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Forest Management Planning for Private Forest Owners in Sweden

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1 Background

Sweden has 27.4 million hectares of forest land, according to FAO's definition, and 22.9 million hectares with a potential growth over 1 m^3 per hectare and year of which 11.6 million is owned by 350 000 private owners (SLU 2005). The number of holdings are 240 000, thus the average size is 45 hectares. Most forest owners have other sources of income for their living. Of the owners 38% are women, and 37% do not live close to the holding (The Forest Agency 2006).

2 History of forest planning

The Swedish Forest Agency began forest management planning in the 1930's when aerial photos became available. The planning work became more systematic during the 1960's. It was mandatory for all private forest owners to have a management plan according to the Forestry Act between 1983 and 1993..This was largely the result of the forest industry's inability to obtain sufficient amounts of raw timber. A lot of private forest owners had high marginal taxes (>70%) on incomes from the forest and were unwilling to sell timber. Forest owners with management plans had proven more active (and supplied more timber).

Subsidies were available to the Swedish Forest Agency for production of forest management plans. The production of plans was integrated with a national programme the General Forest Inventory of all private forests. From 1983 to 1990, the Swedish Forest Agency produced plans for approximately 700 000 ha per year. Forest plans covered 90 % of all private holdings by 1993 (plans not older than 15 years).

The plans were produced with rough subjective methods, i.e. estimations rather than measurements.

There where criticisms of these plans for many reasons. The quality was low in the description of the stands (subjective estimations, with no or few measurements) as well as in the management

proposals (based on subjective assessment and not analysis). This was made obvious by the development of a new planning system (The Forest Management Planning Package, Jonsson et al. 1993) designed for forest companies with large holdings. This system demonstrated the need for changing forest management practices in company forests.

The system was also demonstrated on a few private holdings and that showed the low quality (Eriksson 1990).

The programme was a considerable expenditure for the state in the form of subsidies. According to nature conservationists, the programme also placed too much focus on timber production and too little on nature conservation. At the beginning of 1990's the forest management plans became voluntary again, and planning activities fell to less then 200 000 hectares annually. Sweden adopted a new Forest Act from 1994, where the general idea was to give equal weight to production and environmental goals.

Environmental consideration was included in the forest management plans, and different variables were assessed for this purpose. The Swedish Forest Agency and the forest owners' association, Södra, developed a system called "Green Forest Management plans" in 1995.

For each stand a long-term production and/or environmental goal is formulated in one of four classes and the assessment of forest production and nature values are reported. These are PG - production goal with general nature conservation consideration, PF (or K) - production goals with reinforced conservation consideration, NS - nature conservation goals where management is needed to sustain the conservation value, and finally NO - nature conservation goals where the forest should be left untouched. The balance between these goal classes is specified on estate level. In a "Green Forest Management Plan" 5 % of the forest area should be in goal class NS/NO, another 5 % in PF, and 90% in PG. Holdings of less than 20 ha have no requirements regarding balance. A Green FM plan is required within 5 years for certification from FSC (Forest Stewardship Council).

Other organisations may make different, additional demands. The forest owners' association, Norra Skogsägarna (Eriksson, J. pers comm) call their FM plans "Ecoplan" (eco from both ecological and economic) and consider 5 % NS/NO the central part and put less emphasis on another 5 % PF.

Since 2003 a Forest and Environment Declaration is required according to the Forest Act (The Forest Agency 2006). The owner must have information about his or her forest. These data are both forest data for stands such as area, age, if regeneration activities are required, and environmental data: area with broadleaved hardwood, nature reserves, protected biotops, wetlands with special value, the presence of archaeological sites, and other valuable areas. This regulation makes at least a simple forest management plan necessary. The information is for the benefit of the forest owner and there is no plan within the Forest Agency for a follow-up of the regulation.

Forest planning systems have generally been available for the private forest owners since the 1980s, and to some extent before that time. Most of the systems offer little guidance to the owner for making economic management decisions, but some professional systems include possibilities for economic optimisation. This is the situation today, despite the possibilities for sorting the data, printing of pedagogic maps, updating the information with annual growth, changes in stand boundaries, and completed management activities.

3 Kind of planning, purpose, time scale

Planning should be normative, i.e. help the owner to achieve his/her goals within the frame of the Forestry Act and other rules set by society. The planning process needs sufficient, accurate data and should ideally be based on extensive analysis and the comparison of the outcomes of management alternatives. In real life, plans for private forest owners are often based on subjective data and management proposals. Also, there is a need to identify the goals of the forest owner and to adopt the plan to fit them. Many (most) owners lack clear ideas concerning their goals. Therefore much work is needed in this area.

Green FM plans are a means of implementing the goals of the forest owners' association, Södra, and the Forest Agency (e.g. the politicians) of setting aside a proportion of forest land for conservation.

During the 1980's the FM plans were aimed at both more intensive timber production and higher supply of round wood for the forest industry. This was based on experience gained during the 1970's. In Älvdalen 2000, the establishment of forest management plans led to increased activity (Svensson 2002) when compared to the previous years. Clear cuts, soil scarification and cleaning increased 150-200% and precommercial thinnings and thinnings increased 400-500%. Also, the forest management plan resulting in many forest owners transferred their holding to another person.

FM plans in Sweden are made with a 10 year planning horizon. On the strategic level, a longer planning horizon is necessary. The long term judgements are made by comparing total cut volume during the 10 year planning period and growth, also considering clear cut area and age class distribution. In general long term optimization is not done.

FM plans should be updated every year and revised after a few years. This is not done in most cases, but organizations making plans offer this service as an option, and it might be more common in the future, especially if web based techniques are used.

Forestry and therefore forest management planning in Sweden, has been and still is primarily focused on timber production. Timber production is important for the country and has a strong tradition. The last 15 years (1990-2005) has seen a trend towards nature conservation, but during last few years the interest in production has increased again.

There are of course uses other than production and nature conservation. Reindeer herding is important for the Sami people and there are cultural heritage values for the Swedish people as well.

4 Regional levels of planning

Sweden has a long tradition of planning at the regional level. This type of plan is the result of the analysis of different management alternatives (and not optimization, the forest has many owners). The analyses are based on sample plot data from the national forest inventory and since 1985, the Hugin-system (Bengtsson et al 1989, Lundström & Söderberg 1996) has been used. Calculations are done for timber balance areas (see Figure 1) and separated among private forest owners and other owners (mainly companies and public owners). Calculations are done for 100 years in 10

periods. National analysis was done 1985, 1992, 1999 and 2003. Special analyses have been done between these dates, including detailed analyses for some areas.

There is no direct link between the regional planning level and the management planning for a private forest holding.

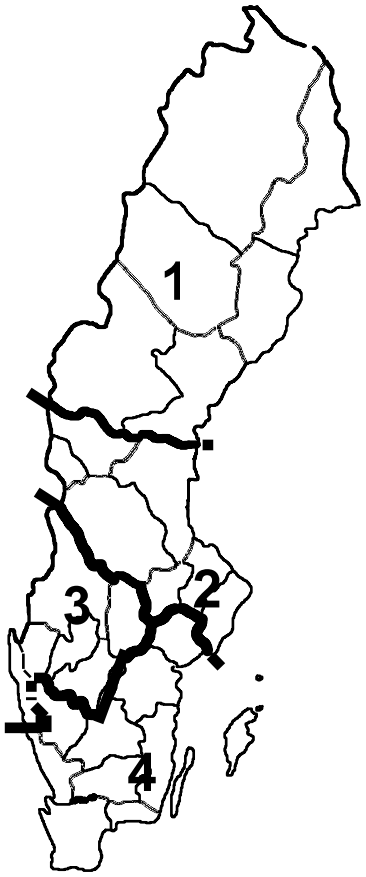

Figure 1. Timber balance areas in Sweden.

5 Planning activity

Approximately 4 million hectares have FM plans that are less then 10 years old (Table 1). The dip in planning activity 2005 is in a large part the result of damage from the storm "Gudrun" in January 2005, that felled appro. 70 million m^3 of forest.

Table 1. Area (1000 of ha) of field data capture for green plans (Ragnar Spross, pers comm)

Year	1997/98	1999	2000	2001	2002	2003	2004	2005	Sum
Area	460	540	830	630	550	480	440	140	4080

Management plans are most often produced by timber buying organizations (Table 2). The planning work is done by their employees, or often by contractors hired by these organizations. The

main purpose for these organizations is the provision of services. It is their objective to help the forest owners make decisions regarding where to cut, with the ultimate goal of buying the timber. Another reason is to impose nature conservation strategies on the forest owners.

Table 2. Organizations proportion of planning market (Ragnar Spross, pers comm)

Organization	Type of organization	Market share
Forest Owner Association		49 %
The Forest Agency		31 %
Skogssällskapet	– forest mgmt org	4 %
Sydved	– round timber buyer	4 %
Others	– companies, buyers	12 %

The area certified is 2.9 mill ha (>1 m3/ha, year) with group certification according to PEFC (PEFC 2006, Lundell S pers comm), and 0.45 mill ha (>1 m3/ha, year) with group certification according to FSC (FSC 2006, Häggström E pers comm). The latter figure also includes some areas owned by others than private persons.

6 Making FM plans

Subjective inventory methods (relascope) are used widely. Aerial photo interpretations are done in the first step by some organizations (Forest owner associations Norrskog and Norra Skogsägarna). The planners start each season in May with a short training course. The length of this training varies from a couple of days up to two weeks depending on the prior experience of the people.

Some organizations do a follow up of the quality of the plans. Comments, management proposals and other information in the plan are checked before the plan is delivered to the forest owner. Also some organizations make an objective sample plot inventory in some stands. This is to give feed back to the planner, but also to give a declaration of the quality of the data delivered during a season, and the salary to the planner is based on these results.

There is no official standard for what information should be contained in a forest management plan or for standards of quality. Neither is there a formal requirement that the plan be made by a certified person, or a person specifically educated to do so. But in reality those making plans have two years of forest education.

Field computers are often used during the field work. Aerial photos and maps with boundary lines for the estate are included, as well as the programmes needed to handle the data and assessments of the planner.

7 Who can contribute to the FM plan

The planner is the most important person as they make most of the necessary measurements and

judgements, and propose management activities. Eventually an aerial photo interpreter makes delineations, estimations and measurements. The forest owner decides who or what organization will make the plan and what other values should be considered. The owner also formulates the goals and may provide some data. The public/politicians make regulations, extension service(s), tax regulations and other factors that may influence the design or content of a forest management plan. The authorities provide data via internet (Swedish Forest Authority and the County Administration about valuable biotops, the National Heritage Board about sites of special cultural or historical value, the County Administration may provide data via the internet about nature conservation and in some cases local authorities provide land use plans. The Swedish Society of Nature Conservation makes data available to the local authority/ administration or forest owner, reindeer herders and the appropriate authority have data about areas of interest for their needs, in Ren2000 (Länsstyrelsen i Västerbotten 2006).

8 What kinds of documents are made?

The management document includes the name of the estate and the owners' name and address. A description of the goals is sometimes included. The name of the planner and date the plan was completed are included, and a description of the method for data collection and establishment of management proposals are often included as well. Sometimes there is a statement about the data quality, or rather possibility of inaccuracy. This is followed by a description of the state of the forest in tables, figures and often in text form.

A very important aspect that is always a part of the plan is a forest map showing the identity of and the delineation of the stands and a standwise description of the forest. The map is often used in conjuntion with an aerial photo (ortophoto). Thematic maps of different kinds are often included showing land classes, goal classes and cutting classes of the forest.

The standwise description also includes management proposals. A summary of proposals and their consequences in ha, m^3 and age class distribution is also included, and a comparison of the estimated growth is common. The plan is often available in a digital version.

The plan belongs to the owner! Neither the state, nor the public is given access without permission from the owner. However some data from the General Forest Inventory from the 1980´s and some data bases are in the public domain.

9 Variables in the plans

- Stand identity
- Area
- Land class
- Cutting class/ tree layer
- Age
- Site index
- Standing volume
- Tree species composition)

- Average diameter (not always included)
- Average height (not always included)
- Stem number (not often included)
- Basal area (not always included)
- Soil moisture class (not always included)
- Terrain class (not always included)
- Management proposal
- Time period (immediately, -5 yrs, 6-10 yrs, sometimes also 11+ yrs)
- Cut percentage
- Cut volume
- Medium, higher and lower level of proposal of cut (not always included)
- Goal class – proposal for balance of timber production and nature conservation
- Description, comments on both production and nature conservation
- Comments regarding the management proposal

10 Future trends – changes in forestry

There will be an official forest policy report released on October 3, 2006 (Skogsutredningen 2004). According to preliminary information a suggestion about mandatory forest management plans will be included. A political process will probably follow giving goals and direction for approximately the next 10-15 years.

The forest industry is very important in Sweden and the demand for bioenergy is increasing. Other uses and interests found in forest lands are also growing or more clearly pronounced and they will become increasing important in future forest management planning. Increasing knowledge of these other users and values will faciliate their inclusion in the planning process.

Another interesting change is that the forest estate prices are increasing. This is partly caused by low rate of interest on loans.

Trends in forest management planning include development of a new generation of planning system (Mistra 2006). This system named “Heureka” will also be applicable for private forest owners. This system provides better problem analysis, more accurate consequence descriptions, and better management proposals that will increase the efficiency of resource management and utilization. All planning requires accurate data. Perhaps the technology for remote sensing will improve and coupled with field measurements make this type of data collection possible for small private forest holdings at a reasonable cost.

There are also research programmes aimed at making forest management plans more flexible, and adapted to the needs of the individual forest owner.

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