

Working Papers of the Finnish Forest Research Institute 38: 36–41

Forest Planning in Private Forests - Norway

Tron Eid

Norwegian University of Life Sciences

1 Background

The productive forest area in Norway is approximately 7 mill. ha. Non-industrial private forest properties, represented by 120 000 owners, cover almost 80% of this area (Statistics Norway 2003), i.e. the average size of the private forest property is approximately 45 ha. The management of these forest properties have traditionally been combined with agricultural production. This combination is still important, but over the past decades an increasing part of the owners' incomes are coming from outside the farm. The forest area in Norway is also highly non-homogeneous with respect to productivity, elevation and terrain. Forest planning in Norway is therefore carried out within a framework of high diversity with respect to the owners' education, occupation and goals, and within large variations for natural conditions.

The first forest plan in Norway was worked in 1875, but systematic forest planning covering significant areas in private forests started in the early 1950's. The activities in forest planning reached a peak in the 1990's. Over the past few years the planning has comprised 300 000-500 000 ha forest land per year. This corresponds to 10-20 years cycles to cover the entire area of productive private forest land in Norway. The aim of the present paper is to give a brief description of planning in private forests in Norway.

2 Stakeholders and procedures in private forest planning

2.1 Stakeholders

The Ministry of Agriculture and Food provides regulations for forest planning. The Ministry also has the overall responsibility for administrating the subsidies related to forest planning. The present regulations from the Ministry (2004) focus on the plan content and on the quality of the plan content. Previously these regulations also comprised detailed requirements for the inventory methods to be applied. According to the new regulations, the stakeholders of a planning project may freely choose inventory method as long as the basic requirements with respect to content and

quality is fulfilled.

The forest planning projects may be divided into two groups, i.e. projects for “individual owners” and projects for “large areas”. Projects for individual owners are mainly done for large industrial properties. The vast majority of projects are performed as projects for “large areas”. Generally such projects cover 5-15 000 ha of forest land. In 2004, 41 projects were started for a total area of approximately 500 000 ha. The 41 projects comprised nearly 7 500 properties (NIJOS 2005). As an integrated part of the conventional forest planning, i.e. planning focused on timber production, also assessments related to biological diversity may be performed. Since such assessments form the basis of the Norwegian certification regime (PEFC), integrated projects are quite usual (35 out of the 41 projects started in 2004). In general there are three main stakeholders in the forest planning projects for large areas:

- The county authorities have the administrative responsibility. They initiate a new project according to an over-all 10 year main plan for the county. In addition they provide administrative services and expertise for individual projects.
- The forest owners, represented by the local forest owner association, are the buyers of the data and work out the requirements for the content of the plans.
- The forest planning companies are the supplier of data and work out the final plans.

2.2 Procedures

A forest planning project is initiated by the county authorities according to the over-all 10 year plan. The first task is to settle a steering committee for the project. The local forest owners constitute the majority of the committee. Professional local foresters from the association forest owners and from the municipality may also be members. An expert from the county authorities is administering the committee and acting as a secretary. The most important task of the committee is to prepare requirement specifications for the plans to be developed. These requirements are usually sent to several planning companies. The companies then work out bids to the steering committee with a detailed description of plan content, quality (accuracy) of the data, inventory methods to be applied and prices of the product. The number of planning companies involved in the competition for a project is varying, but from a situation 5 years ago, where almost all projects were given to one company without any competitive bidding, today most projects involves competition between two or more companies. The next task of the steering committee is, according to considerations on plan content, quality (accuracy) and price, to choose the company they want to do the actual planning work. Most of responsibility in the project is from now on in the hands of the planning company. The task of the steering committee is limited to follow up the work of the companies related to the inventory, to the design of the plans and to coursework for the forest owners when the plans have been finalized. The total duration of a project from the first initiative of the county authorities to the finalized plans is usually 3-4 years.

3 Inventory methods

Three main data sources constitute the basis of a forest plan. The first source is electronic data from official map series with information on property boundaries, land use classification, infrastructure and topography. The second data source is digital aerial photographs covering the whole

area subjected to planning, and the third source is data from field-, photo- or laser inventories.

The most widely applied inventory method is a “photo inventory”. Over the past years this method has been applied for an increasing part of the forest area, and today almost 90% of all inventory work in private planning is based on the method. Several variants of the inventory method are carried out, but in general there are four main phases;

- Stand delineation based on photo interpretation
- Stand inventory based on photo interpretation
- Field control in stands
- Systematic sample plot inventory covering the entire area of the project for calibration of the subjectivity of the photo interpreter

The stand delineation is in general based on criteria like main tree species, development class and site quality, but also on practical considerations related to the treatment of stands. In the stand inventory, which depends on the individual photo interpreters’ judgements, volume, species proportions, mean height, basal area, site quality, and age is assessed. In the third phase, all stands are looked up in the field, and, if necessary, the results of the photo interpreter are calibrated. For some projects only a part of the stands are controlled in the field, usually those close to maturity and with a high productivity. There are even projects without any field control where the plan is based solely on the photo interpretation. In the fourth phase, a systematic sample plot inventory covering the entire area is carried out. The results from this inventory are used for calibration of potential biases of the individual photo interpreters with respect to their volume estimates at the stand level. The calibration is supposed to provide an unbiased volume estimate at the property level. Previously this systematic inventory was compulsory for all projects. In the new regulations from the Ministry there are no such requirements, and today only a few projects include a systematic sample plot inventory.

“Relascope inventories” are carried out for 5-10% of the area. This inventory method comprises three phases starting with stands delineation based on photo interpretation, continuing with a stand inventory with relascope plots distributed subjectively in each stand and ending with a systematic sample plot inventory for calibration of potential biases from the relascope inventory. Over the past few years, an increasing number of projects have been based on “laser-scanning inventories”. This method is a combination of photo interpretation (stand delineation, and assessments of species distribution, site quality and age), laser-scanning (volume, height, basal area, no. of trees, etc.) and a systematic sample plot inventory (for calibration of the laser-scanning data). It is expected that laser-scanning in future will play an increasingly important role for the planning of private forests in Norway. So far 8-10 such projects have been carried out.

4 The forest plan

4.1 Content

The content of a Norwegian forest plan may be divided into three main parts;

- A forest map with delineated stands
- A description of the present resources

- A description of treatments

In addition to basic features related to the topography and infrastructure, the standard forest map usually displays information on development class and site quality for all stands within the property. Alternative forest maps related to different themes may be requested. The resource description (present state) may be divided into two parts. Firstly, summary figures and tables with information at the property level (total area distributed on productive forest land and other land-use categories, total volume, species distribution, development class- and site quality class distribution, and current total growth according to different classifications) is presented. Secondly, there is a detailed description of each individual stand (area, development class, site quality, age, volume for different species, and possibly information on mean height, dominant height, basal area, and number of trees).

The description of the treatments may also be divided into two parts. At the property level, there may be a suggestion for the overall annual harvests for the next 10 years. Previously the potential annual harvests suggestion was based on compulsory computations with a large-scale scenario model. Such computations are now less frequently performed, and quite a large number of plans are today produced without any overall harvest suggestion for the property. Treatment suggestions for each individual stand may also be a part of the forest plan. Here basic silvicultural works such as timing and performance of final harvests, regeneration method, young growth tending and conventional thinning are described. These suggestions are mainly based on visual assessments performed by the planners in the field. Since a field control of each stand no longer is compulsory, an increasing part of the plans are produced without any treatment suggestions at the stand level, or with only a part of the stands having such suggestions. Although there are variations between projects and among the companies, this means that the present Norwegian forest plan is becoming like a description of the present state than an actual plan for future activities in the forest.

The forest plan may be offered as a written document or as an electronic plan. An increasingly proportion of the plans are now delivered as an electron plan. The forest owners are in such cases provided with software including GIS-tools. With this software the forest owner may produce summary tables as well as maps on different themes. In addition the software can be used for updating the state of stands and for delineation of new stands according to performed treatments. The software may also be used for updating the state according to an estimated growth for individual stands.

4.2 Costs and prices

A relatively large number of investigations have been done over the past 10 years in order to evaluate the quality of the forest plans (see e.g. Eid 2003 and Eid et al. 2004). The figures on expected accuracy (random errors for volume at the stand level) and biases (systematic errors for volume at the property level) in Table 1 are based in these investigations. In addition the table shows estimates for the costs related to different products/plans.

Table 1. Expected accuracy, biases and costs according to different products and methods.

Product/Method	Accuracy (%)	Biases (%)	Costs (EUR ha ⁻¹)
Stand map (site quality/development class)	-	-	2-3
Photo inventory only	20-30	0-30	5-8
Photo inventory - field control in stands	15-25	0-30	10-20
Photo inventory - field control in stands and systematic sample plot inventory	15-25	0-5	15-25
Laser-scanning and photo inventory	10-15	0-5	10-20

The figures presented in Table 1 are involving all costs of the planning companies related to field work, data management and finalizing plans. The price for the forest owner is reduced considerably due to subsidies provided by the public authorities. The subsidies may vary between 30% and 70% depending partly on local regulations. The figures in table 1 are not differentiated according to the property size, but reflect the average. For the forest owners, the price ha⁻¹ for the product in general decreases when the size of the property increases.

5 Concluding remarks

Since year 2000 there has been substantial changes in practical forest planning for private forest in Norway. From more than 20 different departments closely connected to their respective local forest owners associations, the work is today performed by 6-7 companies, totally or partly, independent of their forest owners associations. The main result of these changes has been larger and more professional units. At the same time the Ministry has provided for a planning environment with fewer regulations and with more competition. Along with these two main changes in the organisation of the forest planning, we have, however, also seen a decreasing willingness among the forest owners to pay for the planning products. A “more distant relation” among the forest owners to the forestry activities in general, along with decreasing timber prices over some years, are probably the main explanations of this negative trend. The main result of these changes has been a focus on cost reductions in all phases of the planning work. The inventory procedures have changed towards more remote sensing, and less conventional field inventories. The product (plan) has become more differentiated, i.e. the forest owners may choose among different alternatives according to content and quality. In general this means that the Norwegian forest plan of today is offered to a lower price, but also with a poorer quality than previously.

References

- Eid, T. 2003. Kontroll av relaskoptakster og fototakster. Pp 10-17 in Registreringer i Aas skog 1960-2000. Aktuelt fra skogforskningen 5/03:1-17. (In Norwegian)
- Eid, T., Gobakken, T. & Næsset, E. 2004. Comparing stand inventories for large areas based on photo interpretation and laser scanning by means of cost-plus-loss analyses. *Scand. J. For Res.* 19:512-523.
- NIJOS (2005). Kontroll av skogbruksplanprosjekter 2003 og 2004. Note from the Norwegian Institute of Land Inventory. 4 pp. (In Norwegian)
- Statistics Norway (2003). Forestry Statistics 2003. Official statistics of Norway NOS D 320.