause of this deficit is a tax system which can tax virtually the entire profit from a harvest on private land. Thus, land owners often only cut when they need additional funds, rather than on an ongoing basis.

Governments have taken some action and have under consideration further action to bring these lands back into active timber production. Legislation has been enacted which forces harvesting when a timber stand starts to stagnate. The law also requires that such harvested land be regenerated and tended after harvesting. Under consideration are taxation changes which would make it unattractive to delay timber harvesting past an optimum date. A third alternative might be to permit forest companies to purchase the land, but it does not appear that this option is being pursued actively at this time.

Forest companies and Forest Owners’ Associations are taking some action to encourage landowners to manage their properties. Most companies and associations prepare and circulate to landowners in their area detailed brochures on forest management. Forest company brochures also suggest to the owner that, in return for the right to acquire the timber harvested, the company will reforest and tend the land to meet the requirements of the Forestry Act.

This extension service seems to be working well and is expected to increase in the future. These programs provide important lessons for those segments of the British Columbia forest industry dependent on timber from private and agricultural-lease lands.

10 STRATEGIC ISSUES

10.1 Education and Training

Forestry education and training in Scandinavia is both extensive and long-standing. Intensive forestry education began in Sweden in 1828 and in Finland in 1862. Today, few work in Scandinavian forests without training. All students take 9 years of compulsory comprehensive school. After that, they can choose three forestry paths, broadly categorized as forest worker, forestry technician, and professional.

About 30 educational establishments in each of Sweden and Finland provide the training necessary to become a forest worker or forestry technician. Each country graduates about 800 forest workers and in excess of 100 forestry technicians each year. Forestry programs at this level can last from one to four years and usually involve some vocational experience.

Professional education is offered at two universities in Finland and one in Sweden, the latter having three campuses. The degree programs are four to five years. In Sweden, the students take first year at one campus, second and third year at a second campus, and fourth year at either the second or a third campus, depending on their specialization. In Finland, students choose between one of the two universities for their full education, depending on their interest areas, the newest of the two universities being more specialized. Sweden graduates about 60 foresters each year, Finland about 80. A degree in forestry provides the student with the knowledge, responsibility, and analytical competence needed to manage the natural resources of the forest. Students are educated not only for forest management, education, and extension services, but for other tasks such as nature conservation and community planning where a combination of biological, technical, economic, social, and business competence is required. The foregoing is a simplification of the Scandinavian education and training system. Figure 26 provides an idea of its true complexity.

From our observations, the education system has provided Scandinavia with a skilled and supportive work force. Wherever we went, both logging and silviculture workers appeared very skilled at their jobs and were knowledgeable about how their job fit into the management regime of the overall operation. It was very noticeable that all workers appreciated the forest for more than just providing them with a job. They recognized the forest as an asset to the country and their employer, to be managed with great care. Many appeared to
use the forest for recreation as well as employment. All were supportive of forest management. A further advantage of training appeared to be reduced supervision for the workers, as they were knowledgeable about job functions and supportive of the need to do a good job. Most organizations had very flat organization charts. A training and forestry education system such as that in Scandinavia would do much to improve forest management in British Columbia.

FIGURE 26. A flowchart outlining the components in Swedish forestry education.

10.2 Research and Development

Forestry research is centered in three institutions in each of Sweden and Finland — the universities, a tree improvement organization, and an operations research group similar to FERIC in Canada — all of which are funded cooperatively by industry and government. Research in Finland is also carried out by the Finnish Forest Research Institute. In both countries there are additional, smaller organizations engaged in forest research.
In Sweden, 76% of the university's forestry budget is spent on research and only 12% on education. Two-thirds of all forest research done in Sweden is carried out by the university's Faculty of Forestry. The faculty has five research programs focusing on:

- land use;
- inventory of forest resources;
- timber yield of a site;
- techniques concerning stand establishment and timber harvesting and utilization; and
- production of other resources and environmental assets, and their preservation, management, and utilization.

We visited one of the university's research stations in southern Sweden where it was reported to us that 80% of forestry research in southern Sweden is funded by industry, through a cooperative venture with government, spending slightly more than Cdn. $1 million per year. Private individual owners, who hold 80% of the forest land in southern Sweden, do not contribute to that research program. The research priorities in the south focused on air pollution, insect attack on seedlings, vegetation management, frost damage, root rot, windthrow, and declining timber quality, approximately in that order of priority.

That particular research cooperative is only a small example of Sweden's research programs. For example, the operations group, funded by industry, government, and the forest owners, has an annual budget in excess of Cdn. $4 million, about 40% of which is paid by the government. The Swedish tree improvement organization has a slightly smaller budget, which is also funded 50/50 by government and industry. The Swedish pulp and paper industry spends about 2% of its gross sales on research, the sawmilling industry about 1%.

10.3 Forestry Planning

Unlike British Columbia, both Sweden and Finland have long-term national forestry plans which include specific resource goals. The most recent plans in both countries were prepared in 1985, the Swedish plan for a period of 100 years to 2080 and the Finnish plan for a period of 15 years to the year 2000.

The Swedish plan projects the potential cut under three scenarios: (i) maintaining the present silviculture investment level; (ii) attempting to produce more wood; and (iii) providing for more multiple use. The first option is self-explanatory. The second option details the activities necessary to achieve more wood, such as more intensive care of young stands, increased fertilization and ditching, and increased use of lodgepole pine. Essentially, it models an intensity of forest management on private lands as high as that now carried out on company lands. The third option emphasizes management systems which favour environmental and recreational aspects by calling for less fertilization and ditching, phasing out of lodgepole pine, slightly longer rotations, increased natural regeneration, and more emphasis on the production of hardwoods. Interestingly, all options satisfy Sweden's present target of a sustained yield of at least 75 million m³ per year. The Swedes are now wrestling with how to balance incentives for increased production of wood against incentives for increased production of environmental services.

The Finnish plan, called the Forest 2000 Programme, has as its main emphasis an increase in the country's timber harvests (see Appendix 4). Because the potential cut exceeds the current actual harvest, this objective could be achieved without increasing the rate of timber production. The Finns, however, have rejected this approach and are planning for an increase in timber production as well as harvest. The plan recognizes that multiple-use requirements could decrease this cutting potential by 3 to 4% by the year 2000. This decrease is to be offset by an increase in the volume cut of approximately 25%.

There are three important points British Columbians can learn from Scandinavian forest planning. First, Scandinavian countries are setting targets for annual cuts in the future. Second, they are not planning to retreat from, but rather increase, their current annual cuttings. Third, they will accomplish this having regard for multiple-use requirements which focus more on forest management techniques than on the alienation of the working forest.
11 KEY RECOMMENDATIONS

From the many issues assessed and lessons learned during this Mission, we have developed the following key recommendations for British Columbia:

1. **Education:** We must improve the education and knowledge base of the general public, forestry workers, and landowners not presently contributing to the working forest.

   The general public in Scandinavia have greater confidence in forestry than their counterparts in British Columbia. This should be addressed through a forestry curriculum in the compulsory schooling program and through increased communications between the forestry community and the adult population, such as field tours, open houses, and advertising, combined with appropriate written and audio-visual material.

   Education for forestry workers must be improved at all levels. All forestry workers should be given at least some training. There must be better coordination between technical and professional courses to permit technicians to advance. Professional courses must be more field oriented and provide a better understanding of integrated resource management. A comprehensive continuing education program must be developed for all levels.

   While British Columbia does not have the same extent of private ownership as Scandinavia, private landowners should be encouraged to keep forestry land in forest production. Two avenues, that should be pursued immediately, include tax incentive schemes and a comprehensive extension service provided by both government and industry. If such programs fail, it may be necessary to legislate standards of forest practise on private land. The fundamental goal of such an education program should be to imbue all British Columbians with a strong forestry ethic.

2. **Forest Resource Goals:** We must establish what we expect from the forests by setting resource goals for timber production as well as all other uses of the forest. These goals should reflect increasing, not decreasing, timber production while at the same time make appropriate allowances for other uses of the forest.

   Our goals for timber production and our production methods should be determined having in mind trends in manufacturing capabilities and market demand, recognizing that flexibility is a key element for our future forests.

   British Columbia should focus more on environmentally sound forest management practices than on alienating more of the working forest as a means of preserving the environment.

3. **Forest Management Techniques:** Emphasis must continue to be placed on increasing wood quantity (growth rates) and quality (growth traits) through appropriate intensive management programs. Tree improvement and fertilization programs should be expanded. A program to assess herbicides and their alternatives should begin immediately.

   All timber production programs must be considered in light of their impact on other forest resources and must be developed to cost effectively minimize such impacts. To accomplish these goals, inventories of all forest resources must be substantially improved through expansion and updating, and significantly more work must be done in growth and yield modelling for managed forests.

   We believe the adoption of these recommendations will significantly improve forest management in British Columbia, making it second to none in the world.
12 CONCLUDING COMMENTS

Missions such as ours provide foresters with an opportunity to compare the Scandinavian forestry experience with that of British Columbia. Scandinavian forestry, because it has evolved earlier and over a longer period of time than ours, offers many lessons. If we are to continue learning, it is important for us to remain in close touch with the experiences of our international colleagues.
APPENDIX 1: Mission members and itinerary

Mission Members

Mr. John R. Cuthbert  
Assistant Deputy Minister and Chief Forester  
Ministry of Forests  
Province of British Columbia

Dr. T. John Drew  
Director General  
Pacific and Yukon Region  
Forestry Canada

Mr. Lowell A. Johnson  
Manager, Forest Resources  
Houston  
Northwood Pulp and Timber Ltd.

Mr. Blair J. Mayes  
Assistant General Manager  
Dunkley Lumber Ltd.

Mr. Brian D. Gilfillan  
Assistant General Manager  
Northern Interior Lumber Sector  
Council of Forest Industries of British Columbia

Mission Itinerary

Sweden

27 May to June 6  
Swedish Facilitator: Mr. Hugo Von Sydow  
Sveriges Skogsvardsforbund  
The Swedish Forestry Association  
Box 500  
S-182 15 DANDERYD  
Sweden

28 May  
The Swedish Pulp and Paper Association  
Villagatan 1  
S-114 32 STOCKHOLM  
Sweden  
Contact: Mr. Goran C. Wohlfahrt  
Vice-President, International  
The Swedish Wood Exporters’ Association  
Box 26083  
S-100 41 STOCKHOLM  
Sweden  
Contact: Mr. Lars Strangh  
Managing Director

29 May  
Domän  
The National Forest Enterprise  
S-791 81 FALUN  
Sweden  
Contact: Mr. Ingvar Ekholm  
Forestry Director

30 May  
Korsnas AB  
Box 103  
S-794 OO ORSA  
Sweden  
Contact: Mr. Jan Eklund  
Regional Forest Manager

31 May  
McDo  
Box 700  
891 01 ORNSKOLDSVIK  
Sweden  
Contact: Mr. Lars Eriksen  
Chief Silviculturist  
The Institute for Forest Improvement  
Box 3, S-910 36 SAVAR  
Sweden  
Contact: Mr. Ola Rosvall  
Head of Northern District

1 June  
SCA Skog AB  
S-651 88 SUNDSVALL  
Sweden  
Contact: Mr. Jerker Karlsson  
President

2 June  
Karl Hedin AB Sawmill  
Aktiebolaget Karl Hedin  
Bergslagsvagen 49  
773 00 FAGERSTA  
Sweden  
Contact: Mr. Karl Hedin  
President
The Swedish Sawlog Association
Tingvallavagen 9M
S-195 31 MARSTA
Sweden
Contact: Mr. Ake Barklund
Director

3 and 4 June
Elmia Wood ’89
Contact: Mr. Leif Stromquist
Stromquist Forest Consulting
Svardvagen 11 D
S-182 33 DANDERYD
Sweden

5 June
The National Board of Forestry
Skogstyrelsen
S-551 83 JONKOPING
Sweden
Contact: Mr. Nils-Erik Nilsson
Head, Forecasting & Planning
Sodra Skogsagarna
S-351 89 VAXJO
Sweden
Contact: Mr. Henning Hamilton
Information Director

6 June
Kronoberg County Forestry Board
Skogstyrelsen
Box 1233, 351 12 VAXJO
Sweden
Contact: Mr. Roland Persson
Head of Silviculture

Finland

7 June to 12 June
Finnish Facilitator: Mr. Torsten J. Nykopp
Managing Director
Finncell
Eteleasplanadi 2
POB 60
SF - 00101 HELSINKI
Finland

7 June
The Hon. Toivo T. Pohjala
Minister of Forestry
Parliament Buildings
HELSINKI, Finland
Central Association of Finnish Forest Industries
Eteleasplanadi 2
00130 HELSINKI 13
Finland

Contact: Mr. Samuel Kaurinkoski
Director of Forestry
Dr. Pavivio Piirinen and
Professor Ilpo Tikkanen
University of Helsinki
HELSINKI, Finland
Dr. Aarne Nyyssonen
Secretary General
The Finnish Academy of Science
and Letters
Mariankatu 5
SF-00170 HELSINKI
Finland
Metsateho
Fabianinkatu 9B
SF-00130 HELSINKI
Finland
Contact: Mr. Hannu Valtanen
Managing Director
Her Excellency
Mrs. Mary Vandenhoff
Ambassador of Canada to Finland
Rantapoku 22
HELSINKI, Finland

8 June
Tehdaspuu Oy
Salpausselankatu 26
PL 139
SF-45101 KOUVOLA
Finland
Contact: Mr. Esko Pakkanen
Director of Corporate Planning

9 June
Kymmenene Corporation
Eteleasplanadi 2
P.O. Box 300
SF-00131 HELSINKI
Finland
Contact: Mr. Hans-Peter Blauber
Senior Vice President
Forest Division
The Forestry Act

A new forest legislation was adopted by the Swedish Parliament in 1979. This legislation is based on the Acts dating from 1905, 1923 and 1948. The Government has issued an ordinance and the National Board of Forestry has announced regulations concerning the application of this Act. The Act has been in effect since 1st January, 1980, and was amended on some points in 1983.

The aim of the forest policy

§ 1 By means of proper utilization of their wood producing capacity, forest land and forests growing on them should be managed in such a way as to provide a permanently high and valuable timber yield. This management should pay heed to nature conservation and other public interests.

General Provisions

§ 2 For the purposes of this Act, forest land is defined as:
1. land which is suitable for the production of timber and which is not used to any large extent for other purposes.
2. land where the presence of forest is desirable to protect against sand or soil erosion or against lowering of the timber line.

However, land lying wholly or mostly unutilized shall not be regarded as forest land if, by virtue of special circumstances, it is not desirable for such land to be put to use for the production of timber.

§ 3 This Act does not preclude the utilization of forest land for purposes other than for the production of timber.

§ 4 This Act shall not be applied where its provisions conflict with regulations issued under the provisions of the Nature Conservancy Act and other laws.

Establishing of stands on forest land

§ 5 New stands shall be established on forest land:
1. where after felling, or due to damage to forest, the timber-producing capacity of an area of land is not satisfactorily made use of;
2. where land is unused;
3. where forest is so thin or is composed of unsuitable tree species for the type of terrain to such an extent that its growth is considerably lower than the growth which is possible.

Measures on the bases of the first paragraph above shall be carried out in cases covered by categories 1 and 2 without delay. In cases covered by category 3, measures will be carried out within a reasonable period of time.
§6 If a forest stand is over-aged, and the timber-producing capacity of an area is exploited to only a minor extent, the County Forestry Board may decide to force clear cutting and the establishment of a new stand.

§7 Establishment of new stands shall be carried out using methods of regeneration which may be necessary to assure the growth of new forest which is satisfactory in terms of density and of composition in general. Regulations on methods of regeneration, scarification, planting of seeds and seedlings/transplants, tending of newly planted areas, and other measures in the above respect are issued by the government, or by a public authority designated by the government.

§8 Where required for silvicultural considerations, the government, or public authority designated by the government, may issue regulations prohibiting, or placing conditions upon:
1. the use of forest reproductive material of indigenous or of foreign origin, in establishing new forest stands;

2. trading with such material.

Forest reproductive material is defined as seed, seedlings/transplants, and other regeneration materials intended for establishing new forest stands.

§9 Cleaning newly-planted and young stands of forest will be carried out when forests are so dense, or otherwise are in a condition that production of valuable timber is significantly hampered.

If such forests are near the age when thinning may take place, the County Forestry Board may, in special cases, allow early thinning to be carried out instead of cleaning.

Forest shall be thinned when it is so dense that the production of valuable timber is being considerably inhibited.

§10 Forest owners are responsible for establishing and tending new stands.

§11 The County Forestry Board may, in special cases, grant exemptions to §§ 5, 7, and 9.

Cutting of forests on forest land

§12 Cutting on forest land may not take place in any other form than:
1. cleaning or thinning which benefits the growth of the forests;
2. clear cutting which is suitable for establishing new stands.

§13 Clear cutting of forest may not take place until it has reached such an age that only a minor increase in its average production can be achieved if it is allowed to remain standing. Average production is calculated as the average annual growth since the establishment of the stand.

The government, or the public authority designated by the government, may issue regulations laying down the lowest permissible age for clear cutting for various tree species growing in various parts of Sweden, on land of varying site quality class.

In special cases, the County Forestry Board may grant exemptions from the first paragraph above.

§14 It is the responsibility of the forest owner to see to it that clear cutting is carried out to an extent which will promote an even age distribution of the forest on his holdings. The government, or the public authority designated by the government, may issue regulations regarding the maximum portion of a holding which is allowed to be clear cut during a given period, and also what portion must be clear cut during that period. The latter portion may be no more than half of the portion which is allowed to be clear cut. In special cases, the County Forestry Board may grant exemptions from the first paragraph above.
§15 A holding is defined as that forest land which lies within the borders of one municipality and belongs to one and the same owner, unless otherwise provided in the regulations issued by the government, or public authority designated by the government.

§16 The County Forestry Board shall, on request, advance notice of decisions as to whether a specific cutting is consistent with the requirements of §13 or §14.

§17 Forest owners are obliged, under regulations issued by the government, or public authority designated by the government, to notify the County Forestry Board of cutting to be carried out on their land.

§20 The government, or public authority designated by the government may issue regulations for combating insect damage and removal of damaged forests, or storage of timber, and other measures required to combat the creation of breeding grounds for insects. Forest owners are responsible for ensuring that such measures are carried out. Other parties who have right of management over forest and timber are also responsible for preventive measures in connection with cutting and storage of timber.

Forests difficult to regenerate and protected forests

§18 The government may order that forests difficult to regenerate due to an unfavourable location, or needed as protection against sand or soil erosion, or to prevent lowering of the timber line, be set aside as forests difficult to regenerate or protected forests.

§19 Cutting in forests difficult to regenerate and in protected forests may not take place without the permission of the County Forestry Board.

In connection with granting permission, the County Forestry Board may decide upon measures to limit or to minimize inconvenience and to ensure regeneration.

Permission is not required for cleaning or thinning which benefits the development of the forest.

Nature Conservation Aspects

§21 The government, or public authority designated by the government may issue regulations on the aspects of nature conservation which have to be taken into account in forest management, for example in relation to the size and form of the clear cut area, establishment of new stands, leaving of tree groupings, and the stretchings of forest roads.

These powers do not include the authority to issue regulations which are so far-reaching as to severely handicap utilization of land currently in progress.

Forest Management Plan

§21a There shall be a forest plan for every holding with guidelines for forest management on that holding. The plan is to be drawn up in accordance with regulations issued by the government or the authority designated by the government.

The government or the authority designated by the government may issue regulations regarding exemptions from the first paragraph above.
§22 The National Board of Forestry performs overall supervision of compliance with this law and with the regulations published under the provisions of this law. The County Forestry Boards perform more detailed supervision of compliance at county level.

§23 The supervisory authorities have the right to be supplied, on request, with the information and documents required for such supervision in accordance with this law.

§24 The supervisory authorities may prescribe or prohibit certain action where required to ensure compliance with this Act, and with any regulations issued under the provisions of the Act.

Certain action may be prescribed or prohibited when it has become clear that the advice and directions of the public authority have not been followed. However, in urgent cases, or where there exists other special justification, such prescriptions may be issued immediately.

In connection with a decision to prescribe or prohibit certain action, the supervising authority may order a penalty in case of non-compliance.

Should a person fail to comply with a prescription the supervising authority may order the measure to be carried out at the expense of the person at fault.

§25 Should cutting result in relatively extensive and costly regeneration programmes, the County Forestry Board may, in connection with cutting being carried out, order guarantees to be furnished to assure completion of such regeneration measures.

Guarantees may also be required as a condition for permission being granted in accordance with §19.

If guarantees are not furnished in cases as provided for in the first paragraph above, the County Forestry Board may issue an order prohibiting forest cutting on the holding concerned without the permission of the County Forestry Board.

§26 The government may order special fees to be levied in cases covered by the provisions of this Act.

§27 Payment of a fine will be sentenced upon any person who, either wilfully or through negligence,

1. violates any regulation issued under §8, Par. 1 or §20, Par. 1;
2. violates §12 or §13, Par. 1;
3. violates the cutting limit under §14;
4. violates §19, par. 1, or the cutting regulation issued under the provisions of §19, Par. 2;
5. violates the cutting prohibition under §25;
6. fails to fulfill the duty of notification as laid down under the provisions of §17.
7. fails to comply with an order or violates any prohibition issued to ensure compliance with any regulation under §21.

In cases of minor violations there will be no conviction for liability.

In the event of several persons being accessories to a deed as referred to in the first paragraph above (§27), Chapter 23 §§4 and 5 of the Penal Code will apply.

In accordance with this Act, violation of any prescription or prohibition under penalty of a fine cannot entail any other prescription than a fine for the violation of that prescription or prohibition.

§28 Timber from cutting which represents a violation of this Act, or the value of such timber, shall be declared forfeit, unless this is manifestly unjust.

§29 Proceedings against a decision by the County Forestry Board under the provisions of this Act will be conducted in the form of an appeal to the National Board of Forestry. Proceedings against a decision by the National Board of Forestry will be conducted in the form of an appeal to the government.

§30 The authority concerned may order for its decision to be duly observed, notwithstanding any appeal.
Laws referring to nature conservation in forestry

The Forestry Act
The Forestry Act presents guidelines as to how the forest is to be managed on a sustained yield basis. It contains directions and recommendations for establishing and tending of stands and for clearcutting operations. Also prescriptions for forest protection against insects and environmental considerations must be regarded.

Nature conservation can normally be combined with rational forestry. Forest owners can, of course, be interested to show even greater environmental concern than is required according to the Forestry Act.

The Broadleaved Deciduous Forestry Act
"The Broadleaved Deciduous Forestry Act" aims to protect for the future the following domestic tree species: elm, ash, hornbeam, beech, oak, wild cherry, linden and maple.

Normally after clear-felling a new broadleaved deciduous forest should be established.

The Nature Conservancy Act
Some areas have a greater demand for environmental considerations than are stipulated in the Forestry Act. The Nature Conservancy Act presents more detailed rules for the ways in which the ecosystem is to be protected and cared for in nature reserves and in nature conservation areas. Draining of wetland and plowing of clear-felled areas to facilitate regeneration must thus be notified in advance.

The Ancient Monuments Act
Regulations to preserve national antiquities as old gravefields, and habitations are stipulated in the Ancient Monuments Act. The County antiquarian should be contacted before starting forestry operations near ancient monuments.

The Right of Common Access
The right of common access to private land is a very old traditional privilege in Sweden. It maintains the right of common access to private land for everyone with some rights and obligations implied. The picking of berries, flowers, mushrooms as well as occasional camping are thus allowed within certain limits.
Specific consideration

On some land specific consideration has to be shown. This applies primarily
- near lakes and large waterways
- along coasts and in archipelagos
- near cultivated land, cultural environments and residential areas
- along roads with heavy traffic
- in areas of great importance to scientific nature conservation

What needs to be done varies from case to case. Some examples are shown below.

When clearcutting save storm-resistant trees near residential areas

When cutting show consideration to the environment near lakes and waterways

Widen and keep beautiful sceneries and save decorative trees along roads with heavy traffic

Save beautiful trees, bushes and edges of forests near cultivated areas

Contact the district forester

If you are uncertain about these environmental considerations, contact the County Forestry Board who will give you further information adapted to your holding.
General consideration

The Swedish forest is of great importance in many ways. It produces timber and job opportunities, provides possibilities to pick berries and mushrooms, and is used for recreational facilities like hunting, fishing, etc. Furthermore, it forms part of an ecosystem with plant and animal life. The forest is a striking element in the landscape and contains valuable cultural environments. A prerequisite for using it in all these ways is that we respect and balance competing interests.

This leaflet informs you of various kinds of environmental considerations to be practiced according to the Forestry Act.

Adapt the cutting site to the terrain and the surrounding forest. Do not clear cut too large areas.

Remove felling residues from banks, brooks and ditches.

Be careful with the environment close to ancient monuments or relics of ancient culture.

Remove felling residues from paths and roads. Avoid damaging these paths when hauling, scarifying or planting. Repair any damage that may occur.

Do not fertilize within 50 metres of lakes and streams. Avoid fertilizing shallow land.

Choose cutting sites with care especially on ridges of mountains and on hill sides.

Do not cut large new areas near previously cut sites until the refertilized stands are above breast height.

Avoid disturbing birds and mammals during spring and early summer when birthing or scaring.

Adapt the forest roads to the landscape and protect spots with unusual flora and fauna.

Avoid draining swamps, small lakes, springs and brooks.

Some areas are of great value to plant and animal life as well as scenery. These areas are at the same time often of little importance to the timber production. Clearcutting on such land should be avoided. This implies small areas as:

A small islands
B banks
C forest groves
D edges of forests
E grazing land close to buildings
F small left pastures
G rich vegetation tens
H around small lakes
I small and narrow swamps
J near springs
K near brooks and ravines
L on boggy grounds
M rocky and steep slopes
N flat stone land

Furthermore, save if possible
O old pines-preferably in groups
P dry trees standing or lying
Q trees and high stumps used for nesting
R old deciduous trees-preferably in groups
S rare deciduous trees-preferably in groups
T small, mountain ash, juniper etc. as fodder
APPENDIX 3: Swedish rules for protection against insects

Background

Insects can mass-propagate and damage the forest severely. During the last years insects have mass-propagated and severely damaged growing pine and spruce forests. Every year insect damage causes losses of 100s of millions Sw. crowns.

The following noxious insects are the most common:

- Pine: The pine-shoot borer
- Spruce: The eight-toothed bark beetle, The six-toothed bark beetle

The insects propagate mainly under the bark on coniferous timber. If they have favourable access to such breeding material, they will mass-propagate and cause great damage. This has happened during the last years. Unbarked timber, wind-throws, cleaning and logging residues have been left to a great extent in the forests and served as suitable breeding grounds.

Forest protection rules stipulated in the forestry act.

To control the severe insect damage the Parliament decided in 1977 - by means of an addition to the forestry act of that time - on more rigorous rules for forest protection. These rules and some additions have been added to the forestry act of 1979.

- According to the new act protective measures must be taken to prevent breeding-grounds.
- If mass-propagating occurs or is feared, special control measures will be taken according to regulations stipulated at that moment.

In this brochure information is given about the forestry act and the regulations to this act, which are compiled by the National Board of Forestry.
Where are the regulations valid?

- on all land, that means not only on forest land but also in power lanes, new-built areas, parks etc.
- for Scots pine and Lodgepole pine within the whole country
- for Norway spruce within the whole country except the following areas in the inland of Norrland
  - the parishes of Transtrand, Särna and Idre
  - an area north resp west of the county roads 573 and 504 in the county of Jämtland
  (Särna - Lillhärdal - Sveg),
  the railway Sveg - Östersund - Gällivare and
  the county roads 97, 98, 394, 397 and 395 in the County of Norrbotten
  (the distance Gällivare - Finnish border by Pajala)

There are no claims to forest protection measures in spruce forests for the inland of Norrbotten, where the damage risk is insignificant.

Who is responsible?

- The land owner is responsible for both protective measures and combating when mass-propagating.
- The person who has disposal to forest and timber (i.e. buyer of standing crop) is responsible for protective measures when logging and storing.

Measures taken in damaged forests

Conifers damaged by storm, snow, fire or otherwise must be either
- barked in the forest or
- felled and extracted to motor road. This must always be done, if the timber volume exceeds 4 m$^3$ in a hectare. Also smaller quantities should be taken care of.

The extraction must be executed in time to treat or transport the timber, before the new insects are hatched, that is before the dates listed for extraction in the table on page 6.
Measures taken with cleaning, clearing and logging residues

- **Stems must not be left.**
Felled stems or parts of stems of fresh conifers thicker than 5 cm on bark must not be left in the forest. This is only allowed if the timber is barked or barked in strips. Strip barking must be carried out in such a way that a maximum of 5 cm bark strips are left. Pine must be barked before June 1, spruce and lodgepole pine before July 1.

- **Small amounts of residues may be left.**
When cleaning and clearing only 100 felled conifers thicker than 5 cm on bark at the stump cut may be left per hectare. Only 10 of these may be thicker than 10 cm. When logging only 200 units per hectare may be left of:
  - butts, timber, pulpwood etc. (1 m = 1 unit)
  - felled trees, 7-10 cm at the stump cut (1 tree = 1 unit)
  - some left felled trees thicker than 10 cm (1 m = 1 unit)
  - tops thicker than 7 cm at the stump cut (1 top = 1 unit)
Only 50 of 200 units may be butts or tops.

- **During certain periods residues may be left.**
These periods occur after the insect swarming. The residues will dry until next year, when it is no longer suitable as breeding material.

**SCOTS PINE**
- In Norrland except the county of Gävleborg and the parishes of Transtrand, Särna and Idre residues may be left from June 1 - July 15. 1)
- In the remaining parts of the country residues may be left from May 15 - July 15. 1)

1) If stem parts thicker than 5 cm are cut to half meter long pieces, the time will be prolonged until August 15, only when cleaning or clearing.
NORWAY SPRUCE
- In the inland of Dolland residues may be left the whole year.
- In the remaining parts residues may be left from August 1 – September 30.

(Only tops and felled trees thinner than 10 cm are referred to when logging).

LODGEPOLL PINE
- All over the country residues may be left from Aug 1 – Sept 30.
(Only tops and felled trees thinner than 10 cm are referred to when logging).

Measures taken after severe attacks

After severe and extensive insect attacks or danger for such (forest fire, storm felling, snowbreak etc) the National Board of Forestry will announce measures to be taken. An example is the combating of the eight-toothed bark beetle in Värmland.

Land owners who discover great insect attacks on their forests must report this as soon as possible to a County Forestry Board.
Measures taken for timber extraction to motor road

Unbarked fresh coniferous timber logged before and during the insect swarming must be extracted to motor road in time to be processed or transported before the insects are hatched. This means that the timber extraction to motor road must be finished at least one month before the time of transportation.

<table>
<thead>
<tr>
<th>Tree species</th>
<th>Area - see maps</th>
<th>Timber logged before</th>
<th>Must be extracted to motor road latest</th>
<th>Treated or transported latest *)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCOTS PINE</td>
<td>Norrland except Gavleborg parishes</td>
<td>June 1</td>
<td>June 15</td>
<td>July 15</td>
</tr>
<tr>
<td></td>
<td>of Transtrand Sarna and Idre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remaining parts of the country</td>
<td>May 15</td>
<td>June 1</td>
<td>July 1</td>
</tr>
<tr>
<td>NORWAY SPRUCE</td>
<td>The whole country except the inland</td>
<td>July 1</td>
<td>July 1</td>
<td>August 1</td>
</tr>
<tr>
<td></td>
<td>of Norrland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LODGEPOL PINE</td>
<td>The whole country</td>
<td>July 1</td>
<td>July 1</td>
<td>August 1</td>
</tr>
</tbody>
</table>

*) valid from 81-09-01
Timber logged after the dates marked in the table may be left all winter until the latest extraction date next year.
To avoid timber damage, i.e. insect hole or blue stain it must be transported early in the spring before the insect swarming.

**Measures taken when storing timber**

Unbarked fresh coniferous timber must not be stored in the forest or nearer conifers than 3 km according to the dates mentioned in the right column on page 6.

Timber may be stored after these dates, if it is protected in some of the following ways:
- Barking
- Covering of spruce stacks i.e. with plastic
- Extracting the upper logs of the spruce stacks after the insect swarming
- Sprinkling
- Water storage
- Spraying with insecticides (must be notified to the County Forestry Board).

These regulations concerning timber storage will enter into force on September 1, 1981.
General information concerning forest protection against insects

To protect your forest against insects according to the forestry act, you as a forest owner must observe the following rules:

- Young stands must be cleaned at a height of 2-3 m. The felled coniferous trees are at this time thinner than 5 cm and unsuitable for breeding material.
- Process the timber to the minimum dimensions valid for various assortment systems when logging.
- Log in time for the timber to be transported, before the insects are hatched. Try to extract the timber to motor road at least a month before the latest date stipulated for further transportation.
- Check the forest yearly. Utilize storm-felled, snow-broken and in other ways damaged trees. Process them and extract the timber before the summer. Control the areas around the latest loggings first.
- Leave no timber after logging or clearing in power lanes, boundary lines, along roads etc.

The maximum amount of timber and timber residues that may be left in the forest are stated in the regulations of the forestry act.

The interest of every forest owner, however, should be to leave less.

For further information contact your county forestry board.
APPENDIX 4: Finland’s Forest 2000 Programme

The Forest 2000 Programme
Guidelines for developing Finnish forestry and the forest industries

**TIIVISTELMÄ: METSÄ 2000-OHJELMA**


The Forest 2000 Programme is a long-term programme for forestry and the forest industries. It attempts to obtain a better integration of timber production and other forms of forest use. The total annual cut is to be increased by 15 mill. m³ by the year 2010. This is almost one third greater than the level during the first few years of the 1980’s. In order to achieve the cutting targets, the cut area will have to be increased by almost a third by the turn of the century. The area of thinnings will experience the greatest increase. Considerable changes are proposed in silvicultural and basic improvement work. According to the programme, the growth of the raw-material base and the consumption of the wood-based products will permit an annual increase of about 3 % in the production of the forest industries as a whole until the end of the century. This would be the same as the target growth rate of the GNP.


Key words: Timber production, cutting targets
ODC 903.2:72.83:916
Correspondence: University of Helsinki, Department of Forest Products Marketing, Unioninkatu 40 B, SF-00170 Helsinki, Finland
Approved on 26.2.1986
The task and organization of the programme

The Forest 2000 Programme sub-committee was appointed by the Economic Council on the 21st of February 1983. The task of the sub-committee was to draw up a long-term programme for forestry and the forest industries. The sub-committee consisted of a group of executive representatives from various important interest groups, as well as a working committee subordinated to it. Working groups for silviculture and forest management, for timber procurement, for the development of the forest industries, and for the multiple-use of forests were set up by the sub-committee to procure the information for drawing up the programme.

The elements of the programme

Alternative analysis was used in defining the cutting and timber production targets of the programme, and in determining the development prospects of the wood-processing industry. This meant that the most important environmental factors, such as trends in the demand for products of the forest industries and the overall effect of the multiple-use of forestry, could be taken into account in the profitability calculations carried out for the comparison. The goals of the Forest 2000 Programme were finalised on the basis of the results of the alternative calculations. As well as defining the goals, an attempt was made to develop the economic, industrial and forest policy instruments needed to achieve these goals.

Methods

A modified version of the MELA forest calculation programme, recently developed by the Finnish Forest Research Institute and the Department of Forest Mensuration (University of Helsinki) was used in designing the cutting and timber production programme. In the first stage, MELA simulated the management options for the stands, and the development of the stands when managed accordingly. In the second stage, the programme assembled from these management alternatives a cutting and timber production programme implementing the cutting removal or other targets set for the management of the forests.

When preparing the different options available to the Forest 2000 Programme, the forest calculation programme was used both for defining the combination of measures designed to produce the desired removal, and for determining the development of the growing stock and the removal achievable through a particular combination of measures. At the same time, an attempt was made to ensure that the achieved solution was also economically optimal.

The analysis of the cutting and timber production options also included a profitability comparison of the different alternatives. Cost-benefit analysis was used in the comparison. The result showed that as the cutting removal increased, the profitability only improved if industry was able to utilize all the roundwood which became available. At least this was the case when sustained yield management was practised, i.e. where the cutting potential did not decrease in the future.
The objectives of the programme

The starting point when practising a forestry and wood-based economy is to increase the prosperity of society through the exploitation of the forests. The most important aims of forest policy are: 1) support for the general targets of economic policy, 2) balanced development of the different forms of forest use, 3) complete utilization of the productive capacity of forest land, 4) economic viability of the measures applied, 5) matching the timber assortment structure and volume of timber utilized with the cutting potential, and 6) the creation of conditions favourable for viable forest-based industries.

Considerable investments were made in silvicultural and basic improvement work in Finnish forestry during the 1960's and 1970's in order to increase timber production. As a result, the annual cutting potential has increased since the middle of the 1950's by 13-14 mill. m$^3$. At the same time, the use of wood as fuel and the export of roundwood have considerably decreased. Timber imports have correspondingly increased. Although industrial wood raw material consumption has more than doubled, the overall trend in the annual cut has slightly decreased. An increasing proportion of the cutting potential has remained unexploited since the middle of the 1960's. The difference between the annual allowable cut and total removal, mainly in the form of large-dimensioned spruce and non-coniferous cordwood, has over the years been about 10 mill. m$^3$/a. This is equivalent to a good 15% of the potential cut.

Following the objectives and factors outlined above, the main emphasis in the Forest 2000 Programme is directed at increasing the level of cuttings. At the same time, attention is paid to the role of silvicultural and basic improvement work in increasing timber production.

The multiple-use of forests

The programme attempts to obtain a better integration of timber production and other forms of forest use. The total value of all the subsidiary forest products was, at the beginning of the 1980's, approximately 10% of the value of the timber cut annually along long-distance transport routes. The area of forest land reserved mainly for protection and recreational use totals 1.7 mill. ha. This area is expected to increase by only about 0.1-0.2 mill. ha by the year 2000.

Multiple-use applications are expected to decrease the annual cutting potential by a total of 2.2 mill. m$^3$ (3-4%) by the year 2000. The programme notes that more attention should be paid to the needs of multiple forest use, in addition to timber production, both in planning and in the measures employed in forestry.

Cutting and timber production targets

The removal targets of the Forestry 2000 Programme, i.e. the targeted amounts of roundwood harvested from the forests, are presented in Table 1 and Fig. 1.

The total annual cut is to be increased by 15 mill. m$^3$ by the year 2010. This is almost one third greater than the level during the first few years of the 1980's. Achieving this
The removal targets of the Forest 2000 Programme. The cut can be increased annually by 650 000 m$^3$ until 2000. Almost half of this increase is large-sized sprucelogs, and a third pine and non-coniferous cordwood.

![Chart showing removal targets of forest products](chart.png)

**Table 1. The removal targets of the Forest 2000 Programme.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Implem. 1980-82</th>
<th>Targets 1990</th>
<th>2000</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>48.8</td>
<td>54.0</td>
<td>61.0</td>
<td>64.9</td>
</tr>
<tr>
<td>Pine</td>
<td>20.5</td>
<td>21.5</td>
<td>24.0</td>
<td>25.5</td>
</tr>
<tr>
<td>Spruce</td>
<td>19.4</td>
<td>21.8</td>
<td>25.3</td>
<td>26.5</td>
</tr>
<tr>
<td>Non-coniferous</td>
<td>8.9</td>
<td>10.7</td>
<td>11.7</td>
<td>12.0</td>
</tr>
</tbody>
</table>

**Of which:**

<table>
<thead>
<tr>
<th>Type</th>
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<th>Targets 1990</th>
<th>2000</th>
<th>2010</th>
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</thead>
<tbody>
<tr>
<td>Large-sized timber</td>
<td>22.6</td>
<td>24.5</td>
<td>29.2</td>
<td>31.7</td>
</tr>
<tr>
<td>Pine</td>
<td>11.3</td>
<td>11.5</td>
<td>12.5</td>
<td>13.0</td>
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<tr>
<td>Spruce</td>
<td>9.5</td>
<td>11.3</td>
<td>15.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Non-coniferous</td>
<td>1.8</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
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<table>
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<th>Targets 1990</th>
<th>2000</th>
<th>2010</th>
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</thead>
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<tr>
<td>Cordwood</td>
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<td>29.5</td>
<td>31.8</td>
<td>32.3</td>
</tr>
<tr>
<td>Pine</td>
<td>9.2</td>
<td>10.0</td>
<td>11.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Spruce</td>
<td>9.9</td>
<td>10.5</td>
<td>10.3</td>
<td>9.5</td>
</tr>
<tr>
<td>Non-coniferous</td>
<td>7.1</td>
<td>9.0</td>
<td>10.0</td>
<td>10.3</td>
</tr>
</tbody>
</table>

The goal presupposes that the cutting potential is exploited to a greater extent than was the case during the 1970's and 1980's. Half of the increase in cuttings would be large-sized spruce logs and a fifth deciduous cordwood. Cuttings of these timber assortments have decreased during the past few years. The cutting targets of other timber assortments, apart from large-sized hardwood logs, are also to be increased. In order to achieve the cutting targets, the area cut will have to be increased by almost a third by the turn of the century (Fig. 2). The annual area of thinnings will experience a considerable increase (70%).

Considerable changes are proposed in silvicultural and basic improvement work (Figs. 3 and 4), e.g. the proportion of natural regeneration will be increased in forest regeneration work. A start has already been made on this part of the programme. Site preparation and the cleaning of regeneration areas will
increase to some extent; a technology less harmful to the environment will be used on these sites. Artificial regeneration will see a slight shift from planting to sowing. The greatest changes will occur, however, in basic improvement work. All new drainage work is to be completed before the end of the century. The amount of re drainage, which includes ditch cleaning and supplementary drainage, should triple by the year 2000. The level of forest fertilization is expected to double. It is also proposed that the pruning of standing trees be increased.

The calculations indicate that the programme will lead to a 20–30% increase in the costs of silvicultural and basic improvement work by the end of the century, and an increase of about 10% in state-funded forest improvement work.

If the targets of the programme can be implemented in their proposed form, then the volume of the growing stock will increase by about 10% and the annual increment by about 20% by the year 2020 (Fig. 5). The growing stock will change from its present composition to one that is more pine dominated.

The fact that the cutting and timber production targets are also presented in the programme by area (by forestry board district) will presumably assist in the planning the implementation of the programme on a regional basis.
Fig. 3. The silvicultural targets of the Forest 2000 Programme. The need for silvicultural work will increase slightly from the present level.

Fig. 4. The forest improvement targets of the Forest 2000 Programme. Drainage of new areas will fall sharply and, in practice, cease completely by the turn of the century. The need for redrainage will correspondingly increase. It is recommended that pruning of standing trees be made eligible for forest improvement funding. It is also recommended that the annual level of forest fertilization be increased to that prevailing at the beginning of the 1970's.
The development possibilities of the forest industries

The development possibilities of the forest industries up to the year 2000 are examined in the programme by taking the cutting targets as the starting points. The predictions indicate that the consumption of the most important groups of products will grow during the period 1980–2000 as follows:

<table>
<thead>
<tr>
<th>Product group</th>
<th>Whole world</th>
<th>Western Europe</th>
<th>Annual growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawnwood</td>
<td>1.1...1.5</td>
<td>-0.7...0.7</td>
<td></td>
</tr>
<tr>
<td>Wood-based panels</td>
<td>2.2...4.7</td>
<td>2.4...4.6</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td>3.3...3.7</td>
<td>2.5...2.8</td>
<td></td>
</tr>
<tr>
<td>Paperboard</td>
<td>2.8...3.5</td>
<td>2.0...2.8</td>
<td></td>
</tr>
</tbody>
</table>

According to these estimates, the total demand for forest industry products, weighted by the present structure of Finnish exports, will grow at a rate of about 3% a year until the end of the century.

According to the targets of the programme, the raw material base of the forest industries will increase annually by 650 000 m³. Almost half of this amount will be large-sized spruce logs, and a third pine and non-coniferous cordwood. It appears that products based on kraft pulp will remain sufficiently competitive, consequently there will continue to be a demand for them in the future. A clear structural change has taken place in Europe dur-
ing the past few years in the supply of spruce sawnwood and non-coniferous pulp. Pulp production based on extensive forest plantations has appeared in Continental Europe, especially in Spain and Portugal. New sawmill capacity has also been built in Continental Europe. This production is, on the basis of its location, already more competitive on the European market than its Finnish equivalent. It is clear that in the coming years the Finnish forest industries will have to make greater investments in product development and marketing.

It can be assumed on the basis of past developments that the proposed cutting targets can be achieved as long as competitive production can be ensured:

<table>
<thead>
<tr>
<th>Implemented</th>
<th>Forest 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual growth %</td>
<td></td>
</tr>
<tr>
<td>Forest industries</td>
<td></td>
</tr>
<tr>
<td>- volume of production</td>
<td>+ 4.4</td>
</tr>
<tr>
<td>- wood consumption</td>
<td>+ 2.3</td>
</tr>
<tr>
<td>- consumption of non-coniferous pulpwood</td>
<td>+11.2</td>
</tr>
<tr>
<td>- consumption of large-sized spruce logs</td>
<td>+ 3.0</td>
</tr>
</tbody>
</table>

Four development alternatives for the forest industries, which differ from each other with regard to the volume of the spruce logs used, are analysed in the programme. The results are presented in Table 2 and Fig. 6.

It appears that the raw material situation for the sawmill industry will remain satisfactory for the rest of the century. The production of pine sawnwood could be increased slightly compared to the level at the beginning of the 1980’s, and that of spruce sawnwood considerably increased if the product is made competitive on the international markets. However, if the cutting targets are to be met, it will probably be necessary to direct an increasing proportion of large-sized spruce logs to the pulp industry, mainly for the production of mechanical pulp. This means that, of the presented alternatives, III and IV are the most realistic.

Owing to unfavourable competition in the market for particle and fibreboard, significant increases in the production of these products will be unlikely. The future production of plywood depends on whether the proportion of spruce in the product can be increased.

Growth in the forest industries will seemingly take place almost entirely in the pulp and paper industry. The potential annual

Table 2. The development possibilities of the primary forest industries according to the Forest 2000 Programme.

<table>
<thead>
<tr>
<th>Product group</th>
<th>Implemented 1985-87</th>
<th>Production possibilities in 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Coniferous sawnwood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- pine</td>
<td>8 322</td>
<td>11 900</td>
</tr>
<tr>
<td>- spruce</td>
<td>5 106</td>
<td>5 700</td>
</tr>
<tr>
<td>Plywood</td>
<td>3 416</td>
<td>6 200</td>
</tr>
<tr>
<td>Particle and fibreboard</td>
<td>613</td>
<td>770</td>
</tr>
</tbody>
</table>

| Pulp                          |    |     |     |     |
| - mechanical                  | 7 101 | 10 400 | 10 800 | 11 400 | 12 200 |
| - chemical                    | 2 387 | 4 100 | 4 500 | 5 100 | 5 900 |
|                               | 4 714 | 6 300 | 6 300 | 6 300 | 6 300 |
growth in the production of pulp until the end of this century is 2–3 %, for chemical pulp 1.5 %, and for mechanical pulp 3–5 %. Production in the paper and paperboard industry could grow annually by 3.3–5 %.

According to the programme, the growth of the raw material base will permit a 3 % annual increase in the production of the forest industries as a whole up until the end of the century. This would be the same as the target growth rate the GNP. However, the increased production presupposes that the functioning, competitiveness and raw material supply of the forest industries is maintained, and that their wood consumption structure is adapted to the structure of the cutting targets.

The means available for achieving the targets

The targets of the programme are ambitious and demanding. The measures, as presented, will presumably not be enough. It will be necessary, therefore, to devise additional measures to supplement the programme while it is being carried out.

The most important of the means available for increasing timber supply are forestry planning and an increase in the advice and services directed at the forest owners. By the beginning of the 1990's, individual forestry plans will have been drawn up for 90 % of the privately-owned forest area. Personal advisory services, and the execution of forestry plans, will have to be made more effective. All the forest owners, including those living out-
side the area where their holdings are situated, will have to be brought within the scope of the advice and service facilities. This will require a staff increase of about 50 in the district forestry boards, as well as in the number of staff needed by the local forestry associations.

Other means of increasing timber production proposed in the programme include the development of forest ownership, forestry legislation and forest taxation, increasing the effectiveness of forest cooperation at the regional level, and improving the functioning of the roundwood markets. Active and constructive cooperation between the different interest groups is essential.

Economic, investment, energy and foreign trade policy, research and development work, and the effective marketing of wood-based products, all play a central role in strengthening the demand for timber.

Monitoring and updating the programme

Social development and environmental conditions, such as acid precipitation, can bring about relatively rapid changes in forest management and in the forest ecosystem. It is also difficult to predict the activities of the forest owners and forest industries. Implementation of the programme must be monitored continuously, and its targets and choice of means checked at least every 5–10 years. The continuity of the necessary research work, data systems and data registers, as well as development of the planning models, must be ensured. Since the Forest 2000 Programme is a long term project, it must be supplemented, at fairly short intervals (about 5 years), with a programme in which the targets and measures are scheduled annually, and which are checked and continued each year.
APPENDIX 5: Selected reference material

References are listed only once even though they may cover more than one subject matter.

General Statistics


History, Policy, Institutions and Regulation


Nilsson, N.E. Major developments in forestry and the forest industries over the 40 years since 1947: the lessons they may offer for the next 40 years. Jonkoping: The National Board of Forestry; 1987.


Holopainen, V. Outlines of Finland's forestry and forest policy. Helsinki: Society of Forestry in Finland; 1984.


Silviculture


Protection


Timber Management


Forest Owners
