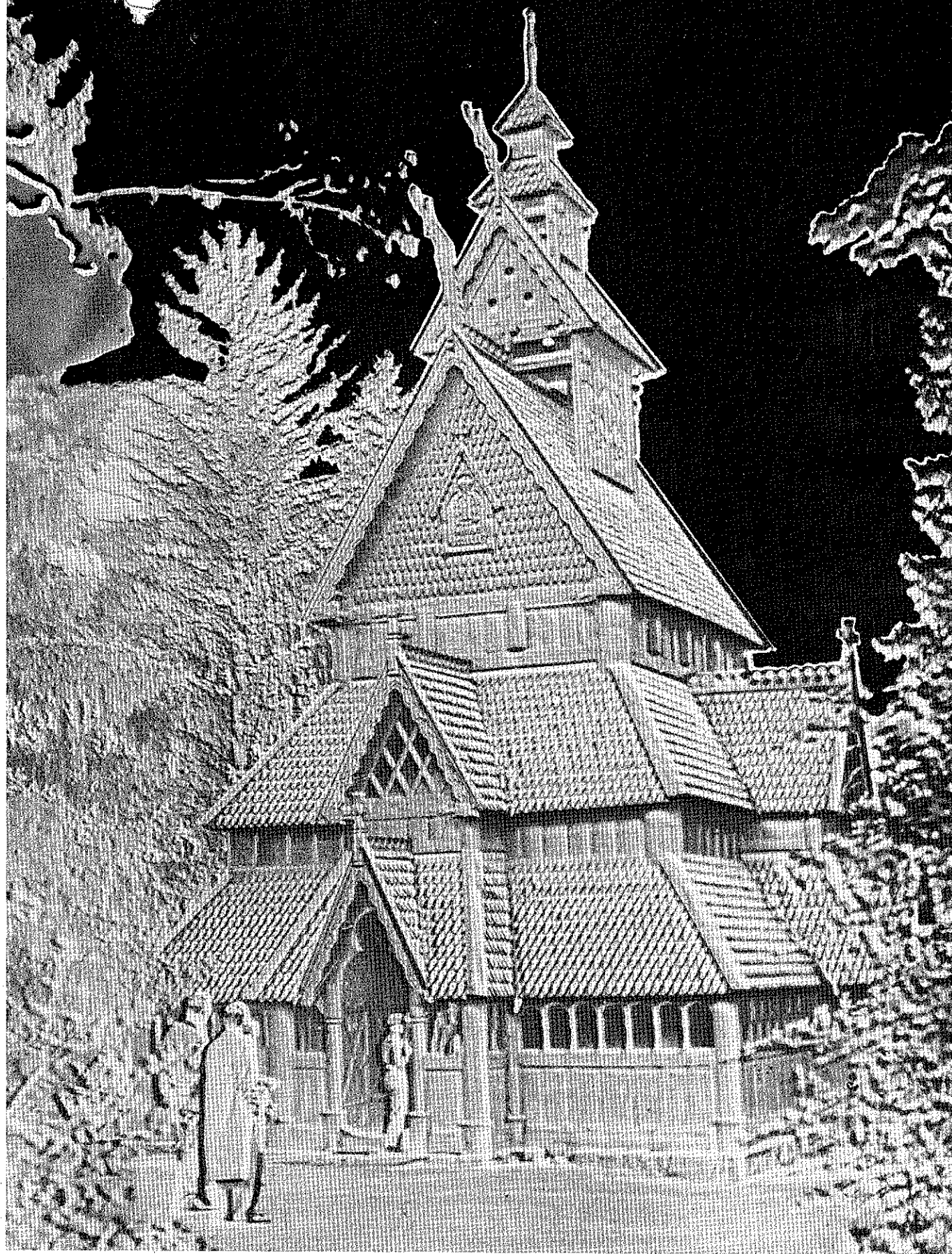


JAN 17 1951

# FOREST SERVICE NEWSLETTER



NO. 90

VICTORIA, B. C.

JANUARY, 1951.

An entirely unofficial budget of news,  
nonsense, 'n' opinion compiled from  
time to time for the profit, amusement,  
and annoyance of the staff.

A REPORT TO THE MEMBERS OF THE B. C. FOREST SERVICE  
on the  
FORESTRY TOUR OF 1950 TO SCANDINAVIA

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Prepared by F. S. McKinnon on Behalf of the Government Delegates  
--Hon. E. T. Kenney, Dr. C. D. Orchard, and F. S. McKinnon.

## FORESTRY TOUR OF 1950 TO SCANDINAVIA

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Delegates--Hon. E. T. Kenney, Dr. C. D. Orchard, and F. S. McKinnon

INTRODUCTION

Forest history in British Columbia has followed the usual pattern of forested countries, world-wide, from an over-abundance of timber, through a period of liquidation, to a parting of the ways, beyond which we finally either liquidate the resource or turn over a new leaf and perpetuate the wood supply through the application of rational forest management. In British Columbia, we have either arrived at, or closely approach, this critical point where we must decide whether we wish to protect the forest industry or see it progressively decline.

We have elected the course of forest management and rehabilitation, and every effort is being made to mend our ways along the lines recommended by the Royal Commission (Sloan) on Forestry. In natural sequence it follows that in our new approach we should be acquainted with the progress that has been made in older countries where sustained yield management already has made substantial progress, and in countries where it has been an accepted policy for generations past.

With the object of acquiring this information and education, representatives of the Forest Service and members of the forest industry, visited some outstanding operations in the Pacific Northwest States during the past summer on a tour organized by the British Columbia Loggers' Association, and in August departed for Norway and Sweden, again accompanied by representatives of industry, on a tour organized by the Forest Service. The party spent one full month in these two countries, where every opportunity was afforded to get an insight into forest administration, forest practice, and manufacturing, both public and private. The tour was of such outstanding value that we feel that the staff generally will be interested in a full report.

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THE JOURNEY ACROSS

On August 17 the Forestry Tour party assembled at the Vancouver Airport and embarked on the first leg of the journey to Scandinavia. The trip over British Columbia and the Rockies was very interesting as there were not many clouds and visibility was good. There were stops at Calgary and Winnipeg, where the weather was cool, and everything went well until we got to Toronto where we ran into the tail end of a very heavy thunderstorm that had dumped three inches of rain on to the city in a very short time. The weather conditions were such that it was not possible for our plane to leave for Montreal until 2:45 a.m. It was a tough show in Toronto with everyone tired; and added to that was the oppressive feeling that goes with the typical muggy weather that prevails in eastern Canada during the summer. About 1:30 we were allowed to get into the plane and stretch out. Finally we arrived at Montreal and, about 6:00 a.m., got to our rooms in the Laurentian Hotel.

The weather in Montreal was cool and cloudy, and there was an opportunity to do a little sightseeing and window shopping before the bus left for Dorval on the afternoon of August 18. We departed promptly on schedule, the route taken by the aircraft leading down the St. Lawrence past Quebec City to a village called "Seven Islands" where they change course and go almost due north to Goose Bay. As we flew down the St. Lawrence there was an excellent view of the country below with its mosaic of fields and woodlots. One thing that strikes you is the rectangular pattern of the fields which are laid out in strips lying at right angles to the river. The reason for this dates back to the early days when the first settlers used the river for transport and wanted to have their land fronting on the waterway. As we passed over Quebec City there was a good view of the heights that Wolfe scaled immediately prior to the battle with Montcalm on the Plains of Abraham.

Flying north over Quebec and then Labrador one is impressed by the very poor soil conditions of the country in contrast to the rich soils of the St. Lawrence River valley. Goose Bay is in the midst of this huge area of poor forest cut up by muskeg and rock. Such soil as exists is sand--no gravel. By report the trees are 6 inches to 10 inches on the butt. Goose Bay is a huge airport with one runway 10,000 feet long and one 8,000 feet. There are 3,000 people living there in connection with the airport with the Canadians and Americans each having duplicate facilities. Goose Bay itself is situated 150 miles in from the main coastline, and a large number of tankers come in each summer with the supplies of gas and oil. The flying time from Montreal to Goose Bay is four hours.

The Atlantic crossing was without incident but the ten hours of sitting was tough. We crossed over Ireland about 8:00 a.m. on the morning of August 19 and had a glimpse of the green fields of old Erin through the clouds. The fields are like a patchwork quilt and noticeably smaller than the Quebec brand. At the same time the green fields were very green and lived up to all advance notice. On across the Irish Sea past Ailsa Crag or "Paddy's Milestone," a small "gum-drop" island midway between Great Britain and Ireland, and so to Prestwick. The gang were pretty much all in at this stage, but after getting to our rooms and having a little rest everyone perked up and the question arose as to what to do with the afternoon.



Tour party at Prestwick. (right to left) Hon. E. T. Kenney, L. R. Andrews, C. D. Schultz, J. E. Liersch, J. Burke, S. M. Simpson, Mrs. L. R. Andrews, Mrs. H. J. Hodgins, Miss Jane Hodgins, R. R. Douglas, Mrs. H. Clark, F. S. McKinnon, Dr. C. D. Orchard.

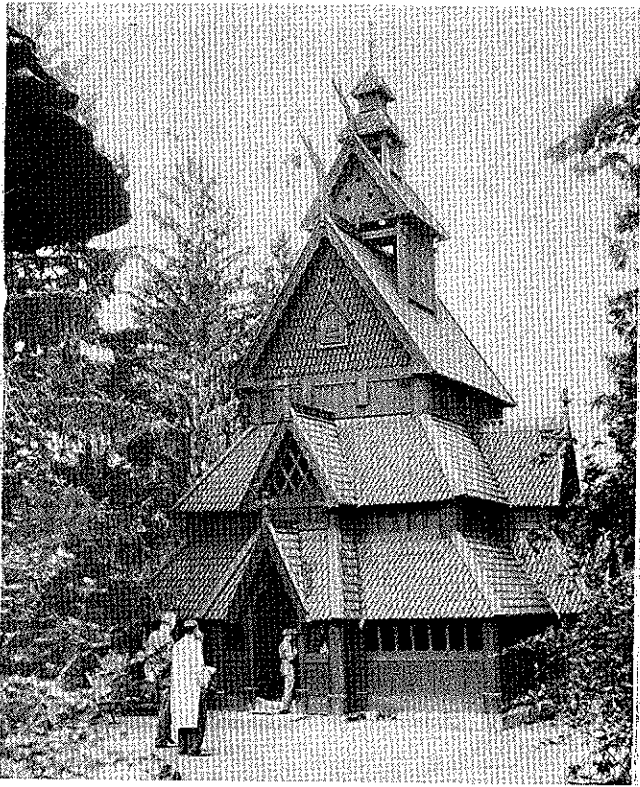
A tour bus was secured and the party set off on an afternoon's ride through Ayrshire. The countryside in Ayrshire is beautiful and very much like Saanich. We travelled through Ayr (birthplace of Robert Burns), Troon, Kilburnie, Paisley, and finally into Glasgow. Enroute we could not help but notice that the Ayrshire cattle and sheep looked well fed and contented; the crops of hay, oats, wheat, and root crops looked very good with heavy yields. We drove past Paisley Abbey, Paisley Cathedral, and Glasgow University, finally winding up on Sauchiehall and Argyll Streets. Being a Saturday afternoon the latter two streets were just one mass of humanity and the jay-walking even put Victoria in the shade, which is something in itself. There seemed to be plenty of fruit and vegetables around in the shops. My impression of Glasgow was that although the streets are clean it is a drab city with dirty, sooty buildings. The people on the streets appeared well fed and reasonably well dressed but definitely unpressed. On the way back to Prestwick we passed through Kilmar-nock but did not have a chance to explore this interesting-looking town.

#### IN NORWAY

Up bright and early on Sunday morning, August 20, to take the Scandinavian Air Service plane to Oslo. This flight took two and three-quarter hours and was not particularly interesting because of the cloudy weather. However, from time to time through the clouds, we could see some of the Norwegian countryside after we passed over the coastline at Stavanger. In general, the countryside looked much like our own Interior country lying between Kamloops and Prince George and north from there. It is rolling country interspersed with many lakes and considerable areas of peat bogs or swamps. We arrived at Gardermoen, the airport for Oslo, which is about 34 miles north of the city. We were met by a delegation headed by Mr. N. Ihlen of the Royal Norwegian Forest Society and, as an added welcome, the Norwegian Airforce, which is stationed at this airport, sent a flight of five jet planes overhead flying in formation. The welcome we received was typical of the generous and open-handed way in which we were to be received and entertained everywhere we went through Norway and Sweden. The people in Scandinavia really went out of their way to do everything they could for us and their hospitality was almost overwhelming.

Upon arriving in Oslo we got our rooms at the hotel, cashed travellers' cheques, and endeavoured to acquaint ourselves with the currency of the country. In the afternoon a number of us had afternoon tea at the home of Mr. and Mrs. Harry Horne, Commercial Attache on the staff of the Canadian Legation. In the evening we were entertained at a dinner given by Mr. K. R. Fjeld, the Minister of Agriculture, on behalf of the Government of Norway. This was held at the Dronning Restaurant which is located at the yacht club on the end of a pier on the waterfront. In many respects the setting was very much like Coal Harbour, Vancouver.

The Norwegian people are formal even in their everyday relations with one another and their entertaining is, therefore, on a very formal level. The routine of one of their dinners calls for the host to give an address of welcome as the first course is being served. Then, at the end of the meal, it is customary for the host to be thanked for his hospitality, and if there is a hostess you personally thank her for the meal as you are leaving the table. "Skalling" is conducted according to certain definite rules--for example, in a party of more than twelve you do not "skall" your host but he may skall whom he pleases; also you do not "skall" your hostess. There is a



Norwegian Church Dating from 1200 A. D. Folk Museum, OSLO

jewellery, a resident must turn in an equal quantity of old gold or silver. Prices of things are much lower than in Canada but at the same time their rate of income is relatively low. Sawmill workers get 45¢ an hour while carpenters are paid 60¢ an hour. A school teacher will earn probably 8,000 kroner (\$1,200.00) a year and a professor 18,000 kroner (\$2,700.00) a year of which about 25 per cent is taken in income tax. Butter is about 60¢ a pound, milk 10¢ a quart, meat 45¢ a pound, and bread 5¢ a loaf. A suit of clothes (tailor made) is about \$67.00; a pair of shoes, \$6.00-\$7.50. On the other hand, cigarettes and whisky are expensive--cigarettes being 22¢-30¢ for 10 and whisky \$7.50 a bottle.

#### Norwegian Forestry

During our tour of Norway we travelled by bus and sharp at 8:00 on the morning of August 21 we left Oslo for Skien. In the course of this trip we had our first intimate introduction to the Norwegian countryside, and it might be as well at this point to introduce a few statistics about Norway and its forests.

- (1) Population of Norway--3 million.
- (2) Productive forest land--19 million acres, representing 24 per cent of the total land area.
- (3) Annual cut of timber--395 million cubic feet.
- (4) Number employed in the forest industries--85,000.
- (5) Mature timber (ages 80-100) occupies 40-50 per cent of the productive forest land.
- (6) Seventy per cent of the forest land is covered by coniferous types and 30 per cent by deciduous growth, commonly referred to as the "leaf trees."

The principal species are Scot's pine (*Pinus sylvestris*), Norway spruce (*Picea abies*), birch, aspen, and alder.

- (7) Forest land tenure is distributed as follows: (a) 17 per cent publicly owned; (b) 63 per cent owned by farmers; and (c) 20 per cent being managed by private owners such as companies and estate owners.

In general, the country through which we travelled during our stay in Norway, was very much like that around Prince George and as a result we felt quite at home in their forests. Our first day we visited the estate of Mr. H. Løvenskiold at Skien. Mr. Løvenskiold owns and operates a sawmill and pulpmill and the estate has been held in his family since 1739. The forest area is 82,500 acres and the forest staff consists of 1 forest inspector, 6 forest managers, and 150 forest workers, or about 1 man employed per 500 acres. Planting on this estate dates from the 1880's but not until 1900 was it extensive. We were shown a series of experimental plantations with different spacings and the conclusions drawn from this work were: (a) the best spacing should be 5 feet by 5 feet, (b) plant about 1,600 trees per acre, (c) it is more satisfactory and better economics to plant 1,600 trees per acre and prune about 200 crop trees per acre, (d) pruned branch stubs are occluded in 7-8 years, (e) one man prunes 100 trees per day to 18 feet.

Following that, we visited a stand which had been thinned and we were to learn that thinning starts at 25 years and is followed by further thinnings at 4-5 year intervals. The method of thinning is that of thinning from below. We were told that the objective of such thinning practice in Norway was to put the increment on the best stems and this could only be achieved by thinning from

definite purpose in this last custom in that it was obviously instituted in the best interests of the host and hostess. "Skalling" must be in the same liquor or wine as the person proposing the skall, i.e., if you are called upon to skall and the first man used red wine, then you also must drink in red wine. The dinners are quite long with lots of food and numerous courses and take about three hours to work through.

Breakfast with Norwegians proves to be a heavy meal with the table set out like a smorgasbord and with about the same foods. No fruit juice or porridge or other breakfast cereals. No toast. Their noon meal is very light with the main meal of the day--"mid-taggin"--coming at 4:30 p.m., and finally a light snack at bedtime.

Oslo is a city of 425,000 and it is very beautiful being located at the north end of Oslo Fjord. We had little or no time for shopping in Oslo but, in the short time at our disposal, we were amazed to find that, five years after the end of the war, the stock in their stores is quite limited. The shelves in the shops are half empty and whole showcases are empty while others have odds and ends of bric-a-brac in them to fill the empty spaces. The Norwegians are rationed for clothes, coffee, sugar, and fats. Also, when purchasing



Bundles of Logs at Skien--4 inch to 15 inch tops  
18 feet long.



Bundles of pulp logs at Skien. Ave. 4 inch top.

below. Our visit at Skien ended by looking at some more plantations and it was stated that the objectives in the planting were: (1) to secure a low rate of taper, (2) to have straight, clean boles on the trees, (3) to get small branch size, (4) avoid compression wood, i. e., to have the same width of ring from pith to bark across the diameter.

The system of silviculture developed by the Norwegian foresters is based on "the cutting classes" which they have defined as a result of experience. When a forester is examining a particular stand he classifies it according to the recognized standards and this classification automatically points to the treatment that should be prescribed, thereby assisting in the determination of the area and quantity to be cut. Five classes are recognized; however, classes III and IV may be combined in one.

The particulars are as follows: Class I is forest under regeneration. In this group fall all areas where a satisfactory regeneration cutting is completed. This means any cutting which has created possibilities of an even reproduction, for instance, shelterwood cuttings, group cutting (small clear cuts), strip cuttings, etc. Clear-cut areas already satisfactorily regenerated do not go into Class I but into Class II.

Class II is reproduction and young growth with or without seed trees. Included are areas that are generally satisfactorily regenerated or supporting young growth on which development has not yet reached the point where, according to the local conditions, it ought to be thinned; clean-up cutting, however, may be required.

Class III is younger production forest of satisfactory--or nearly satisfactory--density. The forest in this cutting class has reached so far in development that it ought to be thinned, or already has been thinned. The forest is presupposed to be so young that the volume per unit area ought to be increasing in the future. In this class is also included uneven-aged forests with a great deal of young timber.

Class IV is medium-aged and older productive forest of satisfactory density--or nearly so--where current volume increment is assumed to be greater than the mean increment. Also included in this class is uneven-aged timber with an approximate equilibrium between older and younger timber, or with some preponderance of older stock.

When deciding whether an area belongs to class III or IV the degree of development of the timber (age) should be the determining factor; not the density.

Class V. Herein belong:

- (1) Old, non-productive, or damaged timber in which production is materially less than normal mean increment for the site.
- (2) Stands of the obviously wrong species (for instance, spruce on typical pine site) provided it is considered to be the right time for a change of species.
- (3) Forests with obviously unsatisfactory stocking (for instance, torn up or badly overcut stands) where the production is disproportionately small in relation to the production capacity of the site.

- (4) Uneven-aged forests with a great deal of old timber, provided this old timber should be cut in order to get reproduction or to liberate young growth.

Cutting class V can further be divided into: class V(a), including stands of an average density of 0.6 or above provided their production is not seriously reduced owing to decay or other damaging agencies. The rest of class V goes into class V(b).

If the average density is less than 0.6 for an uneven stand of class V, the entire stand is classified as V(b) even if within the stand there occur denser patches, when these are too small to be separated as independent stands. The minimum area to be separated generally is 20 decares (some 5 acres). Spruce on a pine site is classified as V(b) if belonging to class V.

When separating class V only the condition of the forest is considered, not the possibility or desirability of commencing regeneration cutting during a short time over the area included in this class.

Deciding whether an area should be classified as I or V is based on the following: if the condition of the forest is such that further cutting is considered unnecessary for germination and successful development of the regeneration for several years ahead over the greater portion of the area, this is classified as class I. In the opposite case, as class V.

The season for planting extends from May through to August and costs of planting are about \$50.00 per acre plus approximately an equal outlay subsequent to planting for weeding once or twice, over-planting, and fencing to avoid damage from elk and domestic cattle to pine seedlings.

The next item on our itinerary was a visit to the Fritzoe estate at Larvik owned by Mr. Treschow who operates a sawmill cutting 14,000,000 feet per year, and a pulp mill producing 60,000 tons of mechanical pulp and 8,000 tons of wallboard per year. This estate has a productive forest acreage of 116,400 acres and 23 foresters are employed in connection with the forest activities. This works out at an average of 1 forester for every 5,000 acres, and, as we were to find out later, it is about average for most forest operations in Scandinavia.

At the Fritzoe estate we were conducted over a series of plantations of various ages and the outstanding impression that we got was the small size of the timber compared to that in British Columbia. For example, at the beginning of the walk we were taken through a stand of spruce 58 years old. The tallest trees were 75 feet high and the average diameter of the stand would be 10 inches d.b.h. When it is realized that the average rotation is 80 years you can appreciate that the size of the final crop is relatively small. One of the unique things we saw on this estate was what was stated to be the only stand of beech in Norway. This stand was 97 years old, height 90 feet, with an average mid-diameter of 11.5 inches. In terms of cubic feet the present volume is about 4,700 cubic feet per acre.

Our next excursion was in the forest of the Mathiesen estate at Eidsvoll. The annual cut from this forest is 3.5 million cubic feet and the forest is managed on a 70-year rotation. The general objectives of the working plan are:

- (1) Thinning.
- (2) At maturity, clear cut the old stand.
- (3) Seed bed improvement and planting.

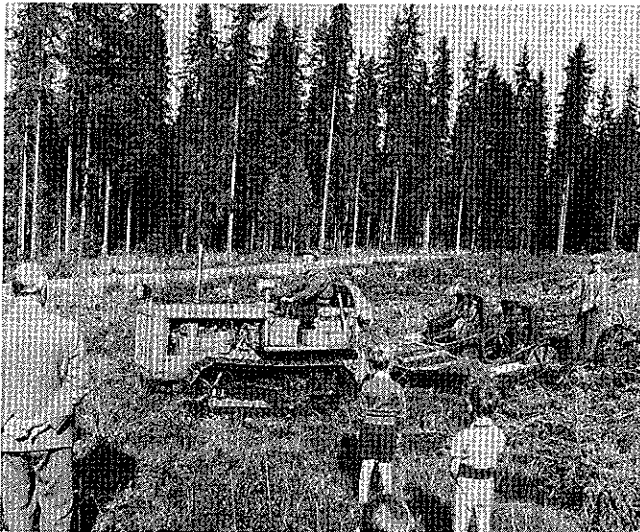
At one point we were shown cutting in a 100-year-old stand of spruce and the largest spruce log was 20 feet long, 15 inches at the butt, and 10.5 inches top diameter. This was probably the biggest log that we were to see in all of Scandinavia, although we did see some trees that would have produced somewhat larger logs. By our standards, logs in Scandinavia are very small and in Sweden we were told that the average log from the operations of the Swedish Forest Service was 5 cubic feet. Converted this would yield them 30 board feet of lumber or, in terms of the International Log Rule, would represent a log 10 feet long to a 9-inch top.

From the Mathiesen estate we went to visit the Eidsvold Church Forest, where we inspected a series of demonstration sample plots established by the Norwegian Forest Research Institute. The stand at present is 120-130 years old and we were told that 30 years ago the volume was 4,290 to 5,720 cubic feet per acre. Thinnings to date have totalled 4,290 to 5,720 cubic feet per acre leaving a stand volume as of this date of 4,290 cubic feet per acre. These plots show that it is not imperative to cut a forest precisely at its peak of production. In thinning from below the poor trees are taken out and the remaining trees are of such size that they still increase in growth value with the years even though the rate of volume increment may be decreasing. The second point of significance was that the accumulated volume of thinnings was equal to the volume that would be taken off in the final crop. This yield from thinnings was astonishing and served to indicate that in British Columbia our current estimates of yield from immature stands are very conservative if thinning operations are possible.

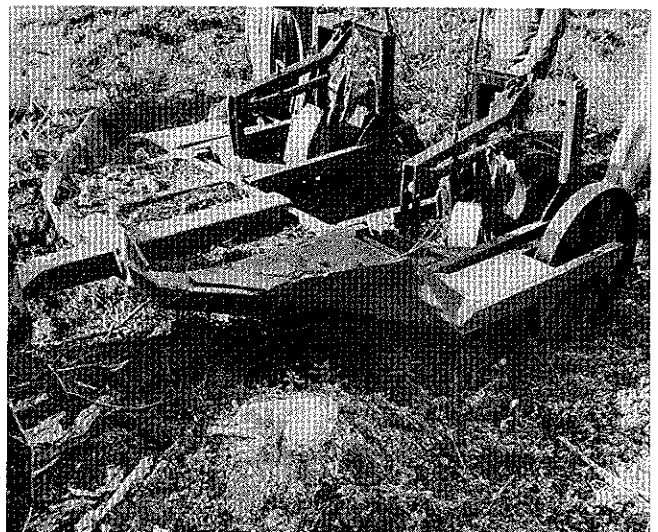
On August 24 we had the pleasure of visiting Mr. Berger Langmoens' sawmill and wallboard mill at Brummundal. This is the largest sawmill in Norway cutting 12,000 standards per year or 25 million board feet. The wallboard mill produces 22,000 metric tons of board per year at the rate of about 100 short tons per day. All wood supplies are purchased in the open market and the annual consumption is 4,956,000 cubic feet of which 1,416,000 cubic feet goes direct to the wallboard factory and 3,540,000 cubic feet to the sawmill which uses logs down to a minimum top diameter of 4 inches. The waste from the sawmill goes to the wallboard factory or to the box factory. From

Brummundal we went to the Farmer's Co-Operative Forest (Løten almenning) where Mr. Bergseng is the Chief Forester. This organization owns 50,000 acres of forest land of which 57 per cent is productive. There is an excess of old growth on 90 per cent of the land and the age of the stand averages 140 years. The current allowable cut is 1,416,000 cubic feet as compared with the ultimate yield of only 1,026,600 cubic feet as a result of the excess inventory of mature timber. The harvest is utilized as follows: fuelwood 27 per cent, saw timber 48 per cent, pulp 21 per cent, and poles 4 per cent. The administrative staff is composed of 7 foresters (1 per 4,700 acres of productive land), 2 sawmill managers, 1 accountant, and 2 clerks. In addition, the permanent staff of forest workers numbers between 600 and 700, or about 1 worker for every 50 acres of productive forest. The 1949 wage bill was 1.3 million kroner (or \$195,000).

At this forest we were introduced to a scarifying machine that was first devised a number of years ago (made by Imset) but has come into favour only of more recent years. The machine is essentially a rotating device, somewhat similar to the rotary soil tillers with which we are all familiar except that this machine is much more sturdily built. The device is tripped manually by a man walking behind the machine and spots are scuffed up in the duff at 6 foot intervals. This machine will prepare 4 to 5 acres per day. The spots in this area were to be seeded from seed trees; however, very often the spots are sown by hand with pine. Spruce as a rule is planted.

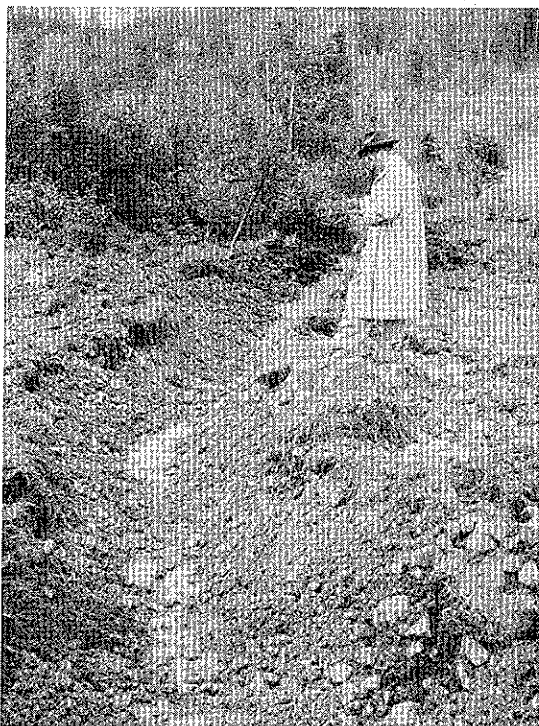


View of Double Scarifier used for ground preparation.



Close-up of Scarifying Machine.

The second outstanding thing at this forest was a demonstration of ditching by the use of dynamite. There is a great deal of ditching done throughout Scandinavia in an effort to improve drainage of their forest land and thereby increase the yield. Labour in the forest is scarce and we met this situation everywhere we went in Norway and Sweden; consequently, the foresters are searching for means of saving labour. In the process of digging ditches by dynamite, holes are punched 16 inches deep, 1 foot apart, and half a stick of 10 per cent blasting powder is put in each hole. The resulting ditch is quite satisfactory and requires little cleaning out by hand. The ditch we saw was 2 feet deep and 4 feet from bank to bank. The cost was about 4¢ per lineal foot.



Mr. H. J. Hodgins inspecting a ditch dug by using dynamite.

Grazing in the forest is a universal problem throughout Scandinavia and the foresters have been making a determined effort to get away from the damage done by cattle and sheep by the establishment of fertilized pastures where restricted grazing may be initiated. We were shown one area of 17.5 acres where 20 head of cattle of varying ages were being grazed for the 3 summer months.

Our next visit was to the forest nursery and forest-workers training school at Sønsterud. The forest nursery is about 100 acres with an annual production of 10.5 million trees, mostly 2-0 pine. The soil is fine, sandy loam with a high water table and no irrigation is necessary. A large proportion of the stock is sold to private land owners and the price is \$6.00 per 1,000 trees for 2-0 stock and \$8.50 per 1,000 for 2-2 stock. On the other hand, the total cost of production is approximately \$4.50 per 1,000 trees. Much of their transplanting is now done by machine at a cost of 38¢ per 1,000 trees compared with 60¢ per 1,000 trees using hand methods. In the field the average worker plants 700 pine seedlings per day using a planting bar and 2-0 stock. In the case of spruce 2-2 planting stock, about 300 seedlings per day are set out using a flat planting method which involves spreading out the roots and covering them with a thin layer of

soil, and finally spreading the duff on top of the soil to cut down transpiration.

The forest-workers training school was established for the purpose of training forest workers to use the right tools in the proper manner and also to make the best use of the human body. For some time the forest workers have been attracted to the cities and this training school is one of the methods that is being adopted in an endeavour to make the work in the forest not so exhausting physically and thereby possibly keep some of the people from shifting to the cities. This educational work started before the last war but the school itself was started in the fall of 1946 and, up to the time of our visit, 1,000 workers had been given the course. The school has 7 courses per year each lasting 5 weeks and trains 50 pupils per course. All expenses in relation to the school are paid by the State and pupils average in age from 17 to 30 years, and must have worked in the forest for 1 year before being admitted to the school. Emphasis is laid upon building up the physical condition of the men through proper gymnastics and sport so that they may be taught control of the muscles and also to increase the strength of the muscles.

After a night spent at the Grand Hotel, Kongsvinger, the party visited part of the forest operated by Mr. And. H. Kiaer in the District of Vinger, County of Hedmark. In all, this company owns about 87,500 acres of forest land divided into a number of tracts set along the River Glomma. This river, the longest in Norway, is 375 miles long and runs through the most densely

wooded districts of the country emptying into the ocean at Fredrikstad near the Swedish border. We were taken to see some of their regeneration cuttings and plantations in the Saeter Forest and learned that they had tried various regeneration methods such as small-opening, shelterwood, and strip. They also had somewhat larger areas of reproduction there with 3- and 4-year-old seedlings. In some places their natural regeneration and planted stock had been damaged by sheep grazing. We were shown some sample plots which demonstrated that there was little increase in growth rate due to thinning. However, the objective of the treatment was primarily to maintain the same volume of growth on the smallest possible forest capital. The plots also served to emphasize the quantity of wood that may be harvested from a stand by light but frequent thinnings that obviate any loss due to mortality.



Panorama overlooking the Glomma River Valley.

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From the Saeter Forest we went to the research forest of Maarid located on the estate of Consul Stang. This estate has an area of 25,000 acres of forest land of which 750 acres are used in a co-operative way with the Norwegian Forest Research Institute for experimental purposes. Professor Eide, of the Research Institute, conducted us over the area and explained what they were doing. The objective is to use the area as a demonstration forest for illustrating cultural methods to the farmers. The experiments were started in 1939 and thinnings have been made at 5-year intervals subsequent to that time. As a result of the thinning treatments the annual increment has been increased from 36 cubic feet per acre to 71.5 cubic feet per acre. One experiment involved removal of the spruce understory in a pine stand which resulted in a 20 per cent increase in pine increment 5 years after treatment. This pine stand was 60 years old. The experimental area has been classed by vegetative site types and the site types correlated with the site quality classes in general use in Norwegian forests. Other than this use of the vegetative site classes we found little interest in that method of site classification in Norway or Sweden.



Professor Eide's experimental forest--Stang Estate.

#### Forest Protection

In the protection of the forests from fire, insects, and disease, we found that there was really no problem. Insect and disease control is a very simple matter in that with the intensive form of forest management that has been adopted any trees which are attacked by insects or disease are cut out of the forest before any damage has been done to surrounding trees. The loss from fire is very low, largely by virtue of climatic conditions, but we were told that on the west coast of Norway they have hazardous periods in the early spring. Certainly, in the eastern part of Norway where we travelled, there is no evidence of a forest fire and, on questioning some of the Norwegian foresters, we were told that the biggest fire in their memory was in western Norway in 1920.

when 5,000 acres were burned over. Most of the forest owners have their land insured through the Norwegian Mutual Forest Fire Insurance Company founded in 1912. This company offers insurance against forest fires at a low premium and at the end of 1948 the total amount of insurance underwritten was about 488 million kroner. An interesting angle to the insurance scheme is that early in the 1920's most of the owners elected to pay all their premiums in 24 years, hence a large part of the early policy holders now have free perpetual insurance from fire covering their growing stock and land. Such fire fighting organization as exists in Norway has been organized through the efforts of the insurance company, the County Forest Societies, and the State Forest Service. Some lookouts have been established.

#### Regeneration Regulations

The regulations designed to keep forest land productive are set forth in such general terms as merely require forest owners to practise good forestry. The owner is entitled to deal with his forest as he sees fit as long as the inspectors find that he is treating it in accordance with the principles of proper management. In general, the owners of the bigger forest estates are so forest conscious that there is very little trouble in administering the Act. Farm woodlots and small holdings are not always so well managed. In the case of a violation the owner is required to plant, or the State will plant at his expense, or the owner may be refused a permit to cut for several years. The supervision on private lands comes from the County Forest Boards.

#### Regulation of Annual Cut

There is no problem of national regulation of the annual cut for the country as long as the present shortage of woods labour prevails. At the present time the national allowable cut is 428 million cubic feet of wood and the current consumption is 395 million cubic feet. Each year the government makes an estimate of the volume of timber which will be available for sale, then the District Sales Societies are notified as to what timber will be available, and these local organizations in turn make an allocation of wood to the various consumers. It was intimated to us that in the matter of allocation of raw material the price of logs could be used to influence the end use.

#### Forest Taxation

Taxation of forest property has a very complicated structure and in brief is made up of five different taxes:

- (a) Since 1880 there has been an annual county tax of 1 mill on the value of the land.
- (b) A tax ranging from 16 to 20 per cent based on the "income."
- (c) A commune tax of 5 mills on "income."

This Norwegian "income" tax is actually more like our property tax. It is a calculated value arrived at as follows:

- i. The productive capacity of the property (average annual increment the land should produce) is estimated by forester surveyors licensed by the Government to do this work.
  - ii. Increment times current market value gives the annual crop value.
  - iii. Crop value is capitalized at 4 per cent (i. e.,  $\times 25$ ) which gives the theoretical present sale value of the land, or assessment value on which the tax is levied.
  - iv. The basic calculation is the increment, or annual yield in wood and dollars--hence "income tax." Our English text-books more likely would call it a "rental" tax, and to us it has all the earmarks of a property tax. Until the assessment is revised the tax basis remains the same no matter what the actual income for the year may have been.
- (d) A state tax in the form of a capital tax on a sliding scale.
  - (e) An income tax on any income over 10,000 kroner. This tax is paid to the State.

In any event, all of the above taxes combined can amount to 105 per cent of the annual income from a forest property but, in recognition of this discrimination, the Government has agreed not to levy a tax of more than 95 per cent of the income. One statement was that on the average the tax amounts to about 45 per cent of the net annual income.

#### General Impressions

Before leaving Norway, I would like to pass on some of my impressions of the people and the country. It is very evident that the Norwegians are a proud people who value their freedom and are prepared to defend it. The German occupation left a great impression on this Nation and the feeling of the people is evident in the post-war murals in their public buildings and in conversation with various individuals. As a Nation they seem to have a great respect for Canada--our party was entertained in some cases on the basis of our being Canadians first and foresters second, even though to them foresters are a group of men who command very high respect.

Norway is a strange mixture of conservatism, democracy, and socialism. The combination seems incompatible but the mixture is there. The people are basically conservative because so many of them live close to the land, the forests, and the sea, and such people are not given to rapid change in their philosophy or customs. The Norwegians are democratic because many of them are property owners (for example, there are 143,000 farms with an average of 70 acres of forest

land per farm) and believe in free speech, free choice of employment, and freedom of worship. But the present Government is Socialist. Then mixed in with all this are a handful of large estate owners who maintain establishments which, by our standards, remind you of the feudal system. These estates are not such a bad thing as it might seem as it was my impression that some of these owners did not operate as efficiently as they might because they had men who had been on the estate all their lives and if their services were dispensed with they would be unemployed. The government is making taxation difficult for the estate owners, and that, combined with the increasing organization of labour, will tend to bring the era of large private holdings to an end. We were very fortunate in being able to visit these estates, to say nothing of being entertained by the owners in such royal fashion, as these people represent a way of life that is disappearing.

Our last day in Norway was spent seeing the sights of Oslo. First we went to see the new 6 million dollar city hall which was completed since the War. It is a marvellous building and has the most impressive murals that one can imagine. From the city hall we went out to a museum to see the Viking ships of ancient times and the raft Kon Tiki on which 6 men recently sailed from Peru to Haiti in 101 days. The party had lunch at the restaurant at the Folk Museum which specializes in villages made up of old houses brought in from various parts of the country and re-erected in Oslo. It was quite an education to see how people were housed 300 to 400 years ago. From there we went to look at the newest park development in Oslo, namely the Vigeland Sculptures. It is a most picturesque setting with a wonderful collection of statuary. The main monolith and surrounding figures contain 120 separate figures which took Mr. Vigeland 10 years to carve. Finally, we drove up to a high hill overlooking Oslo where is located the main ski jump in Norway. Here they are making preparations for the Olympic ski jumping competition in 1952 and the view from the hill back over the city is a sight to be remembered.

### IN SWEDEN

#### Swedish Forestry

On August 28 the party left Oslo by train for Sweden, arriving at Laxa in mid-afternoon. At this point we were welcomed to Sweden by Mr. Wenmark, one of the divisional chiefs from the Swedish Forest Service at Stockholm and Mr. Bragnum, the "District Forester." At Laxa is located one of the most recently acquired State forests in the country, but before telling you what we saw there it might be better to give you some statistics about Sweden in general.

Sweden has a population of about 7 million people and there are 53,500,000 acres of productive forest land representing 57 per cent of the total land area. In the forest industries 170,250 workers are employed, averaging 120 days' work per man per year. The sawmills produce 1.1 million standards of sawn-timber per year, the pulp mills consume 494 million cubic feet of wood per year, and the equivalent of 290 million cubic feet is used for fuel, charcoal, etc., for a total annual cut of 1,533 million cubic feet. The ownership of the productive forest land is distributed as follows:

- (a) Public ownership--24 per cent.
- (b) Companies and estates--30 per cent.
- (c) Farm woodlots--46 per cent.

In connection with the farm woodlots it is of interest to point out that there are 270,000 owners involved in this class of tenure with an average holding of about 100 acres each.

#### Administrative Policies

In the matter of forest administration the Swedish Forest Service administers the publicly-owned forests of 10 million acres of productive forest land; also it is responsible for what is described as "lower forest education." In their administration they have established 10 forest districts, 106 ranger districts, and 435 assistant ranger districts. The staff includes 250 graduate foresters, 106 forest supervisors, 700 rangers, and 550 other personnel to total 1,600 persons.

The privately owned lands, including farm woodlots, are supervised by the Royal Board of Private Forestry which also comes under the Ministry of Agriculture but is quite a separate organization from the Forest Service which comes under the same government Ministry. The authority of the Board of Private Forestry is decentralized among 25 Forest Conservation Boards who, in turn, employ their own staffs of foresters to carry out the actual field supervision of the forest activities on the private lands.

During the first half of the nineteenth century the policy of the Swedish government was to dispose of its forest land to private owners in line with the principle that the nation's wealth can best be managed and its economy usually best promoted by entrusting the natural resources to private ownership and initiative. In 1863 this policy was reversed on the basis of the argument that the forest resources contributed a special form to national wealth and that it could be perpetuated through the methods in use, yet it could be destroyed easily through unrestricted cutting and, from the point of view of the best interests of the nation, it was most important that the forests be perpetuated. Thus, from that date, the policy of the Swedish government has been to sell no forest land and to buy from private owners when available from time to time. A company today cannot purchase any forest land from a private owner, other than another company, and consequently, the pattern of ownership is relatively fixed.

Not a great deal of progress was made by the Forest Service in acquiring land until about 1900 when a number of properties were purchased in central Sweden. In 1903 the first basic Forest Law was passed requiring all private owners to keep their lands productive and this opened a period of extensive planting and seeding in which as much as 100,000 acres per year were reforested.

In 1911 the Swedish Forest Service changed its policy of selling timber on the stump to doing at least part of the logging on their own lands and selling the logs or pulpwood delivered at drivable streams. Another policy was initiated in 1930 relative to the administering of the national forests and the acquisition of forest land. In this programme the principle was introduced whereby the national forest was to be managed strictly on the same business principles under which private enterprise must operate. At the present time the Forest Service operates a Crown company (statens Skogsindustrier) which produces annually 190 million board feet of lumber, 50,000 tons of pulp and wood chemical products, 55,000 tons of hardboard, and 20,000 tons of pig iron and mineral products.

Our introduction to Swedish forestry was at the State Forest of Laxa. This is the most recent forest district created by the Swedish Forest Service and resulted from the purchase, in 1947, of a private estate comprising 68,000 acres of productive forest land. The district administrative staff consists of the following:

|                             |          |
|-----------------------------|----------|
| District Forester           | 1        |
| Assistant District Forester | 1        |
| Forester-in-Training        | 1        |
| Rangers                     | 6        |
| Special officers--          |          |
| buildings, roads, etc.      | 2 or 3   |
| Total                       | 11 or 12 |

This means 1 administrative officer per 6,000 acres.

The allowable annual cut is 2,100,000 cubic feet and all logging is conducted by the Forest Service. Woods activities require the employment of 250 men and 50 horses.

The yields were good, averaging about 70 cubic feet per acre per year and the mature stands seemed to carry about 1,800 cubic feet per acre. At this point it might be of interest to tell you that the boundaries of Crown lands are generally indicated by the trees along the boundary being painted at breast height with a band of white paint and above this a conventionalized crown painted white.



Regeneration cuttings at Laxa State Forest, Sweden.

The next forest property we visited was the Alkvettern estate belonging to a subsidiary company of the Swedish Match Company. This forest is near Karlskoga and the Chief Forester is Mr. Stig Hegardt. There are 55,575 acres of productive forest land on this estate and the average growing stock is 1,373 cubic feet per acre. The average annual increment is 51 cubic feet per acre with an allowable cut of 2,824,000 cubic feet per year. However, due to labour shortage and the desire to build up growing stock the cut has been reduced by 20 per cent to give a harvest of 2,265,600 cubic feet per year.

The administrative staff is composed of a Chief Forester, 2 Assistant Chief Foresters, and 12 Rangers to give approximately 1 administrative officer per 4,000 acres of forest land. In addition, the work staff is composed of 250 to 500 labourers depending on the season of the year.

The Alkvettern estate dates from the middle 1500's and there were smelting works on the property up until 1890. Consequently, until then, the chief utilization of the forest was for charcoal. The first inventory of the forest was made in 1846 by Obarius, the founder of the first forest school in Sweden.

The silvicultural aims are to improve the quality of the stand and increase the growing stock. Regeneration is by natural methods as well as by planting and sowing. Silvicultural features are:

- Planting spruce 5 feet by 5 feet, pine 4 feet by 4 feet.
- Clear cut areas varying from 1/2 to 10 acres in size with 20 to 40 seed trees per acre.
- Rotation age 85 to 95 years depending upon site.
- Thinning operations commence at about 30 years of age and continue at intervals of 5 to 12 years depending upon rate of growth.

- (e) Mr. Hegardt is of the opinion that the trend in Swedish Forestry will be away from natural regeneration to planting with high quality stock from improved seed trees.

We visited a 30-year-old stand of spruce and birch in which a thinning had been made in 1950 leaving 1,600 trees per acre--mostly the dominant and codominant trees. This operation cost \$28.00 per acre and will be paid for by the sale of the material cut.

Very little pruning is being done on the Alkvettern property as the shortage of labour has forced the decision that it is more important to thin than to prune.

Mr. Hegardt supplied some interesting statistics relative to the correlation between pulp yields and rate of growth of trees. The information is as follows:

Pulp Yields per Cubic Meter of Pulpwood

| Width of ring |      |        |               |
|---------------|------|--------|---------------|
| 1             | m.m. | yields | 275 kilograms |
| 1.25          | "    | yields | 263 "         |
| 1.50          | "    | yields | 242 "         |
| 2.00          | "    | yields | 225 "         |
| 3.00          | "    | yields | 215 "         |
| 4.00          | "    | yields | 200 "         |
| 5.00          | "    | yields | 175 "         |

From Karlskoga our itinerary took us to Karlstad where we visited the Uddeholm Company. Mr. Eckman is Chief Forester for this large company with holdings of 550,000 acres of productive forest land. The average stand per acre is about 1,300 cubic feet and the annual increment 21,000,000 cubic feet. The current cut is 80 per cent of the annual increment and about one-half of the company's wood requirements are from their own forests, the remainder being purchased in the open market.

The administrative staff of the forestry department is as follows:

- (a) Chief Forester
- (b) 10 forest supervisors, all graduate foresters, each in charge of a forest district.
- (c) Each of the 10 supervisor districts is divided into 6 to 10 ranger districts. The rangers are graduates of a 1-year course at the ranger school. This is at a rate of 1 ranger per 5,500 to 9,000 acres.
- (d) The total administrative staff is 10 foresters and 80 rangers or at the rate of 1 administrative officer for every 6,000 acres.

Mr. Eckman presented a very able address of welcome to our group, and there is probably no better way of illustrating the problems of a company forester in Sweden than to quote direct from his remarks as follows:

"The management of a forestry enterprise of the size and structure of our company's has to deal with three principal questions--silviculture, how to get the timber out from the woods, and the problem of labour supply.

"Silviculture, as we interpret this work at Uddeholm, takes as its aim the continual improvement of the forests, both in quantity--by increasing the timber capital and the useful wood reserves--and in quality--by biological improvement of the individual trees and stands. Soil improvement by drainage, road construction, and more efficient exploitation methods may also be reckoned to silviculture.

"The forest properties of our company consists mostly of tracts that belonged to old iron-work enterprises and were mainly exploited for the production of charcoal, and that is the reason why our forests nowadays for the best part are a result of extensive clear-cutting and re-sowing. On account of the lack of the right kind of seed in the old days much of this resowing was done with seed of bad quality or unfit origin (of seed) and, because of that fact, we have nowadays a big amount of certain stands, mainly of pine, with a very bad quality of the trees.

"In recent years it has been proved that trees can be "bred" in the same way as corn and cattle. Our company has gone in for selective breeding of forest stands, particularly through careful control of all seed planted now and in the future. In view of this the Company has built a seed extracting establishment of its own and central nurseries for the whole forest department.

"The supply of cones to those establishments is secured exclusively from our own forests with special regard to their quality and suitability for improvement and rejuvenation. And then, you understand, the personnel is forbidden to collect cones from the bad stands I spoke about recently.

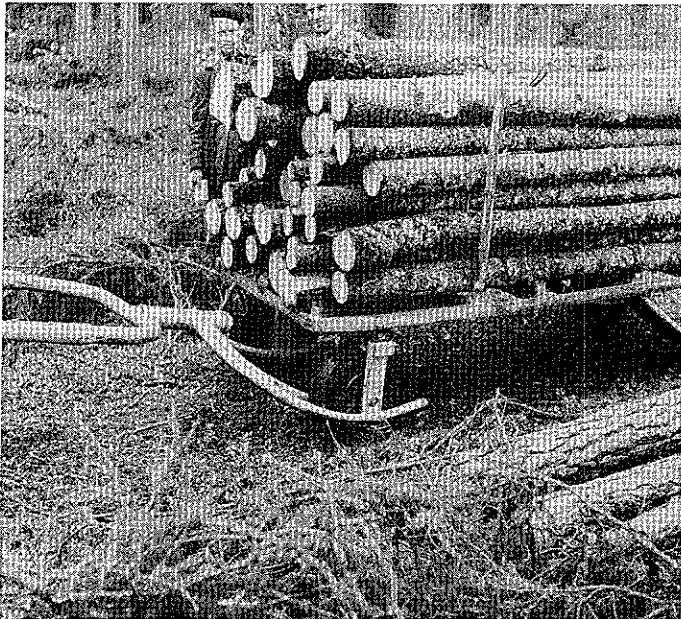
"Another factor of great importance for the improvement of the forests is the thinning of the stands. We do it in this way: Trees of inferior quality are successively removed, so that the final harvest and the later intermediate cuttings will always yield a product of a relatively high quality. In certain cases we even resort to such radical methods as clearcutting of young stands, if they don't promise well. We don't allow inferior trees to grow to sawtimber dimensions.

"The theoretical rotation period for the Company's forests is about 90 years for the best sites and 110 years for poorer land. These rotation periods are no obstacle to earlier or later final cutting of certain stands. Our method is individual tending and our aim is to get a very good growth on all spaces of our forests.

"It has been said that the forests of Sweden and the country's production of sawn goods have deteriorated as the virgin forests have been consumed and replaced by planted stands, and the modern silviculture has contributed to this deterioration. Such is not the case as we always try to produce timber of the highest quality, certainly a little softer in texture, but still superior to the quality of virgin forest timber with regard to knottiness."

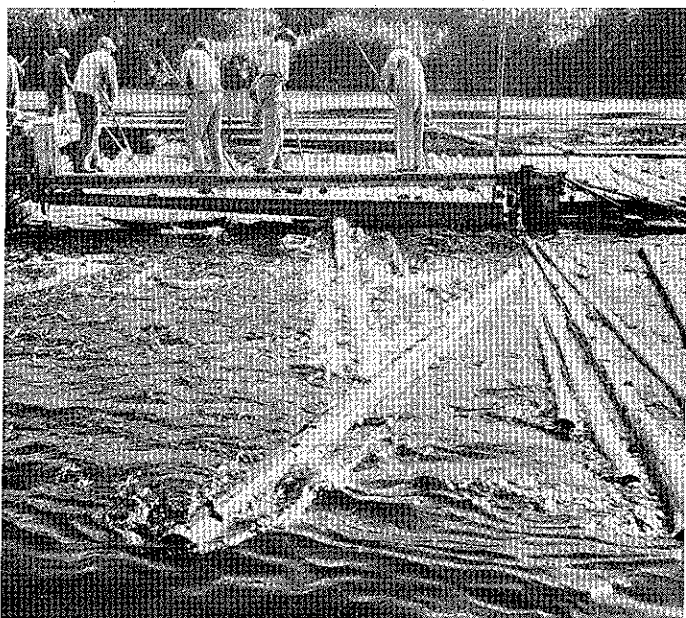
The second great problem in forestry is to get the timber out of the woods and transported to the industries.

"The forestry department has to take care of all these jobs from the stump until the timber is left in the industries' timberyards.



Wagon used for hauling out wood to main haulroads. Note pneumatic tires, Swivel shafts, skids ahead of wheels, and shaft springs. Cost 200 Cr. Sw.

forestry especially suffers from an acute labour shortage. One of the reasons--at least in this part of the country--is that a good many of the workers have chiefly been housed in the Company's farms and crofts, rather often lying widely scattered in the forest, far away from roads and villages, schools, shops, and modern facilities.



Sorting logs at sorting grounds on Klaralven River. Note power roller under platform for quick transfer of logs.

"For the operations in the woods we use about 3,000 men and 1,200 horses, 50 to 100 power saws, and a couple of small tractors for skidding and hauling. Most of the hauling goes on in winter-time, while the transportation to the industries goes on in spring-time and in the summer. For the transportation we use, in certain divisions, mostly railways and trucks, but for the forests as a whole the most important transportation method is stream-driving. This is the cheapest transportation method we have, and we are lucky to have a very good system of waterways in the river Klaralven and its bigger and smaller bywaters. The river Klaralven is a common waterway for all woodworking companies in the province, and there is a big assorting space near the end of the river, where each timber-owner can get his own timber.

"The third great problem in our forestry is the supply of labour. In Sweden the rural population has decreased, while the town and industrial population has shown a steady increase. As a result,

"In order to redress the balance, the Company in the last few years has shut down the worst-situated crofts and constructed new villages of different sizes, centrally located and with all necessary facilities. At the same time we maintain all farms and crofts so located that we believe people can stay there for the nearest future. Today the Company has about 1,100 farms and crofts and about 600 apartments for renting. The maintenance of houses for wood-workers is a very expensive detail for the Company. I can tell you that the Company every year has an income from its own houses of about \$100,000, while the cost of the upkeep and that of expensive repairs for everyone during the last few years has amounted to about \$500,000 on the average.

"However, we have to do it in order to make the forest workers feel at home and to counteract the trend of depopulation."

The outstanding thing that Mr. Eckman showed us was a stand of Scot's pine that was spot-seeded 30 years ago and is now of such poor branching habit due to wrong provenance that the Company will cut down this stand and replant with stock of improved quality. This served to impress all of us with the necessity of being very certain that the seed used in connection with our reforestation

programme in British Columbia should be from the most suitable seed sources, otherwise the foresters of the next generation may be obliged to cut down plantations at an early age.

Planting on the Uddeholm Company lands is a spring operation and we were shown an interesting planting tool which may be of use in British Columbia. This tool had a 30-inch handle with 14-inch crossbar welded to the top of the handle. At the other end of the handle was a semi-circular blade 12 inches long and shaped half round like a trowel--the blade of the trowel being about half of a circle 4 inches in diameter. When in use the technique involved cutting out a cylinder of soil, placing the seedling in the hole and then letting the cylinder slide back in against the roots and finally being tamped in place with the heel of a boot.

### Scaling Practice

At Karlstad we learned something of the methods used in connection with log scaling and found that the scaling in that region was done by an independent organization "The Association for Scaling Timber in Wermland." The Association is operated by a Board on which are representatives of both buyers and sellers. The scaling crews scale logs on the river banks, decked along the side of the roads, or on the railway. Logs are graded for saw timber, sulphite pulp, sulphate pulp, poles, posts, veneer logs, ties, charcoal wood, and fuelwood. All classes except fuelwood are scaled in English cubic feet. Lengths are measured in English feet and the diameters in English inches.

The saw-logs are cut in even feet from 14 to 24 feet, but some as short as 10 feet are cut. The minimum top diameter for saw-logs is 6 inches in the case of pine and 7 inches for spruce. Saw-logs are scaled on the basis of the top diameter and the scale is the volume of the cylinder that has as its diameter the top diameter of the log.

Pulpwood is measured in even feet from 6 to 24 feet long, with a minimum diameter of 2 1/2 inches. Scaling practice calls for the diameter to be measured at mid-point on the log.

One scaling gang consists of 4 persons--the scaler, the tallyman, and 2 boys who assist the scaler in measuring the logs. A crew scales up to 5,000 cubic feet per day at a cost of 28 cents per 100 cubic feet. Usually working along with the scaling gang is a roller gang consisting of about 6 men. It is the task of these men to roll the timber to where it is to be scaled and apply the tally marks required. Each owner of timber has his own special mark. The saw-logs are always marked with the individual mark of the owner but in many cases the pulpwood seems to be marked for common sorting and, therefore, is marked either for sulphite or for sulphate pulp.

### Log Sorting Station

On the Klaralven River there is a system of common floating of logs whereby 14 different owners have logs driven down the stream. At the sorting grounds each owner gets out his own saw-logs but the pulp logs are divided up on the basis of the same percentage of logs that each owner put in the water, consequently, there is no special segregation of pulp logs other than sorting them as between sulphite and sulphate. At this large sorting ground 100 men were employed and they handle 70,000 logs per 8-hour day. Pulpwood logs were then all bundled by machines that had a capacity of 150 bundles per day comprising 30,000 pieces or 100,000 cubic feet.

At Skoghalls Verken near Karlstad we visited a sawmill and pulpmill of the Uddeholm Company. The sawmill is equipped with 8 gang-saws and has a capacity of about 24,000 standards of lumber a year. At the log pond for the sawmill the logs are sorted into 14 pockets--from 6 inches to 10 inches top d.i.b. the logs are sorted by 1/2 inch classes and from 11 inches and up they are sorted by 1 inch classes. Another outstanding feature of this big plant is a lumber storage shed 560 feet long with a capacity of 3,600 standards of lumber.

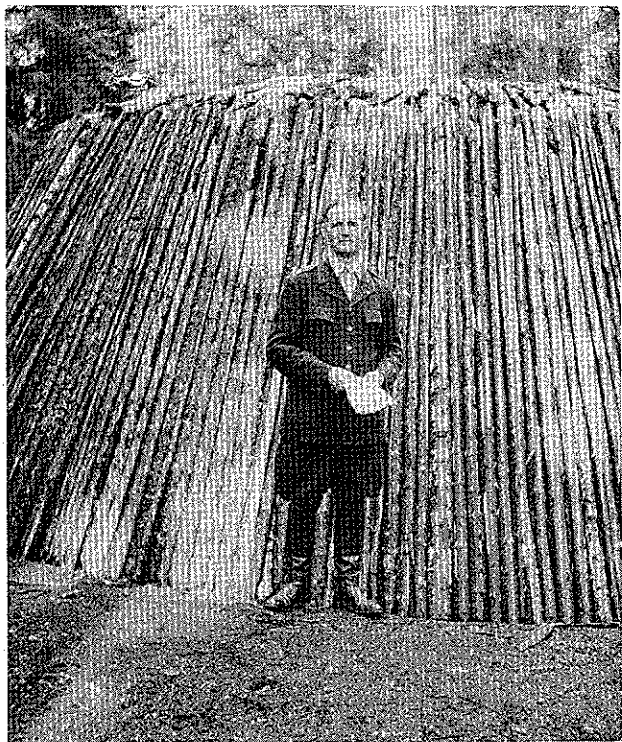
From Karlstad the party proceeded to Skinnskattebergs Bruk, an area which the Swedish Forest Service uses for experiments in utilization. For a period of 250 years the forests of the district were used to help get the iron ore out of the ground and for the production of charcoal. At one time there were 80 foundries in the area and gradually these closed down until there is only one left in operation today.

At the sawmill the recovery from the logs is 70 per cent with the waste going to the chemical plant. The integrated industry obtains practically 100 per cent utilization of the logs. The wood distillation plant uses edgings, sawdust, and thinnings. The products are as follows:

- (1) Charcoal.
- (2) Acetic acid (used in the textile industry and manufacturing artificial silk) and acetone.
- (3) Tar oils.
- (4) Methyl alcohol.

A wallboard factory will be put into operation shortly and at that time the distillation plant will have to rely entirely on thinnings for its supply of raw material. Currently the plant uses 2,500,000 cubic feet of wood waste annually plus 500,000 cubic feet of thinnings.

Prefabricated houses were being made at the rate of 2 and 3 per day to utilize short lengths of lumber which could not be exported.

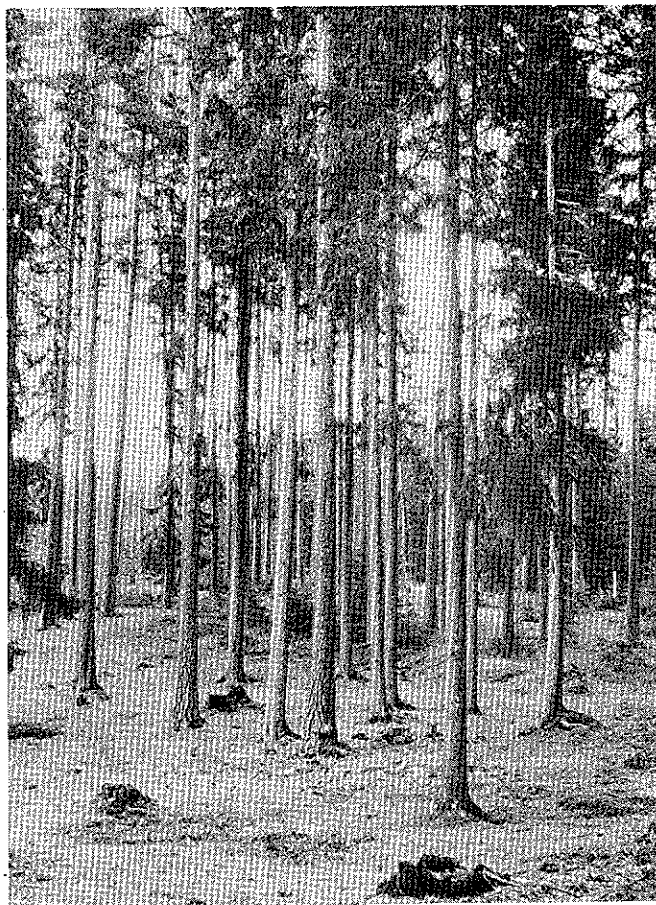


"District Forester" Heglund of Farnabruk standing beside charcoal pit ready for covering and burning.



Charcoal burners "residence" not meant for comfort as he must be on the job 24 hours a day when burning in progress.

Under the direction of District Forester Wadman we inspected some of the Crown forests in the Malingsbo district. The public forests here have been built up by successive purchases beginning in 1899. The present holdings include 68,000 acres and it was interesting to learn that the authorities value the forest land at \$2.80 an acre and the growing stock at \$146.00 per acre. In this locality we were introduced to the use of burning as an aid to securing natural regeneration following logging. We were taken to an opening of about 7 acres in area where a 100-year-old stand had been logged in 1943. In the spring of 1944 the slash was burned and the following autumn the ground was scarified to expose patches of mineral soil. At the time of our visit the stand was fully stocked with 90 per cent pine and 10 per cent spruce. We were told that they treat about 200 acres a year with burning as an aid to securing natural regeneration and the costs of this treatment vary from \$3.20 to \$4.80 per acre. The area we visited had 28 seed trees per acre.



"Cathedral Grove"--Malingsbo Forest--Age up to 140 years old. Diameters 16 inches to 24 inches d. b. h.

In the course of our inspection at Malingsbo we were shown a select pine tree, age 135 years, d. b. h. 18 inches, and height 92 feet. We were also taken to a stand of mixed pine and spruce that ran in age up to 140 years and had an average height of 78 feet for the pine and diameters ranging between 16 inches and 24 inches. On the average, however, the stands that we ordinarily saw throughout Sweden had a maximum height of 65 feet for pine and 55 feet for spruce.

#### Woodmanager's School

The State Woodmanager's School is situated at Malingsbo, and in that connection we were given an insight into the system of forest education that has been set up in Sweden as follows:

#### The Apprentice Schools

3 schools with two 4-month courses a year;  
32 students per course = 192 students a year;  
Requirements for admission--  
6 months practical work;  
average age, 24 years.

Subordinate Forest Schools

5 state schools and 1 private;  
about 100 students a year,  
11-months course;  
2 years' practical work;  
average age, 25 years.

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Rangers  
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The Woodmanager's School

20 students;  
15-months course;  
among others, 2 years' practical work;  
75 per cent have gone through subordinate school  
age, 28 years

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Wood-managers  
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Royal College of Forestry

30-35 students;  
4-year course;  
among other things 1 year's practical work;  
entrance age, 23 years.

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Forest Officers  
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The Woodmanager's School is supervised by a Board consisting of 6 members, representing the State Forest Service, the Board of Private Forestry, the Association of Private Forest Owners in Sweden, and the Agricultural Association of Sweden. The tuition is free and the students have free lodging.

Enroute to Stockholm from Skinnskatteberg we stopped in Vasteras to visit the huge manufacturing plant of the Asea Company who manufacture electric generators, electric motors, electric locomotives, etc. This big plant employs 5,000 workmen and also is the head office and technical centre for the company, thereby employing an additional 2,600 people to make a total of 7,600 employees. The outstanding thing that we saw in their plant was an enormous generator that was under construction and it was stated that this was to be of a capacity of 105,000 K.V., being the second largest generator in the world and destined for installation in northern Sweden.

Forestry Activities at Stockholm

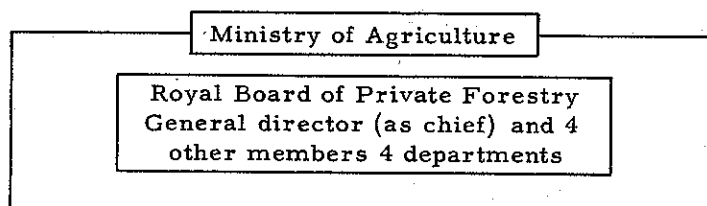
At Stockholm there commenced a series of visits to the Board of Crown Lands and Forests, the Private Forestry Board, the School of Forestry, the Forest Research Institute, the Wood Research Institute, and various lectures on private forestry, forest taxation, and labour relations. The first visit was to the Research Institute which was founded in 1902 and reorganized in 1915. The principal function of this organization is to ascertain how best to manage the forests, and second, to maintain the inventory of the natural forest resources. Six divisions have been set up for administrative purposes as follows: Forestry, Forest Service, Science of Work, Botany and Soils, Genetics, and Zoology. The permanent staff consists of 130 people together with an additional staff of 102 persons employed only during the field season. The Institute is housed in a lovely new building with excellent accommodation by way of office furniture and technical equipment of all kinds. For field-study purposes they have 900 permanent sample plots scattered throughout the country. The Director of the Institute is Mr. B. Eckland.

Our next visit was to the School of Forestry which is headed by Professor Streyfert and ably assisted by Professor Petrini. There are seven professors on the staff and each lectures from 5 to 6 months per year, spends 3 to 4 months annually on field work, and the remainder of the time on research or consulting. We learned that there are 1,000 graduate foresters working in the forests of Sweden. This gives 1 forester for every 55,000 acres. In addition there is the large backbone of trained foremen who directly supervise forest operations. We were told that the annual class admitted to the forest school was limited to 30 students and this number of graduates was sufficient to maintain a total of 1,000 trained foresters working throughout Sweden. It was amazing to us that, in a country that was practising such intensive forestry, only 30 foresters should be graduated each year. We were further advised that there were from 75 to 90 applications for admission each year and the freshman class was selected from these applicants. It might take a man 2 or 3 years to be admitted and their average age at graduation is 27 years.

The Wood Research Institute is a joint Government and Industry undertaking. It was stated that they had a 7,000,000 kroner investment for buildings and equipment but to us it seemed that the investment must be considerably greater than that. For administration purposes their work is divided into a wood technology department, a wood chemistry department, and a paper technology department. Research may be done for a private concern and their experiments and results kept confidential for a year after which time the findings might be made public. One of the interesting things that we saw at this Institute was an experimental insulation board 1 1/8 inches thick made from 25 per cent of waste paper and 75 per cent of wood shavings.

Administration of Private Forest Land

At the Royal College of Forestry we were given comprehensive talks on private forestry and forest taxation in Sweden. Mr. W. Plym Forshell presented a paper entitled "Private Forestry from a Public Point of View" and he gave the details in connection with the administration of private forestry. The administrative breakdown is as follows:



(over)

| 25 Forest Conservation Boards   |  |
|---------------------------------|--|
| President and 2-4 other members |  |
| S t a f f                       |  |
| County forest officer           |  |
| Deputy " "                      |  |
| Assistant Forest officers       |  |
| County forest rangers           |  |
| Assistant " "                   |  |
| Foremen                         |  |

There is a forest conservation board for each county and the Board is headed by a president who is appointed by the Government. The other members of the Board are appointed, 1 by the King, 2 by the County Council, and 2 by the Agricultural Associations or in that ratio. Throughout Sweden there are 120 foresters employed by the Conservation Boards together with 310 county forest rangers, 80 assistant forest rangers, and 1,200 foremen to give a total administrative staff of 1,710 people who supervise the activities on 45,000,000 acres of productive forest land owned by private individuals, companies, or communities. The best description of the principal task of the Conservation Boards and their staff can be given by quoting directly from Mr. Plym Forshell's paper as follows:

"Of course it is of great importance that the administration so to speak should cover the whole country geographically, so that every forest owner, whenever he wants, can contact a near-living ranger or foreman who he as a rule well knows. The whole staff reaches a number of about 2,000 persons of which about 1,800 are working in the field. They are working on several branches of activity such as general advising, education, marking, reforestation, planning of cultivated pasture, planning of forest draining, planning of forest roads, working plans, and, of course, control of logging and other measures according to the law.

"Statistics from 1948 for example show that the whole staff offered 211,000 working days. Of these days 54 per cent refer to marking for thinning and reproduction cuts, 22 per cent to reforestation, 4 per cent to advising and education by courses, 5 per cent to different kinds of planning, 10 per cent to supervision of forest measures in accordance with the law, and 5 per cent to divers things. In the same year marking was performed by the staff of the Boards on nearly 55,000 hectares; 183 silvicultural courses were held as well as 217 special propaganda speeches and more than 1,300 excursions, so-called "silvicultural days" with about 20,000 forest owners as participants.

"Teaching and education is mostly carried on at silvicultural schools situated at estates in the Board's own possession and at agricultural schools with Forest Board officers as teachers. Now a day's forest teaching embraces not only silvicultural work, theoretical and practical, but even logging work, especially rationalizing methods and tool maintenance.

"The activity of the Boards, however, isn't directed towards forest owners and workers only; the Boards also have their own business with seed collecting, seed extracting, plant producing, and distribution of these products. They are our greatest producers of forest-tree seed and plants, and their seed and plant certification is perfectly arranged in conformity with direction issued by the Royal Board of Private Forestry.

"And how do we finance this activity? The yearly budget amounts approximately to 15 millions Sw. Crowns. About 4 1/2 millions come from a special tax, the so-called silvicultural tax, which is paid by all forest owners. Four millions are partly revenues from fees paid to the Boards for assistance by forest officers, rangers, and foremen, partly other income from sale of seed, plants, etc. The last 6 1/2 millions are public grants.

"Besides, the Boards have to distribute state subsidies for regeneration, draining, and road-building under supervision by the Royal Board of Private Forestry. For the present the state subsidies for different purposes amounts in the whole to about 5 million Sw. Cr., but the demand is still greater than the supply. And the demand is still increasing with the increasing interest, but the supply depends on the current state of the Public finances. Compulsory reforestation cannot be subsidized except in certain cases, when the forest owner lives under especially poor conditions. In general, subsidies can rise to at most 50 per cent of the computed costs.

"As you have heard, the Board's activity is greatly diversified as to forest management, but it gets its special character because of the daily dealing with not only the forests but also the owners. And human beings are more varied than forests. Therefore, the officials must be not only trained and clever foresters but also good psychologists endowed with a good deal of enthusiasm and patience; and I can truthfully say, most of them really are."

#### Forest Taxation

The forest tax structure is very complicated: so much so that the average forester in Sweden does not understand it. Consequently, a visiting forester can be pardoned for failure to grasp all the details. The outstanding points that one picks up from analysis of the available information is, first, that the taxes are as much as the traffic will bear and, secondly, from a technical point of view the taxes are based on the productive capacity of the land.

The forest tax structure is made up of the following taxes:

- (1) State taxes
  - a. Income tax.
  - b. State property tax.
  - c. State forestry fee.
- (2) Commune and County taxes
  - a. Real estate tax.
  - b. Commune and County income tax.
- (3) Private companies pay a property tax on their joint stock.

For taxation purposes the cost of forest operations including such things as planting, thinning, cleaning, cleaning of ditches, costs of marking, forest insurance, and forest management may be deducted from the gross income. However, no deductions are allowed for such basic improvements as drainage and road construction.

The state income tax is progressive and increases with increasing income. It was stated that, in calculating this tax, the net income from the forest property is added to all other incomes of the taxpayer regardless of source. The following table gives the basic amount of the taxes:

| <u>Taxable income</u><br><u>in kroner</u> | <u>Basic amount</u><br><u>in kroner</u> | <u>Percentage of tax payable</u><br><u>on increases over the income</u><br><u>bracket.</u> |
|-------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------|
| 1,000                                     | 100                                     | 11                                                                                         |
| 10,000                                    | 1,550                                   | 24                                                                                         |
| 200,000                                   | 105,170                                 | 70                                                                                         |

The state property tax also is progressive but only properties exceeding 30,000 kroner in value are subject to the tax. The scale of this tax is as follows:

| <u>Taxable property</u><br><u>in kroner</u> | <u>Tax</u> | <u>Percentage of tax payable</u><br><u>on increases over the income</u><br><u>bracket</u> |
|---------------------------------------------|------------|-------------------------------------------------------------------------------------------|
| 30,000                                      | 0          | 6                                                                                         |
| 100,000                                     | 420        | 10                                                                                        |
| 3,000,000                                   | 3,020      | 18                                                                                        |

The State Forestry Fee is a tax that is imposed on forest owners only and covers part of the operating costs of the local Forestry Boards. This fee is paid by all forest owners whose property is valued at 2,000 kroner or more. The tax is based upon the value of the forest and the rate set each year--the current rate being 1.5 mills.

The county real estate tax is designed to give the communes a steady income from the forest and the rate is set every 5 years. For the purpose of this tax the forest land value is estimated on the basis of its normal yield capacity and the gross value is reduced by 30 per cent for carrying charges such as maintenance of the forest, administration, roads, planting, and drainage. The Swedish authorities have a very complicated formula for calculating the real estate assessed value of the forest, but this would not seem to be the place to present the information passed on to us. It will be sufficient to say that the annual real estate tax for the communes averages 8 mills and for the counties 2.5 mills.

The commune and county income tax is a tax on the income of the forest owner over and above the amount calculated for the real estate assessment; for example, if the owner receives just as much as the assessment value he pays no tax, but if he gets more than the assessment value of the annual yield or sells the property he must pay the commune and county income tax.

The sum total of all the forest taxes on a forest property can be in excess of the annual income and this has been recognized by the government so that it has been agreed that the maximum of all taxes on a forest property will not be more than 80 per cent of the income.

#### Regulation

Regulation of use of the forests of Sweden has its genesis in the strict regulations that were imposed on the iron industry of the nineteenth century with the objective of developing a continuous production of iron. As early as 1840 there was a regulation that a sawmill could not be built in central Sweden if the wood was needed for the iron industry.

Currently, regulation of the use of the forest is based on the principle that forest legislation is necessary to insure proper management of the forest and the Swedish conservation law of 1949 attempts to attain this objective with a minimum of interference. The main features of this Act are as follows:

- (a) It includes a public declaration of the principles under which a forest should be managed. The principle of securing an economic profit is included as one of the objects of forest management.

- (b) Forest land is defined as soil suitable for wood production and not used essentially for a different purpose.
- (c) No cutting shall be made except with the approval of the local Forest Conservation Board. If a cutting has been carried out contrary to the law the forest owner and the Conservation Board must attempt to arrive at a solution. If no agreement is reached the Board has the power to prohibit cutting of any trees that are not marked by one of its foresters.
- (d) Compulsory regeneration of the forest following harvest of the final crop.

It was stated that 70 to 80 per cent of the forest land in Sweden is under cutting plan. The private companies and large estates are managed according to working plan. For the State lands the procedure relative to annual cut is for the Forest Service to set up a cutting budget for each forest district and on the basis of that budget the Crown timber available in excess of that logged by their own operations is offered for sale by public auction. The County foresters endeavour to get the wood-lot owners to regulate their cut and, if necessary, to under-cut so as to build up the growing stock.

#### Stumpage Values

Stumpage values vary from south to north in proportion to the value of the forest products. As an average we were quoted the following current prices:

- (a) Saw-logs \$20.00 per M. B. M. with a range from \$12.00 to \$25.00.
- (b) Pulpwood (peeled) \$8.00 per cord.

The cost of logs would vary from \$35.00 to \$40.00 per M. B. M. delivered at the side of a river. It was particularly interesting to the members of our party to learn that stumpage accounted for 35-50 per cent of the value of the wood delivered at the mill or river-side.

#### Impressions of the Scandinavian Countryside

The Scandinavian people appear to take a great pride in their homes, and the farm-houses, almost without exception, are in good repair and painted. Barns are very largely painted and in good repair and everything is neat and tidy giving things an air of being well kept. The private houses in the towns and also farm houses are largely of the "salt box" type of architecture and finished on the outside with 1 inch x 8 inch or 1 inch x 10 inch boards laid vertically and the joints covered by 1 inch x 3 inch battens. Invariably the exterior of the buildings is painted with a long-lasting red paint and the trim is white. The roofs are red tile. A number of new houses in the towns and cities are stucco but certainly the predominating style of exterior finish is boards and battens. Eighty-five per cent of the rural homes in Sweden are electrified.

In line with the impression of everything being well kept, we were impressed by the very tidy aspect of all the cemeteries that we passed. No matter how small the cemetery it was neat and tidy and at the time of our visit there were many flowers.

Scandinavia is a land of bicycles and people with packs on their backs. Even the youngsters have their packsacks. There are bicycles by the thousand, and in one town there was a free air station for bicycles in front of a store.

As you drive through the countryside you are struck by the absence of billboards and there are very few hedges of any sort. They are a great people for flags and a home of any consequence has its flagpole. In addition, there is the custom of having small flag-standards and flags on the dining table in restaurant and at formal dinners.

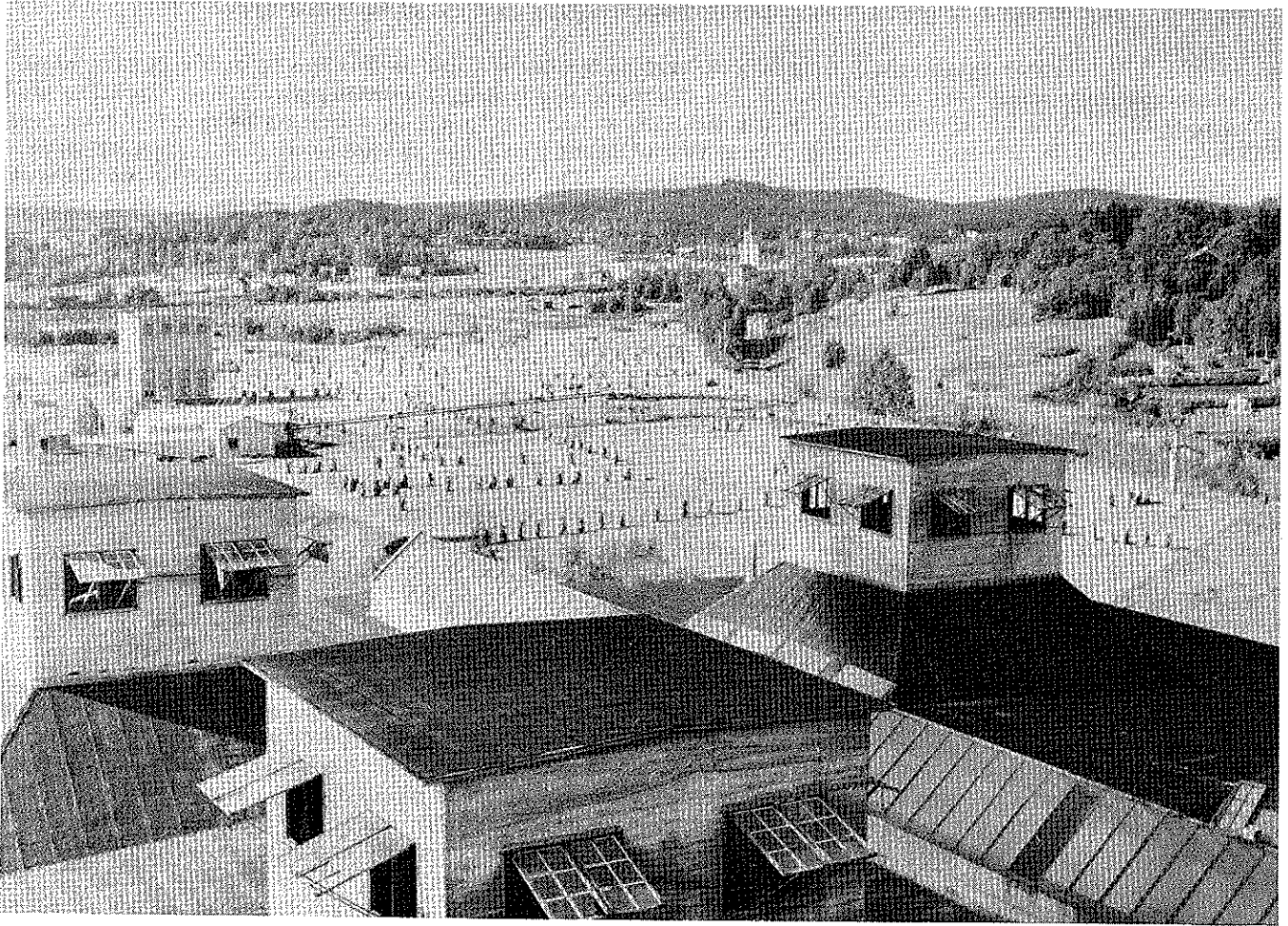
As in Norway the people you meet on the streets and in the country in Sweden are fine, healthy looking, and upstanding. Those that we had contact with we found to be most hospitable and friendly. The Swedish people we met are conservative in their outlook and tied by tradition in many ways yet they have a Socialist government and are being more and more regulated by the State. In our travels we inspected sawmills and pulpmills that had some very efficient equipment yet, as you go through the countryside, you will see women washing the family clothes at the side of a stream. The industrial people everywhere speak of a shortage of labour while in Stockholm there are scores and scores of husky men working in hotels and restaurants where we would have girls.

#### Sundsvall

Sundsvall, a city of 20,000 population, is situated about 270 miles north of Stockholm and is just south of the 62nd parallel. In North America this would be a long way north when you consider that the north boundary of British Columbia is the 60th parallel.

The region around Sundsvall is a very important sawmill and pulp producing area and one of the larger concerns is the Swedish Cellulose Company with its 5 sulphite and 4 sulphate plants representing half of the industry in north Sweden and one-third in the entire country. This large corporation owns 4 1/2 million acres of productive forest land from which it harvests 100,000,000 cubic feet per year. Around Sundsvall the company mills consume about 50 million cubic feet of wood a year of which 45 per cent is cut from their own forest. We were interested to learn that in the Sundsvall region and north from there the general situation is that the forests have been cut over in excess of growing capacity and the requirements of the established industry have been reduced by 20 per cent to enable the forest capital to be replenished. There is a definite shortage of raw material

and we were told that the cut in the company's sawmills had been reduced from 100,000 standards per year to 30,000 standards per year over the past 20 years to shift the wood supplies to the pulpmill. Further evidence of the shortage of logs was presented by the statement of one man that sawmills at Sundsvall are going out of business one by one because they are not able to compete with the pulpmills for purchases on the open market.



View from roof of Swedish Cellulose Company plant at Sundsvall showing forest in background and agriculture up to very doors of industrial plant.

The Swedish Cellulose Company spends the equivalent of 36¢ per acre per year on forest improvement work. Sixteen cents per acre is spent on cleanings and 20¢ on improvement work such as ditching, construction of roads and buildings, etc. The mean annual increment in the forest at this point was 43 cubic feet per acre per year.

While visiting some of the plantations of this company we encountered a unique method of treating their logs in the woods. The common method throughout Scandinavia is to peel all the wood in the forest by hand, using a large spud. Following that the logs or cordwood are piled up in a criss-cross fashion and allowed to dry before skigging. At Sundsvall saw-logs were barked at intervals along two sides of the log, the idea being to facilitate drying out of the log but at the same time to prevent checking and bluestain through the rate of drying being too rapid. This method has been patented and that may be the reason why it is not in more general use.



Thinnings stacked for drying in woods at great Kopparberg Company, Gavle.

Our last visit in the forests of Sweden was on the property of the Stora Kopparberg's Company at Gavle. This company dates back to 1288 when they operated the largest copper mine in the world and the wood was used for lumber, mine props, and charcoal. Their pulp mills date from 1900. The company holdings are made up of 75,000 acres of productive forest land with an average stand volume of 2,145 cubic feet per year. Thinnings are made every 10-12 years and 70-75 per cent of the regeneration areas are treated by burning slash following the cutting of the final crop. Burning in this locality is used primarily to remove the slash prior to seeding operations, but further north burning is a means of removing the duff and exposing mineral soil. The company uses 125-150

kilograms of pine seed per year and 70-80 kilograms of spruce seed. About 10 per cent of the cut-over area is regenerated by planting and this is largely spruce. The foresters prefer natural regeneration provided it can be obtained in full stocking in 5 years but, if the natural growth is delayed, planting is undertaken. Currently the rotation is 100 years but this may be reduced to 85 years depending on the site quality.



View in forests of Great Kopparsberg Company, with piles of thinned wood stacked along road.

We visited a plantation of 16-year-old birch growing on land that was formerly river bottom. The birch is 4 inches to 8 inches d.b.h. and the mean annual increment is 200 cubic feet per acre. Spruce is now coming in under the birch and is 5-6 feet high. The objective of management is to get birch plywood at 50-60 years and subsequent to that a final crop of spruce pulpwood.

#### Conclusions

After making a tour such as has been briefly described in this report, it is inevitable that each participant will be impressed by different things, and there is also the feature that there were so many new things to see and learn about that, in retrospect, it is somewhat difficult to pick out the most outstanding. For myself the most impressive things were as follows:

- (1) The chief feature of the Scandinavian forest economy is the cheap transport of raw material by the rivers. Even by our standards some of them are big rivers and in Sweden almost all of the streams flow from west to east carrying logs or pulpwood from the interior to the coast where the main part of the industries are located. This enables the large manufacturing plants to locate at tidewater where they are directly accessible to ocean shipment.
- (2) Although forestry has been practised in Scandinavia for 200 years and they have had forest services for the past 100 years, yet the very intensive type of forestry which we had the pleasure of inspecting is of relatively recent origin, that is, it has only become established within the past 25 years. It is true that previously the people took good care of their forests but by reason of economic circumstances they were not able to do better forest management than to cut to a diameter limit. The first pulp mills became established about 1900 and by 1920 a large pulp industry had been developed, thereby greatly increasing the demand for wood. This scarcity of raw material was the means of increasing prices to a point where it paid to make thinnings in the forest. Then their forest practice became what it is today.
- (3) By reason of such variables as timber type, size of timber, topography, history of economic development, political background, and economic considerations it is not possible for one country to adopt outright--or frequently even in a limited degree--the forest practice and policies of another country. Each country or major forest region has its own peculiar conditions and must work out a solution to its problems in its own way. At the same time the fundamental technical objectives will be the same regardless of geographical location, that is, foresters will seek to get good protection, improve the quality and quantity of the harvest, and balance the amount of the harvest against the ability of the land to produce.

#### IN DENMARK

The main part of the forestry tour ended at Stockholm and the various members went their separate ways from that point. However, excellent work has been done in forest genetics in Denmark and in order to see something of this a short trip was made to Copenhagen and the Island of Zealand.

The Danish countryside is very flat and resembles a huge farm interspersed here and there with woodlots. Everything is on an intensive scale from the farm crops (milk, butter, sugar beets, pork products, barley, flax) to the forests that they grow to supply about half of their wood requirements. Only 8 per cent of the land surface is forested and this constitutes less than 1,000,000 acres. The forest area has doubled since 1865 as a result of the planting of heathlands, reclaimed sand dunes, and denuded areas. Seventy-two per cent of the forest land is privately owned and the remainder publicly owned.

Foresters state that, on account of the comparatively small acreage of forest land, they are afraid to grow anything but the very choicest trees as regards quality and rate of growth. Natural regeneration as a result has been replaced largely by planting nursery stock of known and superior origin. Dr. C. Syrach Larsen in charge of the State Arboretum has developed superior planting stock through seed selection, hybridization, and vegetative propagation on a commercial scale. Twigs and buds are being grafted on young planting stock as well as on individual stems in well established plantations. In the latter case the grafting is done by cutting trees about 2 feet to 4 feet above the ground when they are 6-8 feet high. Trees of that size have developed a good root

system and are capable of supporting the fast growing grafted material from selected parent stock. The grafted trees are spaced at regular intervals throughout the plantations. Grafts are made in the nursery using 4-year-old Douglas fir planting stock cut back to 3 or 4 inches from the ground and the vegetative cutting sealed in with wax. The vegetative cuttings are not made to include the terminal bud but are taken from along the stem starting 3 or 4 inches back and are themselves 4 to 5 inches long.

It is astonishing how the differences in growth habits show up and they are evident in the short space of 2 or 3 years. For seed purposes it is the practice to select about 30 of the most desirable individuals and plant them out in the seed orchard. For experimental purposes an equal number of the least desirable trees are taken and planted out in suitable places sufficiently removed from the seed orchards so as not to permit cross-pollination. In the seed orchards themselves the trees are permitted to grow normally and are not topped. Seed is collected by climbing the trees, and when they start to get too big for convenience they are abandoned in favour of a new crop of elite trees that have been started in the meantime.

A visit was paid to the arboretum at Charlottenlund, the arboretum at Hørsholm, and the Poplar Tree Breeding Station at Stenlille. There were many interesting things to see at these places such as western red cedar trees growing from cuttings; white spruce crossed with Sitka spruce and then recrossed with white spruce; white spruce crossed with Sitka spruce; white spruce crossed with Engelmann spruce and a poplar cross that had grown to 20 inches d.b.h. in 25 years. It was also learned that the 5-needle pine, *Pinus peuce*, a native of Greece, is resistant to blister rust and this may be the means of helping to develop a disease-resistant strain of white pine that can be grown safely in North America.

It is quite evident that Dr. Larsen and his staff are doing excellent work in tree breeding and it was impressive to see that the racial differences of the various crosses show up in a remarkably short time and growth or branching habits are evident at an early age. It does not seem to be necessary to wait for 20 or more years to see what sort of tree will be produced from a particular cross, consequently rapid strides in tree breeding can be made within a few decades from the time that a programme of research has been initiated.

There are many well-managed plantations of West Coast conifers in Denmark and the preferred species are Douglas fir, Sitka spruce, Grand fir, western red cedar, western hemlock, western larch, and amabilis fir. Yields are high--up to 280 cubic feet per acre per year. One plantation of Douglas fir mixed with Sitka spruce was 63 years old, 100 feet high, and had diameters up to 18 inches d.b.h. A Sitka spruce plantation 43 years old, had an average height of 85 feet for the dominant trees and diameters up to 18 inches d.b.h. with an average of 14 inches. Thinnings are made at short intervals and in some cases even on an annual basis. The universal practice is to thin from below and the foresters with whom we came in contact did not know of a single case of thinning from above anywhere in Denmark.

Spacing is close in plantations, 4 feet  $\times$  4 feet for conifers and 3 feet  $\times$  4 feet for hardwood. The Danish foresters think nothing of paying up to \$50.00 per thousand for special certified planting stock and planting costs run from \$40.00 to \$140.00 per acre depending upon the stock planted. It is intensive forest management and one estate employs one full time labourer the year around for every 86 acres of forest. One State Forest Service ranger who was visited had a ranger district of 1,000 acres and the national average for ranger districts is 1,200 acres. Even by Scandinavian standards this is very intensive forest management, but the Danish authorities feel that it is in the national interest to maintain the present forest area in a high degree of productivity so that in the case of dire necessity, such as a war, the wood requirements of the nation can be obtained at home for 2 or 3 years.

There are 250 foresters employed in Denmark of which 50 are State employees and 200 are employed by private land holders. The foresters have a professional society called the "Association of Danish Graduates in Forestry" which has combined the functions of our Canadian Institute of Forestry and the Association of British Columbia Foresters. This Association can not prevent any land owner from employing a man and calling him his chief forester. The organization mostly holds meetings and stimulates interest in technical matters.

#### FORESTRY IN SCOTLAND

An opportunity was afforded to have a brief introduction to some of the forestry problems in Great Britain. It would appear, in general, that the problem in Britain is one of conversion from agriculture to forestry. The clash of interest arises between the grazing people and the foresters, and the men in the Scottish Division of the British Forestry Commission state that if the grazing capacity of an area is  $\frac{3}{4}$  acre per ewe per year then grazing is justified economically. However, if 5 or more acres per ewe are required then the Forestry Commission believes that it has a prima facie case for conversion to forestry.

Through the courtesy of the Commission officials at Edinburgh we had an opportunity to look at plantations at Aberfoyle, Loch Katrine, Callander, Dumblane, Aberfeldy, Loch Tay, and Drummond Hill. We saw plantations of Douglas fir, Sitka spruce, western red cedar, and western red alder of our own west coast species. Some of these plantations were established in the early 1920's and they are now coming into their first thinning. The thinnings are being utilized for pit props and a timber sale made just prior to our visit had been bid in at a price of one per cubic foot. This would work out at a rate of about \$33.00 per M. B. M. for stumpage.

At the Drummond Hill forest, which is 5,300 acres in area, a supervisory staff of 3 men is employed full time together with 35 woods labourers or at the rate of about 1 man for every 150 acres. The workers are paid £4/14 per week with a bonus of 5/- or 2/6d per week depending upon the quality of the work. Most of the felling and bucking, however, is on a piece work basis whereby the men earn somewhat more than by being paid on a daily basis.

A visit was paid to the Benmore Forest which lies immediately north of Holy Loch, near Dunoon. Benmore was formerly a private estate but in 1928 it was turned over to the Government and now forms part of the Argyll National Park. The first point of interest was a 100-acre arboretum immediately surrounding Benmore House. From 1870 to 1880 Mr. James Duncan established the estate and proceeded to build up an arboretum in which he planted exotic conifers and shrubs from all over the world. The more common conifers are Scot's pine, Norway spruce, grand fir, noble fir, Douglas fir, Port Orford cedar, and Sitka spruce. There are over 200 species of rhododendron, together with azaleas and many other kinds of shrubs. We were interested to find some salal growing at the foot of Douglas fir and Sitka spruce. The trees have made phenomenal growth and there was one Douglas fir 150 feet high and Sitka spruce 129 feet high. The Sitka spruce had a d.b.h. of 40 inches and currently seemed to be growing at a rate of between 1 1/2 and 2 inches in diameter per year.

The plantations established by the Forestry Commission at Benmore are mostly spruces and larches with smaller amounts of Scot's pine and Corsican pine, Douglas fir and true firs. Sitka spruce has been used on sites which are particularly exposed and considering the growing conditions appears to be quite satisfactory. There are about 50 men employed full time at this forest.

An inspection was made of the Devilla Forest Nursery where the Forestry Commission is attempting something new in nursery work. Previously their nurseries had been established on land which was used for agriculture for many years and, in the course of time, these nursery sites developed problems in disease control. The idea was conceived that by establishing nurseries on new soils that had not been used for agricultural crops many of the nursery troubles would be avoided. The Devilla Nursery has been established on a heath soil which is being enriched by compost fertilizer. The results are very satisfactory and 1-year-old pine and Douglas fir were making about twice the growth of similar stock in a standard nursery. Scottish foresters hope that in these heath-soil nurseries, and with the use of fertilizers, they will be able to produce satisfactory 1-0 planting stock.

The return flight from Prestwick was made via Keflavik, Iceland, and Goose Bay to Montreal. In the morning of October 5 we crossed over Greenland and we certainly agreed with the old hymn which speaks of Greenland's icy mountains. They run up to 7,000 feet and are extremely rugged and covered with ice and snow. With overnight stops at Montreal and Vancouver we arrived back in Victoria on October 8, 71 hours and 35 minutes of flying time after our departure on August 17.

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