The forest planning process among medium-sized forest owners

– description of the group and how they adapt the traditional planning hierarchy

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Degree project • 30 hp
Swedish University of Agricultural Sciences, SLU
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Master of Science in Forestry
Arbetsrapport / Sveriges lantbruksuniversitet, Institutionen för skoglig resurshushållning, 527
ISSN 1401-1204
Umeå 2021

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Credits:	30 hp
Level:	A2E
Course title:	Master's thesis in Forest Science, A2E – Forest Resource Management
Course code:	EX0966
Programme/education:	Jägmästarprogrammet/Master of Science in Forestry
Course coordinating dept:	Department of Forest Resource Management
Place of publication:	Umeå
Year of publication:	2021
Cover picture:	Martin Persson
Title of series:	Arbetsrapport/ Sveriges lantbruksuniversitet, institutionen för skoglig resurshushållning
Part number:	527
ISSN:	1401-1204

Keywords: Forest planning, medium-sized forest owners, strategical planning, tactical planning, operational planning, planning hierarchy, decision support system

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Abstract

Forest planning has traditionally been divided into strategical, tactical, and operational planning all integrated into a hierarchy. Forest planning has been a crucial success factor for the Swedish forest industry, and the planning processes among corporations and small private forest owners have been frequently examined. However, the group of forest owners in the border zone between these two categories has not been evaluated before. The primary purpose of this study was to investigate the forest planning processes among medium-sized forest owners in Sweden and to observe and explain differences within the group. The groups relation to the traditional planning hierarchy was also an important aspect to consider, and a general description of the group was desirable to present. A mixed-method approach was used, combining quantitative survey data with qualitative interviews. Some quantitative questions were tested for significance using Welch's two-sample t-test, but most of the questions were not suitable for statistical analyses. Three interviews were conducted.

The results indicates that medium-sized forest owners adopt the traditional planning hierarchy to a large extent, but uncertainty exists regarding the operational planning process. Medium-sized forest owners strongly link to the tactical planning process, with a high share of the respondents conducting planning that is recognized as necessary within the tactical planning horizon, but surprisingly few used decision support systems. However, some expressed views that the tactical harvest plan is not that important and distinguished the harvest plan from the reality. Most forest owners had strategic plans, but fewer had plans regarding nature conservation and ecological landscape plans. Financial return and passing down a heritage for the next generation are the two most important of nine parameters for medium-sized forest owners.

Keywords: Forest planning, medium-sized forest owners, strategical planning, tactical planning, operational planning, planning hierarch, decision support system

Sammanfattning

Skoglig planering har traditionellt delats upp i tre huvudsakliga nivåer: strategisk, taktisk samt operativ planering som alla ingår i en hierarki. Skoglig planering har spelat en nyckelroll for den svenska skogsindustrin, och planeringen hos stora företag och små privata markägare har studerats tidigare, men gruppen däremellan, mellanstora skogsägare, har inte studerats. Det primära syftet med denna studie var att undersöka den skogliga planeringen hos mellanstora skogsägare i Sverige och observera eventuella skillnader inom gruppen. Målgruppens relation till den traditionella planeringshierarkin var en viktig aspekt att betänka och en generell beskrivning var också önskvärd att göra. För att besvara frågeställningarna användes mixade metoder bestående av kvantitativa enkätdata samt kvalitativa intervjuer. Welchs tvåpariga t-test användes för att testa vissa frågor för signifikans, men de flesta frågor var inte lämpliga för statistiska analyser. Tre intervjuer gjordes.

Resultaten visar att mellanstora skogsägare tillämpar den traditionella planeringshierarkin till stor del, men det råder osäkerhet kring den operativa planeringen. Mellanstora skogsägare har starka band till den taktiska planeringen, då en stor del av respondenterna gjorde planering som är vital inom den taktiska planeringen, men överraskande få använder beslutsstödsystem. Vissa uttryckte åsikter om att taktisk avverkningsplanering inte är särskilt viktigt och skiljde den från verkligheten. De flesta respondenter hade strategiska planer, men färre hade planer angående naturvård samt ekologiska lanskapsplaner. Ekonomisk avkastning samt att föra vidare ett arv till kommande generationer är de två viktigaste parametrarna av nio för medelstora skogsägare.

Nyckelord: Skoglig planering, mellanstora skogsägare, strategisk planering, taktisk planering, operativ planering, planeringshierarkin, beslutsstödsystem

Preface

This master thesis is the last piece of work I conduct at SLU after five great years at jägmästarprogrammet (Master of Science in Forestry*)*. The thesis itself was initiated by Karin Öhman and Patrik Ulvdal at the department of forest resource management at SLU. During this semester, I have used the knowledge inherited throughout these years in the academic world and I hope that this thesis will be used somehow.

Martin Persson
Umeå, 2021

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Abbreviations

SLU	Swedish University of Agricultural Sciences
DSS	Decision support system
ELP	Ecological Landscape Plan
SCA	Svenska Cellulosa Aktiebolaget AB
FMP	Forest Management Plan
NIPFO	Non-Industrial Private Forest Owner
SFA	Swedish Forest Agency
PEFC	Programme for the Endorsement of Forest Certification
GIS	Geographic Information System

1. Introduction

The forest sector in Sweden does often flourish with their reputation of Sweden being one of the most prominent forest nations on earth (Swedish Forest Industries n.d). Forest research, management and technical development have been crucial success factors (Lundmark et al. 2017). However, the forest resource is limited by area and extended time horizons, and planning is a prerequisite for a sustainable and competitive forest sector. The Swedish Forest Agency (2019) points out monitoring and planning as essential components for having active and profitable forestry, which also is reflected in Swedish forest statistics. Forest growth has been larger than the harvest ever since the Swedish National Forest Inventory started in 1923, except for a few years (Swedish University of Agricultural Sciences 2020). The ability to form the future by planning and decision-making is considered an essential factor for success (Swedish Forest Agency 2019), why it is of interest to investigate the underlying processes and methods.

The whole forest area in Sweden can be divided in numerous ways and forest owner categories is a common division. According to the Swedish National Forest Inventory, 52.6 % of the productive forest is owned by private individuals, 24.5 % by private companies and 22.8 % by other owners, including authorities, forest commons and state-owned companies. (Swedish University of Agricultural Sciences 2020). However, there are significant regional differences, where the north part of Sweden has a higher share of company-owned forest and southern Sweden a larger share of private individuals. Forest property sizes also differ from north to south, as the mean property size increases further north (Christiansen 2018).

Medium-sized forest owners are a group with no clear definition and are also poorly examined, why this work aims at bringing light and knowledge about this group regarding forest planning. There are nearly 320 000 forest owners in Sweden (Swedish Forest Agency 2017) but medium-sized forest owners only consist of roughly 100 owners by the definition used in this thesis (5000 – 200 000 hectares of productive forest land). This introduction will further describe forest planning and different groups of forest owners in Sweden.

1.1. Objective

The primary purpose of this thesis is to investigate the general planning processes of medium-sized forest owners and observe differences within the group and the reasons why they might differ. It is also of interest to examine how they relate to the planning hierarchy and to give a general description of the group and their main objectives based on the survey questions. The following research questions will be answered:

- How is the planning process designed considering structure, organization, information, decision support system, and objectives?
- Are there differences within the group? What are those and why do they occur?
- How does the group relate to the traditional planning hierarchy?
- Which other indicators can be used to describe medium-sized forest owners except hectares?

1.2. The concept of planning

Planning is linked to the cognitive capacity to make decisions in advance (Owen 1997). However, there is no commonly agreed universal definition of planning. Eliasson (1976) describes planning as a repetition of a process, and it can be viewed as a contemplated timeline of a future scenario. Historically, planners have relied on the rational planning model, here described by Rothblatt (1971). The model is divided it into six phases:

- Overview
- Goal formulation
- Criteria based on goals.
- Examination, evaluation, and choice
- Implementation
- Feedback and adjustment.

The rational planning model met criticism by Simon (1960), who meant that there are too many limitations for the rational planning model, meaning that it requires too much information and time to be conducted properly, resulting in choosing the best-known and not necessarily the optimal solution. Simon introduced the term bounded rationality to describe this phenomenon (ibid).

Pukkala (2002) suggests that decision-making in forest management should be supported by forest planning. The purpose of planning is to generate alternatives of

management practices and essential information linked to the alternatives, ultimately guiding decision-makers to agree on the best solution. One common definition of planning is the process of governing a specific business to a commonly agreed objective (Eriksson 2008a) and various plans will therefore shape the future differently. For forest planning, researchers at the Swedish University of Agricultural Sciences (SLU) made a definition in the compendium *Skoglig Planering* (Eriksson et al. 2008), defining a plan as "a number of intentional and linked decisions that have been documented and deal with future actions". Nevertheless, planning and decision-making are not synonyms. Eriksson et al. (2008) suggest that planning comes with complexity and that planning includes multiple decisions to be made. Furthermore, decisions can be made without planning, or they can be decided based on a plan, but decisions are a core part of planning.

Planning is a broad term, and common phrases within forestry are planning processes and planning systems. Eriksson et al (2008) use the term planning process for a single activity within an organization. A planning system is identified as a series of planning processes linked to each other. Most organizations do their planning at different levels, and we can therefore use the term planning system for the integrated planning in an organization, including all planning processes (ibid).

One aspect of planning is what the planning is supposed to achieve. The objectives can vary between organizations. The Swedish Forestry Act (SFS 1979:429) explicitly states that the forest should give a decent revenue, while preserving the biodiversity at the same time, leaving forest owners to govern the forest as they find appropriate to fulfill those two equal goals. Planning is also about future market positioning and the ability to govern the organization towards that (Eliasson 1976). Often, there are multiple objectives to consider in forest planning (Pukkala 2002). Pukkala also states that planning is a component of decision analysis, including all stages preceding the actual decision. According to Pukkala (2002), the decision analysis can be viewed as a planning system divided into planning processes as described by Eriksson et al. (2008), and that the decision analysis includes both objective planning and subjective considerations (Pukkala 2002).

Planning is vital for organizations (Eriksson et al. 2008), and increased effectiveness is one driving force. Ramanujan & Venkatraman (1987) investigated planning effectiveness and concluded that the planning philosophy and organizational context were the most critical factors. In other words, the planning philosophy and organizational context must support each other. The planning technique and design were also identified as essential factors.

1.3. Traditional planning structure

Forest planning has traditionally been divided into three major time scales: strategical, tactical, and operational levels as described by Eriksson et al. (2008). Davis & Martell (1993) introduced a decision support system (DSS) called SilviPlan, similar to the current hierarchical planning system, consisting of a strategical, tactical, and operational level. However, Davis & Martell do not identify the operational stage as an individual phase (ibid). Swedish forests have an average rotation period of 100 years (Skogsskunskap n.d), and that is what the literature has determined as a benchmark for the time horizon for the strategic level (Eriksson et al. 2008). The tactical level is determined to a 10-year time horizon by Davis & Martell (1993), but Swedish literature has narrowed it down to 5-10 years (Öhman et al. 2020) or 3-5 years (Eriksson et al. 2008) and operational level spans between one month and one year (ibid). The different planning levels can be differentiated by the number of details and structure within each level (Eriksson et al. 2008). Strategic planning is characterized by uncertainty and risk management and operational planning by highly detailed and precise plans with single scheduled forest activities (figure 1).

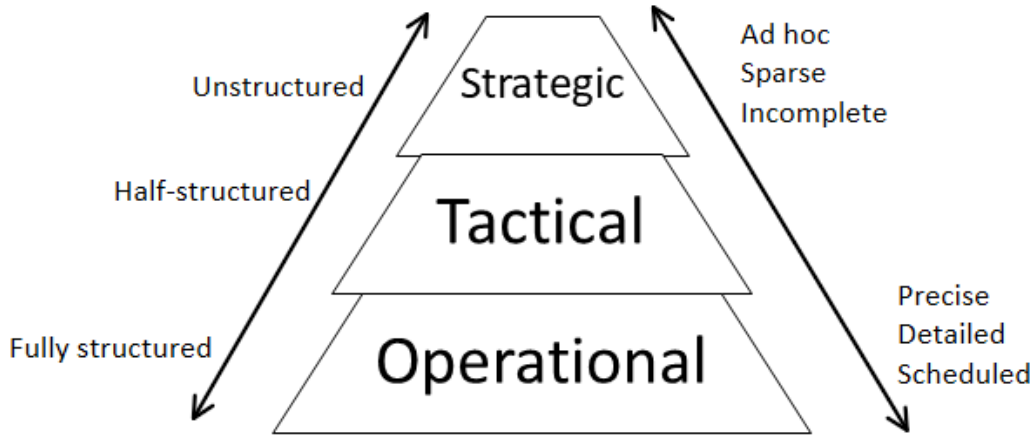

Figure 1. Illustration of the general planning system, visualizing the variations in structure and grade of details and frequency (Eriksson et al. 2008, p.47)

This planning hierarchy is similar to the classic model for planning, or rational planning model (Eriksson et al. 2008). Various authors have described it, but the solid linkage for the forest planning system can be traced to Simon (1960), who divided the classic model into intelligence, design, and choice (IDC). Eriksson et al. (2008) further describe IDC as boxes within each of the three planning processes, strategical, tactical and operational. The intelligence part aims to understand the problem and collect appropriate data. Design is where alternatives are presented, eventually resulting in the choice phase (ibid).

1.3.1. Strategic planning

The main objective of strategic forest planning is to ensure sustained yield, and it typically spans at least one rotation period (Davis & Martell 1993; Eriksson et al. 2008). Sustained yield over time does not necessarily equals an even harvest level every year (Öhman et al. 2020). Harvest levels may need to fluctuate for different reasons, depending on the age-class distribution of the forest, market predictions or other factors not directly linked to the actual state of the forest. Öhman et al. also mention that strategic planning will set the direction of the organization's work with non-timber-production values, for example, nature and biodiversity conservation.

1.3.2. Tactical planning

Tactical forest planning is a link between the long-term strategic level and the short-term operational level, and the main objective is to plan the upcoming silvicultural or harvest activities, usually using a 10-year time frame, but different time scales are mentioned in the literature (Davis & Martell 1993; Eriksson et al. 2008; Öhman et al. 2020). Tactical planning as a process within the planning system can be separated into smaller planning processes. Söderholm (2002) clarifies that the initial step is to determine what order forest activities should be performed within the specific time frame. This process is about prioritization, but the choice of sites also needs to consider road networks to minimize road maintenance costs and machine transfer costs. Finally, the harvest area planning of specific sites usually belongs to tactical planning. GIS-support has proven to be of great help for this stage and the planning system in general (Söderholm 2002; Eriksson 2008b; Eriksson et al. 2008).

1.3.3. Operational planning

With a time frame of less than one year, the main objective of operational forest planning is to schedule the machine groups to specific sites to fulfill the industries' demand of different assortments (Söderholm 2002; Eriksson et al. 2008). Operational planning is the most precise and detailed planning process within the traditional planning hierarchy, and it is well structured, e.g., the input is well known, and the output should not differ as much.

1.4. Decision support systems

There are several decision support systems available for the three major planning processes. The Forest Management Planning Package, "*Indelningspaketet*" (Jonsson et al. 1993), was developed in the 1970´s and was the ruling DSS in Sweden until the Heureka system (Wikström et al. 2011) was introduced. The

software emphasized the importance of long-term objectives, using samples of stands to be inventoried as input, and different scenarios are calculated to optimize the choice of management method (Jonsson et al. 1993).

Today, the Heureka system is the most used DSS in Sweden among larger forest owners (Eriksson et al. 2008). It was initiated in the early 2000s, and the first version was released in 2009 (Wikström et al. 2011). It is now a well-recognized system for analysis and planning and constitutes four software programs. When initiating the Heureka system, the main objective was to develop a system that can handle multi-objective forest management. The four software programs included in the system are:

- PlanEval, the most recent software. The concept is to make multi-objective analyses to guide the user to make the best decision.
- PlanWise, based on an optimization approach.
- RegWise, based on a simulator approach.
- StandWise, analyses for single stands, simulation of stand development.

1.5. Owner structure

1.5.1. Large corporations

The forest planning of large corporations differs from the planning process among non-industrial private forest owners (NIPFOs). One aspect to consider for large corporations is the creation of ecological landscape plans (ELP) within the strategic planning to ensure the conservation of biodiversity (Fries et al. 1998). It became common in the 1990s for large forest owners to establish these plans. The Swedish company Svenska Cellulosa Aktiebolaget (SCA) identifies high-value areas and tries to connect these areas, connected by a natural path for animals and plants to spread and interact (SCA n.d). State-owned company Sveaskog has divided the land into about 180 subdivisions, each having an ELP. The ELPs mostly describe the specific area in different metrics (Sveaskog n.d).

Strategic, tactical, and operational planning is widely recognized as the standard planning system among Swedish forest companies. Planning strategies might change over time within an organization, and there are no recent studies about the planning system of larger companies. The strategic and tactical planning at SCA was investigated by Eriksson (2008b). By that time, SCA used the forest management planning package with a strategic plan of harvesting as much as possible over time and never decrease the harvest level. The strategic planning was carried out on the company level, but the tactical planning was conducted in each

management unit, and it was mainly about the allocation of forest activities (Söderholm 2002; Eriksson 2008b).

Eriksson et al. (2008) evaluated the planning system of forest enterprises and concluded that the companies are very similar. The planning hierarchy is a hierarchy since the operational planning process is dependent on the output from the tactical planning and tactical planning from the strategic planning. Strategic planning is referred to as long-term planning and is also conducted at a high level within the company hierarchy. Medium-term planning is carried out on the regional level and operational at the district level. Long-term planning is usually carried out every 5-10 years and might change due to new policies and better or more accurate forest data. As mentioned before, sustained yield and environmental considerations are the core parts. The main output from the medium-term planning is a stand register containing stands ready to harvest within the desired time horizon of 1.5-2 years. Medium-term planning is considered the most challenging part since there are many parameters to consider. Short-term planning is mainly about allocating machine groups to accurate harvest sites (ibid).

In recent years, the usability of remote sensing has increased dramatically. Airborne laser scanning has proven to be particularly useful for forest inventory of large areas (Reese & Olsson 2016). Swedish forest companies have used these estimations in their work, and Wikman (2019) made regression models of Heureka-based calculations and remote sensing data from the forest resource map, (Nilsson et al. 2017) to map the rate of interest in forest stands at the national level. A new nationwide laser scanning is now in operation and it will deliver new useful data for all Swedish forest owners (Lantmäteriet 2018).

1.5.2. Non-industrial private forest owners

NIPFOs own 52.6 % of the productive forest land, and they contribute an even larger share of the annual harvest due to the geographical distribution, with more private owners in the south with more productive soils (Swedish University of Agricultural Sciences 2020). This group is very diverse. Ingemarson (2004) divided this group into five clusters: traditionalists, economists, conservationists, pessimists, and optimists.

Planning is normally not as complicated for this group compared to large corporations. They own much less land and have less alternatives and decisions to make (Eriksson et al. 2008). However, consultancy is often needed due to their lack of forest knowledge. Gunnarsson & Mårtenson (2004) found that over 50 % of private forest owners want consultancy regarding forest planning. They also concluded that even though high economic revenue is the most important objective

of forest owners, other objectives are still important, such as hunting, recreation, creating a beautiful forest and the feeling of owning forest. Establishing a forest management plan (FMP) is the traditional method of planning for private forest owners (Eriksson et al. 2008). The plan considers ten years and includes a map of the forest, divided into stands, and each stand is described and has a proposal for management. Data for the stands and the whole estate is also summarized, giving the forest owner an overview. It is also important to note that the FMP is a proposal to the forest owner, which is why the FMP is also functioning as decision support. However, Dahlberg (2018) found that the primary function of an FMP among NIPFOs is to provide an overview of the estate. Decision support was the second driving factor of buying an FMP. Dahlberg also found that economics is the most usual factor influencing whether the FMP is followed regarding forest activities and proposed time for certain activities. If a forest owner is heavily dependent on the income from logging activities, they are more likely to follow the FMP (Dahlberg 2018).

Non-industrial private forest owners are a very diverse and dynamic forest owner category. Haugen et al. (2016) examined the geographic, socio-economic, and demographical changes from 1990 to 2010 by reviewing literature and found that female ownership and education levels has increased. However, the increase in female ownership mainly reflects the number of owners. The gender gap is still big between men and women regarding property size and value. It is also more common now that NIPFOs live in urban areas and further away from the forest property (ibid). The behavior also differs among men and women. Men tend to have higher subjective and objective knowledge of forest management than women (Eriksson & Fries 2021), and women value nature conservation and climatic aspects higher than men (Svanstedt 2012).

1.5.3. Medium-sized forest owners

For this thesis, medium-sized forest owners are defined as private or legal persons holding more than 5000 hectares but less than 200 000 hectares of productive forest land. Productive forest land is defined in the Swedish Forestry Act as forest land with a production of one cubic meter or more per hectare and year (SFS 1979:429). This particular group has to the author's knowledge not been studied before in the context of forest planning.

There is no standard definition of medium-sized forest owners in the literature; hence, medium-sized forest owners have been described earlier in other contexts. Lidestav & Nordfjell (2002) defined medium-sized forest owners among NIPFOs to own 50-399 hectares of forest land. Even though this particular group of forest owners has not been studied in the context of planning before, certain groups within

this sample have been examined. Holmgren (2009) found that the regional differences in forest management and practices between forest commons are significant, with the forest commons in the northernmost counties of Västerbotten and Norrbotten having a significantly lower harvesting quota (annual harvest/annual increment) than for the counties of Dalarna and Gävleborg (Holmgren et al. 2004). In another article, Holmgren et al. (2010a) found that on the other hand, the forest commons in the north have been more successful in addressing biodiversity than other owner categories. Ultimately, forest commons are bound to the Forest Commons Law, and forest commons' governance is to a higher degree dependent on different regulatory instruments at the state level, but it differs between regions (Holmgren et al. 2010b). It is also important to note that not all forest commons in Sweden fit the definition of a medium-sized forest owner in this thesis (Lidestav et al. 2010).

The primary aim of this thesis was to get an overview of medium-sized owners regarding their forest planning, but since little is known about them, it was also of interest to give a general description of the group.

2. Material and Methods

2.1. Choice of method

This study was conducted using a mixed-method approach, following an explanatory design (Creswell & Plano Clark 2006). This approach follows a two-phase design (figure 2), with a quantitative phase proceeded by a qualitative, whereas the qualitative part was intended to explain possible differences found in the quantitative study within the sample group. Figure 2 describes the workflow used in this thesis.

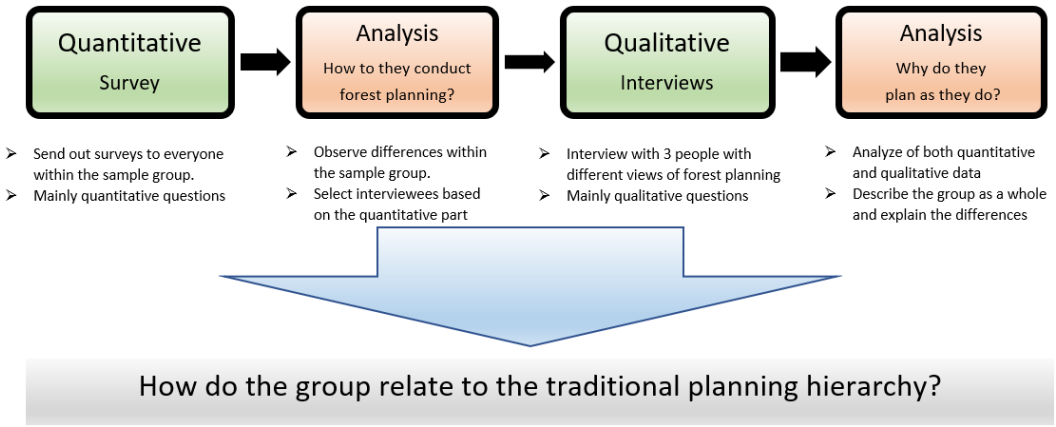

Figure 2. General description of the workflow in this thesis. The upper boxes describe the methodology for data collection and analyses. Ultimately, the final issue was to compare this group to the traditional planning hierarchy — workflow based on Creswell and Plano Clark (2006).

2.2. Sample

The respondents were sampled from an extract from the real estate register. The data was from the estate assessment of 2020, and it is valid for the fiscal year of 2019. It contained mailing addresses to participants for sending out invitation letters and the size of the specific forest property used in the analysis. Other information was also delivered, such as the type of forest owners. The original data used in the

analysis can be seen in table 1, divided by their juridical form. There were 114 owners in total, including part-owners, owning slightly above two million hectares. Almost 9 % of the area were owned by private persons, and the remaining 91 % by legal persons.

Table 1. Sample group divided on owner category showing area and share of land within the different owner categories.

Owner category	Area (ha)	Share of land within the sample
Estate of a deceased person	12 779	0.61 %
Economic association	26 373	1.26 %
Trading company, limited partnership	12 577	0.60 %
Municipalities	55 574	2.65 %
Public corporations and institutions	28 368	1.35 %
Undivided estates of a deceased person	11 248	0.54 %
Private persons	188 561	8.99 %
Commons	551 898	26.30 %
State entities	165 002	7.86 %
Other limited companies	565 583	26.95 %
Other foundations and funds	228 797	10.90 %
Other Swedish legal persons created according to special law	251 796	12.00 %
Total	2 098 556	100 %

The sample was initially narrowed down to 113 invited respondents due to changes in owner composition. During the time as the survey was open, the final sample of respondents came to be 102 due to unknown modifications in owner structure.

2.3. Survey

2.3.1. Survey creation and distribution

The survey consisted of 57 to 61 questions, depending on given answers, of which 38 were mandatory (appendix 1). The survey had background questions, strategical, tactical, operational, and finishing questions. Some background questions were different depending on whether the respondent was a private person or a legal person, and two questions were added to respondents owning wood industries. For the making of the questions, Trost (2007) and Ejlertsson (2005) provided basic principles for making reliable and encouraging surveys. Netigate was used to conduct the survey (Molander et al. 2003).

The three words strategical, tactical, and operational were not mentioned in the questions, and no headings were used to avoid respondents being influenced in their

answers. Since the purpose of this thesis was rather broad, and this group has not been thoroughly studied before, the questions were made to both get an understanding of their forest planning processes and other more fundamental questions regarding their forest ownership. The survey had four different types of questions: alternative questions, scale questions, multiple-choice questions and open questions.

Invitations were sent by post to all respondents and also by email to respondents whose email addresses could be found. The survey was open for responding for 26 days. Reminder letters were sent out nine days after the invitation letter by post and email. The first invitation letter was mailed out on a Wednesday, reaching the respondents by either Thursday or Friday. The reminder letter was mailed on a Friday to reach the respondents earlier in the week to increase the possibility of them conducting the survey. A second reminder was sent by email five days before the survey was closed to those with accessible email addresses. A few respondents were contacted by phone.

2.3.2. Analysis of survey data

The forest owners were divided into new, broader categories for the sake of the analyses. The division is shown in table 2. Trading companies and limited partnerships were merged with other limited companies, municipalities with state entities, and estates of deceased persons with private persons. Ecclesiastical owners were merged with associations and funds.

Table 2. Sample group divided into forest owner categories as used in the analysis. The number of forest owners per category and the percentage of owners per category. The number of hectares per category and the percentage of land within the sample group.

Owner category	Number of owners	Share of owners	Hectares	Share of land within sample group
Companies	31	30 %	561 855	28 %
Commons	23	23 %	608 884	30 %
Private persons	22	22 %	155 206	8 %
Public owners	10	10 %	215 319	11 %
Ecclesiastical, associations and funds	16	16 %	459 945	23 %

The survey analysis focused on compiling the data into results, finding correlations, connections, and explanations. Microsoft Excel was used to manage the data, calculate basic statistic measurements and create figures and tables. Rstudio was used to create graphs and do other statistical analyses (R Core Team 2021). Alternative questions and multiple-choice questions were just presented as they

were answered. Scale-questions were mostly compared with boxplot charts using R-packages Ggpubr (Kassambara 2020) and Rstatix (Kassambara 2021). Some quantitative questions were tested for significance using Welch's two-sample t-test. Open questions were sorted into different categories based on the core message from the respondent. Examples were cited for most categories of answers. Pearsons correlation was used to investigate connections between parameters.

2.4. Interviews

2.4.1. Interview workflow, design, and themes

The choice of interviewees was reflecting the answers they made in the survey, resulting in three participants with varying views of forest planning. One private person in central Sweden, one representative of a limited company in southern Sweden, and one representative of a forest common in northern Sweden were interviewed.

Interviews were performed following a semi-structured approach. The workflow was divided into seven phases as described by Trost (2005), based on the seven phases described by Kvale (1996). Nevertheless, this study adopted a mixed-method, and the seven phases should be seen as the general workflow for the interviews. The seven phases according to Trost (2005) and Kvale (1996) are the following:

- Thematizing
- Design
- Interview
- Transfer to processable form
- Processing and analysis
- Results
- Reporting

The thematization phase aimed at formulating the purpose of the study and what research questions to answer. An interview guide was constructed to cover those themes identified as important.

The semi-structured design was created among themes rather than questions. A few pre-determined supplementary questions were constructed to make sure that the interviewees would give their view of the decisive question that the interviewee sample was based upon, but the themes were formulated to cover those aspects.

Three major themes were covering the strategical, tactical and operational level of planning during the interviews.

When all themes had been covered until the point where both the author and the interviewee were satisfied, the interviewee was asked to describe the whole planning process, from long-term planning to the actual harvest activity as a finishing question. Given the timeframe of the study, the interviews were intended to be 45 to 75 minutes long. Interviews were conducted online using Zoom and were recorded.

2.4.2. Sampling of interviewees

Before the interview, the results from the survey were analyzed to find three suitable interviewees. The participant selection was loosely based on a strategic sampling method as explained by (Trost 2005). Three questions from the survey with apparent differences were identified to be the decisive questions (figure 3).

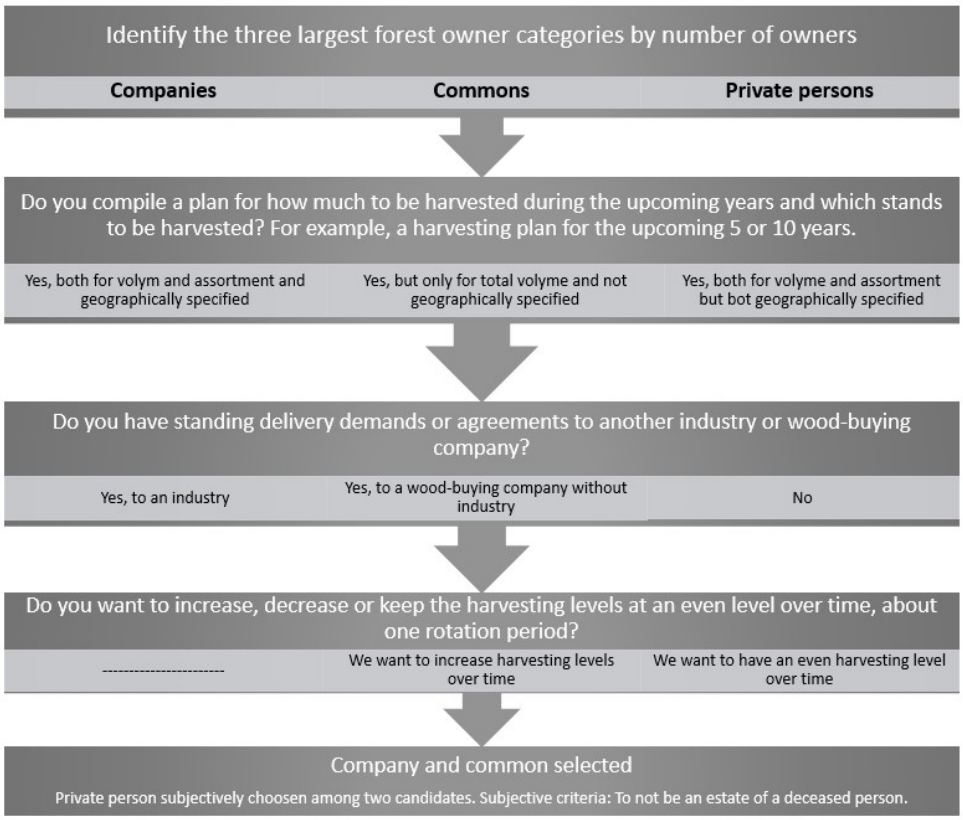

Figure 3. Interview participant selection method. Three survey questions with apparent differences in the answers were used to select participants. For private forest owners, one subjectively chosen criterion was used to choose between two candidates.

2.4.3. Analysis of the interviews

The interviews were summarized to cover the core messages. Initially, the differences identified and used in the sampling of interviewees were analyzed, followed by the three overall themes. Results from the interviews were also used to confirm or question the results from the survey.

3. Results

Seventy medium-sized forest owners answered the survey, resulting in a response rate of 69 %. Associations are not represented in the results as the only economic association in the sample did not answer.

3.1. Medium-sized forest owners – general description

The certification rate within each owner category is presented in table 3. All municipalities were certified, and no state entity was certified. 36 % claimed that they are not certified, which is equal to the percentage of area that is not certified. PEFC seems to be more common than FSC.

Table 3. Rate of owners with either FSC, PEFC, double certification or no certification within different owner categories and for all owners

	FSC	PEFC	FSC & PEFC	Not certified
Private persons	64 %	73 %	55 %	36 %
Public owner	44 %	44 %	33 %	44 %
Company	59 %	68 %	55 %	27 %
Ecclesiastical owner and funds	82 %	64 %	45 %	0 %
Commons	13 %	25 %	6 %	69 %
All medium-sized owners	50 %	54 %	40 %	36 %

The mean harvest was 3.60 $m^3f\ ha^{-1}$ at productive forest land. There was no correlation (r = -0.19) indicating that harvest per hectare is affected by the amount of productive forest land (p = 0.1473) (figure 4). Certified forest owners had an average yearly harvest of 4.35 $m^3f\ ha^{-1}$ (SD = 1.94) and non-certified forest owners had an average yearly harvest of 2.30 $m^3f\ ha^{-1}$ (SD = 1.78), which is significantly lower (p = 0.0001512). Two forest owners wrote that they do not harvest anything due to low wood prices and those forest owners were excluded from this analysis (Figure 4). Using the mean harvest multiplied by the total number of hectares, the total harvest for the group is estimated to 7.4 million m^3f. 21 % of the forest owners had external management of the forest.

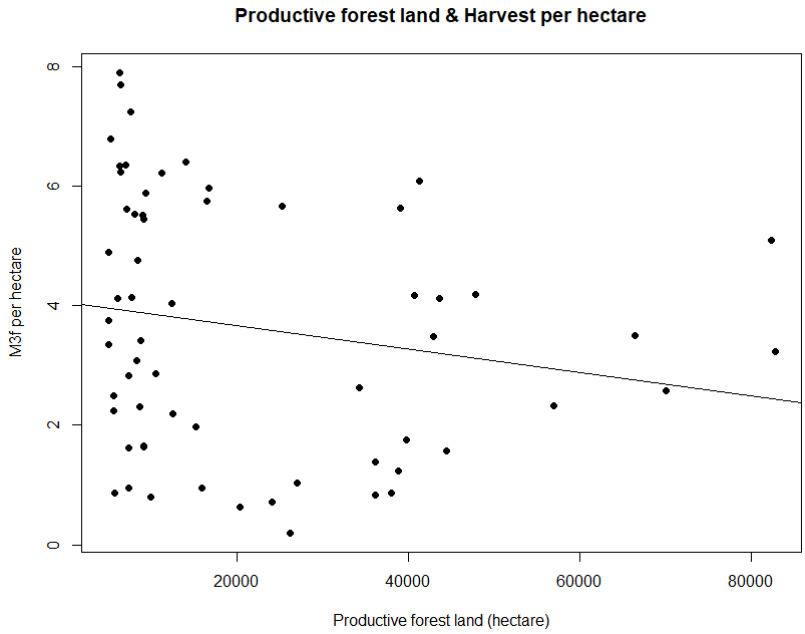

Figure 4. Scatterplot with Productive forest land (hectares) on the x-axis and estimated yearly harvest per hectare (m^3f/ha) on the y-axis.

Nine parameters regarding forest ownership were evaluated (figure 5). Financial return and passing down a heritage for the next generation seemed to be the two factors with the highest score. Esthetical forests for recreation were the most evenly distributed parameter. Own wood supply appeared to be the least important factor.

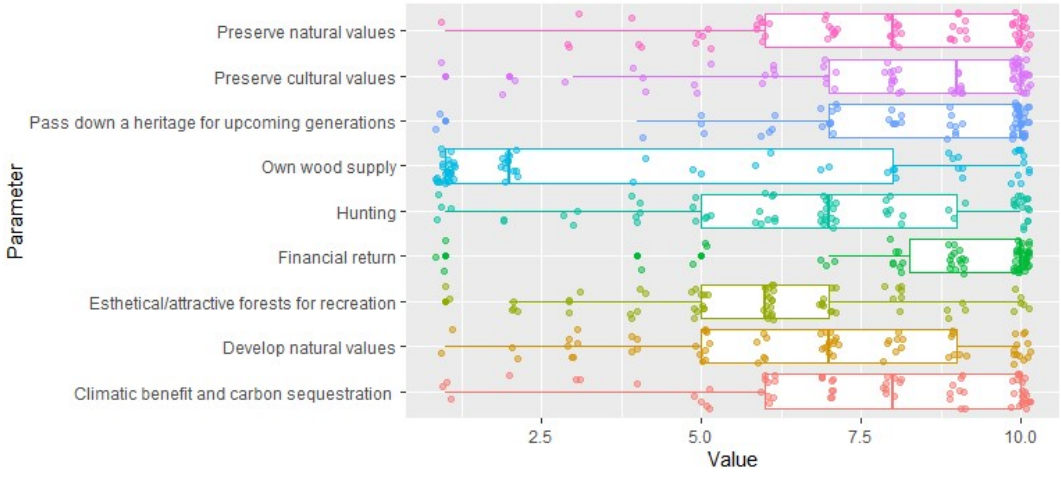

Figure 5. Boxplot of the importance of nine different parameters associated with forest ownership. 1 = not important, 10 = very important.

The importance of these nine different parameters seemed to be of more or less importance between different owner categories. Table 4 shows mean values for all nine parameters divided up on owner category. Public owners put a high number on most parameters, having the highest mean score in all parameters except two.

Table 4. Mean values for the forest-associated parameters divided up on owner categories and for all owners. 1 = not important, 10 = very important. The spread can be seen in figure 5.

	Private persons	Public owners	Companies	Ecclesiastical owners and funds	Commons	All owners
Preserve natural values	6.4	9.6	8.0	5.9	9.0	7.7
Develop natural values	4.6	9.1	6.9	6.5	7.4	6.7
Preserve cultural values	7.3	9.7	8.2	6.7	9.1	8.1
Own wood supply	4.3	5.9	4.7	2.6	2.9	4.2
Esthetics and recreation	4.2	7.6	6.0	5.8	7.8	6.0
Passing down a heritage	8.6	9.3	8.7	9.0	6.3	8.5
Climatic benefit (carbon)	5.5	9.5	8.0	7.7	7.8	7.6
Hunting	7.7	6.7	6.4	7.3	4.8	6.7
Financial return	9.4	9.7	9.0	8.6	6.0	8.7

Ninety-one forest owners did not own any industry or processing facility. Three companies had a small sawmill and one company, one private person, and one public owner (municipality) had a bio energy facility.

Medium-sized forest owners tend to have themselves or their employees conducting silvicultural work to a greater extent than activities that require large machines. It was overall most common to contract entrepreneurs, but more common for silvicultural work, and major forest companies or forest owner associations are contracted to a greater extent for harvest activities and soil scarification (table 5).

Table 5. Two questions regarding forest activity operators

	Me/employees	Entrepreneurs	Major forest company or forest owner association	Do not know
Who is conducting most of the silvicultural work?	10 %	74 %	14 %	1 %
Who is conducting most of the mechanical thinning, harvesting and soil scarification?	3 %	56 %	40 %	1 %

The results in table 5 are reflected by the respondents' views expressed in an open question. However, there are more constellations than those asked for in the question above. One forest owner had entrepreneurs for clearing, planting, and soil scarification. Some respondents also mentioned their percentages of how much is conducted by their personnel, entrepreneurs, or companies.

16 % of the respondents were private persons and of those were 82 % men, and 18 % were women. The mean age of respondents for private persons was 64 years, varying from 40 to 93 years. 45 % of private forest owners had their own philosophy as the primary driver of their objectives for their forest ownership, 27 % had family tradition/duty as the most important. The remaining 27 % had other drivers, "capital investment" was one of them and the other two mentioned "interest in nature".

84 % of the respondents were legal persons. Their forestry objectives were determined by the organization's board or CEO, 37 %, followed by politics and members as visualized in figure 6 below. The category "other" included *"part - owners", "forest manager", "church ordinance"* and one respondent clarified that the board and CEO were determining the objectives, but the other categories mentioned were strongly involved in the process. One respondent wrote: *"We do not conduct forestry for production, management for conservation purposes within nature reserves and national parks"*.

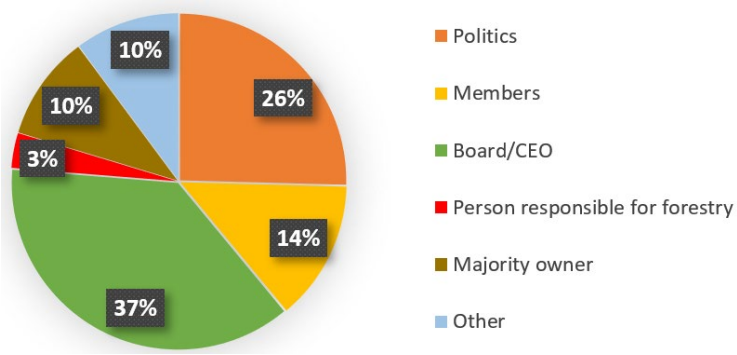

Figure 6. How forestry objectives are determined for legal persons.

Some respondents further explained their determination of objectives. A few had written "*letter of appropriation*" or "*political decisions*", but most answers are very similar to what was mentioned in the previous question, for example, *"Board/CEO along with forest personnel"*. One respondent referred to the PEFC for objective determination. *"Annual general meeting"*, *"part-owner meeting"* or just *"meeting"* appears in five answers. The state of the forest was also mentioned in different terms; *"plan considering the state of the forest"*, *"(forest) growth"* and *"standing harvest assessments"*. *"Economic return"* and similar expressions appeared six times.

3.2. Strategic planning

89 % of the respondents (95 % of the total area) answered that they had long-term strategies affecting today's decisions. 10 % answered no and one respondent did

not know. Public owners differ from the other owner groups, with only five out of nine (56 %) respondents declared that they had these long-term strategies. Thirty respondents developed their thoughts regarding long-term strategies. For example, some answers were general: "*We are striving for a sustainable forestry in the long-term*" and *"Forest values are long-term, and ownership is the most important part in this context".* Most of the respondents mentioned either harvest level assessment/harvest level, growth, or age-class distribution. Those properties seemed to be linked to strategical planning by the respondents. One respondent wrote: *"We conduct long-term harvest level assessments regularly (Heureka) and adjusts the harvest level to the outcome".* Another respondent wrote: *"Ongoing harvest level assessment for 90 years".* Growth was also an essential factor for long-term strategies. *"Harvest in line with growth. Create high growth through good management"* and *"My philosophy is to increase growth and also to plant for example Siberian larch when applicable. The growth also increases by soil scarification and planting the new generation of plants"* are two examples. Some respondents mentioned age-class distribution, for example: *"We try to achieve a more even age class distribution over time"* and *"…we are trying to optimize the time for harvest simultaneously as we try to overcome gaps in the age-class distribution"*. Some respondents linked their views of strategic planning to their primary objective, which is not forestry. One municipality wrote: *"The municipality does not own forest for conducting forestry, but in case the land will be exploited in the future".* One state entity also mentioned that their ownership objective is not about forestry in any aspect but that they need appropriate land for their primary objective over time. One forest owner mentioned recreation, resulting in more extended rotation periods for them.

The forest common interviewee was rather broad when describing their strategic planning, saying that the plan is *"to manage the forest in line with current rules… soil scarification, planting, clearing, thinning, almost no fertilization…use the best possible material"*. When asked explicitly about long-term planning, the interviewee said that *"we are borrowing the forest from our children"*. A board of seven persons decided the objectives and strategies for the forest common, and the manager made much of the forestry-related decisions alone in line with the board-decided objectives. The interviewee said they were constructing 15 kilometers of forest road each year to meet the heavier trucks in the future, which must be seen as a strategic decision. The private forest owner had a rather practical answer about long-term strategies and planning. The forest owner had total control of the entire forest holding and claimed to precisely know every stand. The forest owner had a management strategy to successively thin the stands to help the fauna develop and increase wood quality at the same time, and he/she often mentioned that a well-

developed road network is crucial. The company is facing an upcoming owner shift, and forest strategies at all levels could change.

The quantitative response was identical for the similar question of whether their objectives affect long-term forest planning or not: 89 % answered yes. Twenty-five respondents developed their answers on what objectives affect long-term forest planning. The financial return was a common objective affecting long-term forest planning. If profit or financial return was not mentioned, forest management was mentioned in various approaches. Many answers included both economics and forest management. *"Sustainable and even financial return"* and *"The objective is that the forest should contribute with high financial profitability…"* are examples of financial objectives stated as important influencing the long-term forest planning. Examples of forest management affecting forest planning are for example: *"Management strategy in all stages for optimal growth at all sites"* and *"Better site adaption and a higher share of pine through regenerating with pine at pine grounds…"*. These replies amplify the forest-ownership associated values in figure 5, where the financial return was the highest-ranked value along with climatic benefits and carbon sequestration, which is associated with intense forest management.

76 % of the forest owners claimed to have a plan regarding harvest levels over time, specified to about one rotation period in the survey question. None of the public owners had a wish to increase the harvest level and most owners wanted to have an even harvest over time (figure 7).

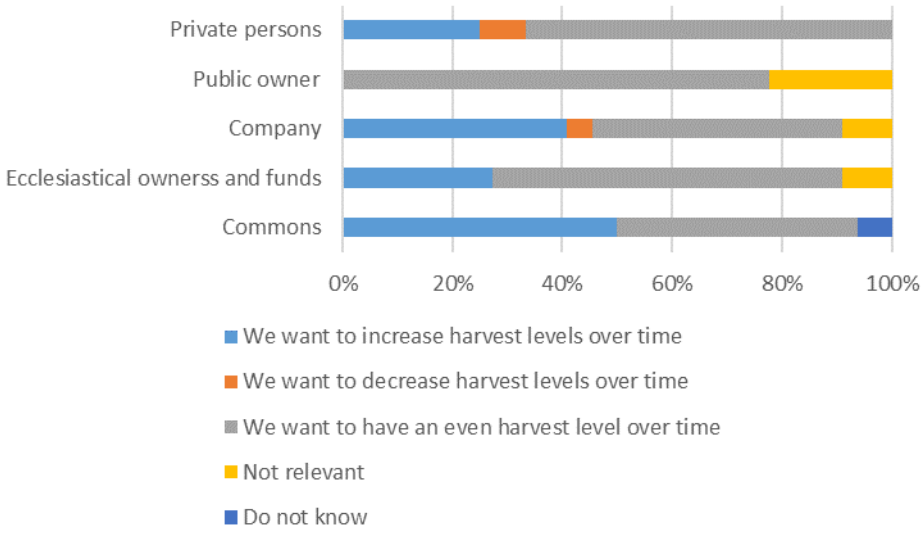

Figure 7. Survey question about long-term harvesting levels. Do you want to increase, decrease, or keep the harvesting levels at an even level over time, about one rotation period?

Twenty-six respondents developed their thoughts regarding harvest levels. Growth was a common explanation to their harvest levels, for example: *"We have a higher growth in young forests, explaining the increase. At the same time, we want to keep the harvest in line with the growth", "We work with all stages trying to increase the growth"* and *"The administration has a stated goal about keeping an even harvest level over time of 80 % of yearly growth"*. Other emphasized financial return and rotation periods were also mentioned, for example: *"We will lower the rotation periods in the long run and increase the growth through optimal management"* and *"The forest should be harvested when mature. The long-term production has earlier shrunken. Now there is work going on with increasing the production.* Two respondents had environmental explanations for their harvest levels: *"We want to increase the carbon sequestration why the objective for production is set slightly lower"* and *"We will lower our harvest level to increase the biodiversity".* The interviews indicated that forest owners see a potential in increasing the harvest levels. The company mentioned increased forest growth and site adaptation as very important for their long-term strategy, where fast-growing and exotic tree species are important were important for forest growth and site adaptation played a crucial role for handling game damages. They saw certification as a limiting factor for having a high wood production. The forest common were harvesting 25 % below the suggested sustainable harvest level according to a Heureka-analysis, due to precautionary reasons. They also shared the companies view on certification, saying that the standards are not adjusted for northern Sweden. The previous forest manager on the forest common increased the harvesting activities in areas that may be of interest to redeem as nature reserves, which the current manager also sees as a risk, and one strategy has been to decrease the areas of coherent old-growth forest. The private forest owner thought that we could increase wood production at a national level drastically by ditching and optimal management.

60 % of respondents had an elaborated plan for nature conservation, equal to 70 % of the total area. At least 50 % of respondents within each forest owner category claimed to have this plan. The results indicates that it was most frequent among ecclesiastical owners and funds, followed by public owners, to have plans for nature conservation. Forest commons differ from other owner categories by not compiling ELPs at all (table 6), but one forest common wrote that they compiled harvest plan similar to an ELP and another common intended to compile one.

Table 6. Two questions regarding nature conservancy and ecological landscape plans (ELPs).

Do you have a plan regarding nature conservancy over time, about one rotation period?					
	Private persons	Public owner	Company	Ecclesiastical owner and funds	Commons
Yes	50 %	78 %	55 %	82 %	50 %
No	50 %	22 %	41 %	18 %	50 %
Do not know			5 %		
Do you compile ecological landscape plans (ELP)?					
	Private persons	Public owner	Company	Ecclesiastical owner and funds	Commons
Yes	33 %	56 %	50 %	55 %	0 %
No	67 %	44 %	50 %	46 %	100 %

Twenty-four respondents explained their views freely on nature conservation. Three respondents wrote about formally protecting forests, for example: *"We are working with the county administrative board to get suitable nature reserves in the area."* Some respondents emphasized that they have a green forest management plan. In contrast, others referred to either certifications or the Swedish Forestry Act, for example: *"The nature conservancy goals are in line with the levels of PEFC/FSC. We are actively working with increasing the share of broadleaves in the landscape."* and *"We are certified and do what is needed according to that. Have no ambition to exceed those goals within the standards of the certification."* Other respondents had more management-oriented answers, for example: *"Create and preserve good environments for biodiversity", "Good care to natural values when harvesting. Preserving of care-demanding biotopes"* and *"We are mostly working with voluntary set-asides...Our strategy is to leave forests that should not be touched untouched but also to have management and sometimes harvest at sites where the natural values could increase or be created by forest activities"*. One respondent had a fairly different answer: *"We take care of all natural values carefully and keep them secret for everybody. We think this is an intern secret within the company"*. The interviewed forest owner had no apparent objective with conservation other than to preserve certain areas and thinks that much land is set aside wrongly. The forest owner emphasized human activities as a prerequisite for the fauna to thrive and draws many parallels to agriculture.

37 % claimed to have an ecological landscape plan. A common explanation why some did not have an ELP was that it was complicated for them to have ELP´s due to estate fragmentation, for example: *"The holding is too fragmented for it to be meaningful"*. Some stated that they have it but do not call it by that name, and a few explained their ELP. One respondent wrote: *"...ELP shows eventual sites of interests and what biotopes and substrates are prioritized within these regions. This*

gives us good guidance about where we focus and concentrate our nature conservancy work".

3.3. Tactical planning

69 out of 70 respondents had a forest management plan. However, there were differences in how useful the plan was according to three parameters. The proposed time and proposed method for a specific forest activity seemed to be of lower importance than the proposed forest activity (figure 8). There were no significant differences between the five different owner categories.

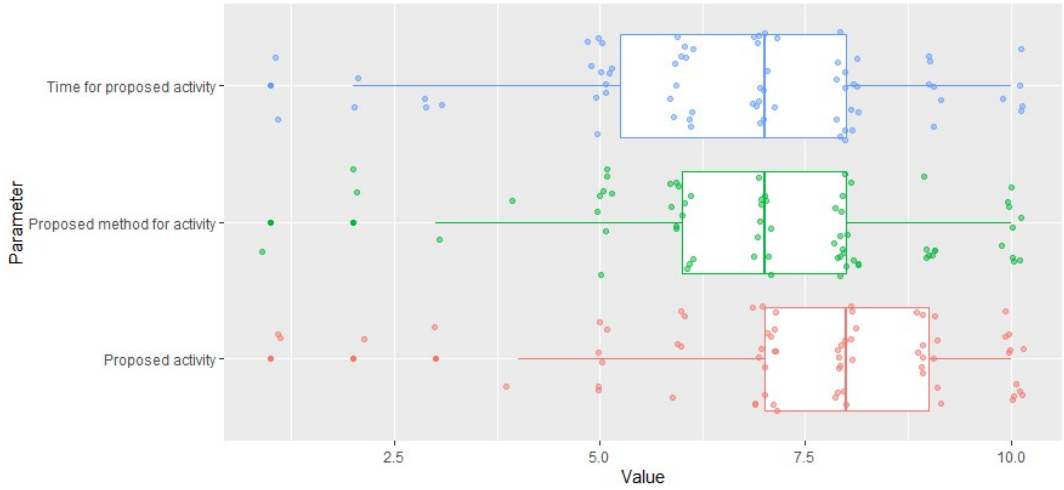

Figure 8. Boxplot with three parameters regarding to which extent the FMP is followed. 1 = To a low degree, 10 = To a high degree.

Thirty respondents developed how they were working with FMPs or similar registers. There were different focuses in the answers. Some respondents wrote about the FMP as a support, for example: *"The FMP is used as a framework and gives a hint about what/when/how. However, prioritization of activities is conducted by responsible forester given some other criteria", "Our management strategy is the basis for all activities so it is followed regarding both activity and time"* and *"Good complement for the (my) memory"*. Others explained that the plan was continuously updated and revised, for example: *"The plan is updated monthly after forest activities and (wood) withdrawals. Corrections are done continuously if inaccuracies are discovered or prerequisites change ex. storm or bark beetle"*. Other respondents emphasized the importance of timber and pulp prices as more important or just as a significant inducer, for example: *"Wood prices are more important than ex. thinnings are conducted exactly as proposed"* and *"...In periods with poor wood prices the plan is postponed, by completely natural reasons"*. Two respondents mentioned reindeer herding and wrote that they could not just follow

the plan; they had to consult with the reindeer herders. One respondent wrote that they were barely working with registration of activities in the forest register and that the sites are operatively planned in a field-planning software. Another respondent had a poorly updated plan that could not be trusted.

49 % of the respondents claimed to not have a standing delivery demand or agreement to an industry or wood-buying company without industry. 7 % had delivery demands or agreements to a wood-buying company without industry and 44 % to an industry. Public owners were most unlikely to have standing delivery demands or agreements while companies had the largest possibility (figure 9).

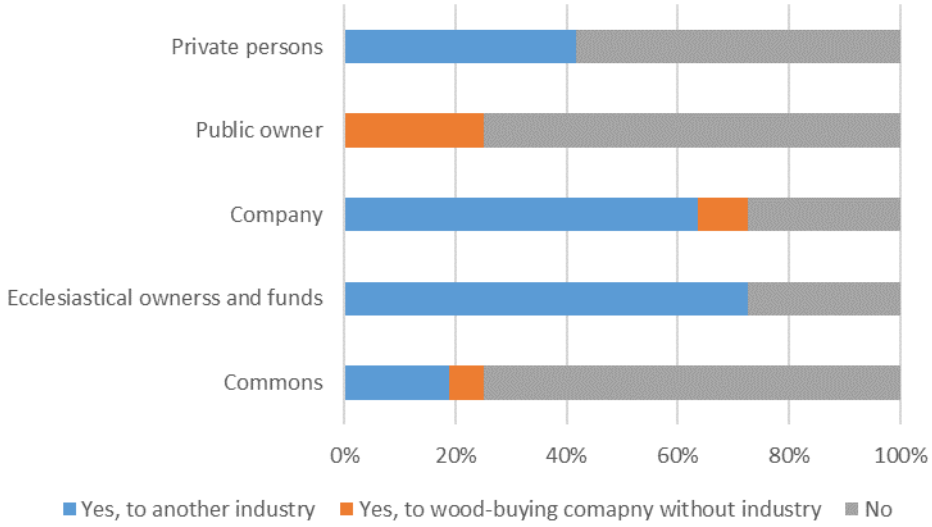

Figure 9. Survey question about delivery demands and agreements. Do you have standing delivery demands or agreements to another industry or wood-buying company?

Respondents had the opportunity to explain how the delivery demands or agreements were designed. Agreements spanned from 0.5 to 3 years and there were several different types of agreements mentioned. Some clarified that they had blanket orders with industries or wood-buying companies, and some had different agreements per assortment. Others clarified that they had a share of their harvested volume bound to an agreement. It also seemed that offer and acceptance is a typical sort of contract formation, but some respondents mentioned delivery stumpage purchase, standing forest timber for sale, cutting commission and delivery-timber. It is also important to note that most forest owners with delivery demands or agreements clarified that they had monthly delivery plans to follow as part of their longer agreement. The interviewed company made agreements every three years for most pulpwood, but the interviewee claimed that they had plans at all time horizons. The private forest owner had weekly quotas to fill and the forest common claimed to have delivery demand or agreements to a wood-buying company without industry, but the interviewee said that they did not have any of that for final fellings,

but that they did have longer agreements with a wood-buying company for thinnings and road clearings.

77 % responded that they were trying to concentrate thinnings and final fellings to certain areas and road networks for a specific period. There were no significant differences between the different owner groups, ranging from 64 % for ecclesiastical owners and funds up to 83 % for private persons. Lower costs for moving heavy machinery were stated as one important reason to allocate the activities to certain areas, for example: *"This is done to make it more effective and reduce costs for moving machines etc"* and *"We are trying to sell (tenure) in clusters to coordinate activities to get a better price"*. One respondent mentioned that a specific activity is done if it is needed, and one wrote *"We are always constructing super-strong roads"*. A handful of respondents expressed difficulties with coordinating activities geographically, for example: *"We try, but we cannot cluster activities as we wish due to wishes from the reindeer herding"* and *"Very hard due to the (geographically) divided property"*. The interviewed private forest owner had a strategy to do all necessary forest activities within one road network to minimize costs for moving the machines, and both the company and forest common tried to cluster stands.

19 % did not compile harvesting plans for the upcoming years. A majority of respondents made plans for total volume only. The degree of details in the harvest plan differed among forest owner categories (figure 10), with companies having the most detailed medium-term harvest plans.

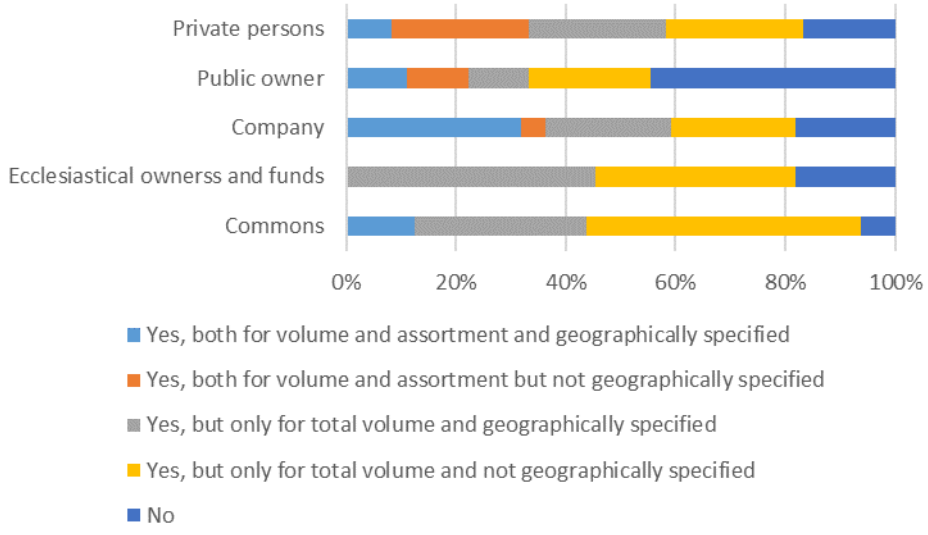

Figure 10. The survey question about tactical planning. Do you compile a harvesting plan?

Some respondents expressed skepticism and promoted flexibility, for example: *"There is no reason to conduct long(term) detailed plans because the conditions always change. It is more important to have an overall plan/objective and at the*

same time be flexible against the market and other external circumstances" and *"No, the reality is most important. Plans are important when selling forest"*. Others mentioned the importance of economics and agreements, for example: *"Have to fill the agreement and take the weather and the industry's need of assortments into account"*. Stands ready for harvest, harvest assessments and other factors were also lifted, for example: *"It is possible to break the harvest assessment down to stand level, but it is a rough plan. The operative plan, the sites ready to harvest, are within two years – where we have field-planned areas, volume, and approximate assortment outcome"*. The company mentioned in the interview that they know exactly which stands to harvest for a particular period and the plan is based on the FMP. They also had experience-based models for calculating assortment outcome. The yearly plan might change due to weather, industry demand, and insects, why their harvest plan were not completely static. However, the company had an even longer harvest planning horizon since they had three-year agreements for most of the pulp wood volumes, why they needed to have a decent perception of volumes during these years. According to the survey answers, the interviewed private forest owner had harvesting plans for both volumes and assortments, but they were not geographically specified. Like the company, the private forest owner had a yearly volume target but did not mention anything about assortments. However, the owner mentioned industry demand as a factor for this type of planning and had weekly quotas to fill, indicating assortment involvement in these plans. The forest common had no assortments involved in their medium-term harvest planning and claimed to not have geographically specified stands to harvest according to the survey but said that they were trying to conduct activities in clusters. Their medium-term planning seemed to be strongly connected to the FMP, which is continuously updated with real growth and with laser scanning data. They sold all wood on stumpage through offer and acceptance, why their sold timber volumes did not equal the outcome, they also got paid most for non-winter stands and had a shortage of those. The general impression was that they were less structured than the other two regarding harvest planning.

41 % claimed not to use any DSS when compiling plans. Private persons (67 %) and public owners (56 %) tended to not use any DSS to a more considerable extent than companies (36 %), ecclesiastical owners and funds (18 %), and forest commons (38 %). 21 % used the Heureka-system, 4 % used INGVAR, and 10 % used other thinning guidelines. 4 % did not know. 30 % answered other, of which laser scanning was the most common DSS amongst this alternative, even though it is not a DSS by definition. On a scale of 1-10, the mean answer was 5.64 for how useful the DSS is for their decision-making (SD = 2.89). Respondents had the opportunity to develop why they use or do not use a specific DSS, for example: *"Heureka approximately every ten years. Now when the laser scanning is fresh, it*

is used to reconcile the volumes in the plan and to update the young forests" and *"Tree height images, orthophoto, and field visits in each stand is used when compiling the FMP"*. Both the company and private forest owner interviewee claimed to not use any DSS for their tactical planning or any other planning horizon. The company interviewee stated that stem number and experience were the decisive factors for medium-term planning, but they intended to conduct Heureka-analyses. The private forest owner did not use any additional tool. The owner made all forest management decisions by him/herself and claimed to have an overview of all stands in the back of the head. On the other hand, the forest common had used Heureka and have used the national laser scanning to update their plans.

6 % claimed not to use any GIS. 71 % had a digital FMP or forest register. 46 % used GIS software, exemplified as QGIS, VSOP, and ArcMap in the question. A few respondents wrote down other GIS software's, such as Timmerweb, Addspatial, Solen, Sokigo Forest, Landinfo, and the county administration board's system Mark-GIS.

3.4. Operational planning

The respondents were asked to estimate how important four pre-determined factors were to choose and prioritize stands for a specific forest activity. Single stands priority and seasonal changes were the essential factors of those, with single stands priority slightly above seasonal changes. Demand from other industries were also essential but has a broad range (SD = 2.54). Demand from own industry had the lowest importance for the group but were very important for a few respondents and it also spanned over a broad range (SD = 2.63) (figure 8).

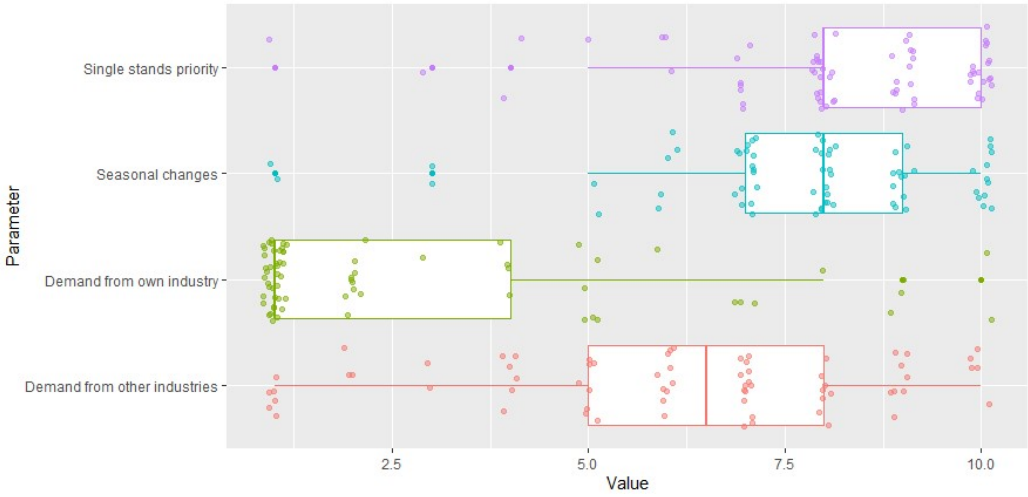

Figure 11. Boxplot with four parameters regarding how stands are chosen and prioritized in the short term. 1 = Not important, 10 = Very important.

There were no significant differences among the different owner categories (table 7). The results indicate that ecclesiastical owners and funds were most likely to choose stands based on the stand's single priority, but they also had the highest mean value for demand from other industries.

Table 7. The mean values of four parameters of how stands are chosen and prioritized in the short term divided into five forest owner categories.

	Private persons	Public owners	Companies	Ecclesiastical owners and funds	Commons
Seasonal changes	7.1	6.3	7.9	8	8.6
Demand, own industry	3.3	1.6	2.6	2.2	3.4
Demand, other industries	6.7	4.4	5.5	7.2	6.7
Sole stands priority	8.7	7.0	8.6	9.5	7.3

Some respondents developed how they performed their operative planning. Two respondents emphasized the importance of fulfilling the yearly harvest target and honoring agreements. Clustering of activities was once again mentioned as necessary and one respondent pointed out that coordination with bordering forest estates was important. One respondent mentioned the availability of entrepreneurs, *"…The short-term planning is more about to what extent entrepreneurs are available"*. One forest owner did all harvest area planning by him/herself. Another forest owner was trying to get as many bare-ground sites as possible.

The interviews revealed that the forest common differentiates from the other two in this stage of the planning process by having little or no control of the operational planning since they sell all final fellings on stumpage. The company´s forest manager significantly influenced the operational planning process and controlled when and where activities are mainly conducted. A timber purchaser is doing the actual production management but is primarily influenced by the words of the company's forest manager. The forest manager is doing most of the harvest area planning, makes maps and objects that entrepreneurs and timber purchasers need. Objects are created differently: thinnings are clustered into geographically oriented objects, while final fellings are single objects. They also have entrepreneurs who work for them and have done for a long time, which they value highly. The private forest owner claims to have total control of the operational planning and processes. The owner decides which areas to harvest and in which order at what time. Demand and weather are two factors influencing short-term planning. The forest owner has one employee who is helping with harvest petitions to the SFA and other work, such as compiling site instructions.

4. Discussion

4.1. Medium-sized forest owners – sample group

As described in the introduction, our definition of medium-sized forest owners is not a fixed and generally accepted group of forest owners, it is somewhat subjective, but the sample for this study was based upon an objective basis. Lidestav & Nordfjell (2002) suggested that a medium-sized private forest owner has a landholding of 50-399 hectares. Our definition was intended to catch the group of forest owners that do not belong to the big mass of forest owners in Sweden or the absolute biggest forest owners. Figure 12 visualizes the intended target group for this study, where the red circle is representing our definition of medium-sized forest owners.

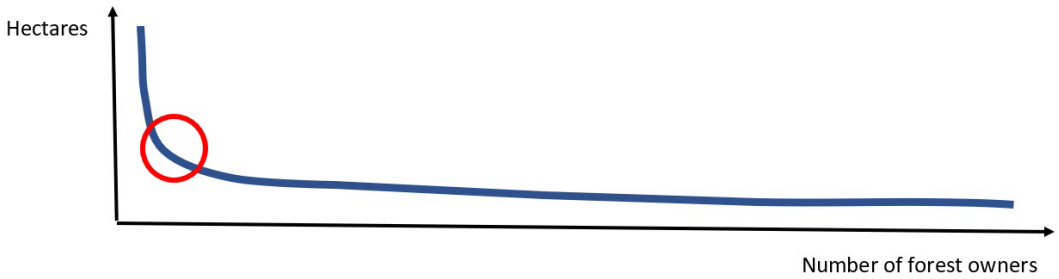

Figure 12. Schematic visualization of the intended target group for this study, marked with a red circle.

By decreasing the limit from 5000 hectares to 4000 hectares, the number of forest owners increased drastically, which did not happen if the lower limit were increased to 6000 hectares. The upper limit was barely not affected when using 100 000 hectares instead of 200 000 hectares, why the author and supervisor thought that 5000 to 200 000 hectares of productive forest land were an appropriate interval for this study.

The original data had a more detailed division into forest owner categories (table 1) of 12 categories, which was shrunken down to five main categories used in the

analysis. That simplification eliminated small owner categories and merged similar categories to get more evenly distributed forest owner categories. The observed differences between owner categories could possibly have been different if the original division was used in the analysis.

4.2. Methodology

A mixed-methods approach was a suitable way of conducting this study, given the little or no existing knowledge about this particular group's planning processes and the fact that the group is diverse. The explanatory design explained by Creswell & Plano Clark (2006) was the best-established method to describe the aim of this mixed-method study. This work has several limitations, whereas time and experience are two major limiting factors. Having a mixed-methods approach for a 30-credit master's thesis is challenging, which is also reflected in the number of interviewees. Conducting good interviews is also challenging and requires practice. Three interviews, averaging 36 minutes each, are very few, and one way of handling that was to have a well-structured and developed process to determine suitable interviewees. The interviews did not give as satisfying results as they were intended to do, and possible explanations might be the authors' lack of experience in conducting interviews, both regarding the construction of an interview guide and the actual interview. More additional questions to the themes could have been added to the interview guide to maintain a flow in the conservation, without having to go to the next theme. One interviewee took the opportunity to talk a lot, mostly about other things than forest planning, often focused on the interviewee's own thoughts regarding several forest-related topics, and it was challenging to try to keep the interview focused on the themes.

The survey had a response rate of 69 %. However, all 70 respondents were not unique. Three forest commons were co-managed with neighboring commons and answered the survey only once, why the same answer was used for two forest owners in these cases. The same thing was actually for a fund and a company. The idea of having unique answers even though there were co-managed was to get data about the forest owner, regardless of who is responsible for the management. 21 % of the responding forest owners claimed to have external management of their forest, and it is more accurate to say that some of these commons and the company were externally managed by the corresponding forest common and fund.
Furthermore, the respondents were fairly distributed regarding forest owner categories. The distribution among respondents was the following, with total sample distribution in parentheses:

- Companies, 31 % (30)
- Commons, 23 % (23)
- Private persons, 17 % (22)
- Public owners, 13 % (10)
- Ecclesiastical, associations and funds, 16 % (16)

Given this distribution among owner categories, it is fair to say that the distribution represents medium-sized forest owners. Private persons had five percentage units lower representation, while public owners and companies have a slight overrepresentation.

There was a minor trend that certain forest owners replied to most open-answer questions. One group replied to most questions, the majority replied to a handful of questions, and some did not answer open questions. All forest owner categories had respondents that answered most open answer questions, why the results from those questions are distributed fairly among the five different forest owner categories. Of 32 respondents that did not conduct the survey, one of them had a policy to not participate in surveys of any kind. The response rate could have been higher if all forest owners had received an email, which might explain why private persons were slightly underrepresented in the survey. Another possible factor is that the survey was not anonymous and that respondents were required to log in with a username and password to reach the survey, making it more effort demanding. The length of the survey does not seem to have been a limiting factor. Everyone who started the survey fulfilled it, but the time required to fulfill it varied much.

4.3. Research questions

This section will cover the four research questions this study was intended to answer. The fourth research question, *which other indicators can be used to describe them except hectares,* are embedded into the other research questions.

4.3.1. How is the planning process designed considering structure, organization, information, decision support systems, and objectives?

The results indicate that this group of forest owners were relatively structured. The majority of forest owners claimed to have strategic plans, and there was a tendency in the comments indicating that their strategic plans were in line with objectives and assessments supporting their long-term strategy. The long-term planning process were to a large extent affected by the objectives, which for private persons was set by their own philosophy (46 %) and family tradition/duty (27 %), while for

legal persons, the organizations board or CEO was the most common answer (37 %), followed by politics and members. The most critical parameters regarding forest ownership were financial return and passing down a heritage for upcoming generations, which also was the case for a study by Gunnarsson & Mårtensson (2004), who examined the objectives and needs for NIPFOs. Wilhelmsson (2011) also concludes that the financial aspect and the actual forest ownership are important goals for NIPFOs.

One apparent difference in the long-term structure was that the private person interviewee had a higher personal power in this process, which likely affects the planning. The interviewee intended to represent private forest owners is either a unique forest owner or indicated that private forest owners with over 5000 hectares are very structured and familiar with forest planning and management.

Long-term nature conservation planning was not as commonly conducted as strategic harvest plans, but there was a clear distinction between different forest owner categories regarding nature conservation planning. Public owners and ecclesiastical owners and funds made these plans to the greatest extent. However, this pattern disappeared for ELPs, where all owner categories were between 33 % and 56 %, except for forest commons who did not have any respondents conducting ELPs. The interview with the forest common supports this pattern that forest commons conduct nature conservancy plans to a smaller extent than other forest owners. The forest common interviewee thought that "*most of the land can be managed (for production).*" and the interviewee expressed fear that land might be set aside for conservation purposes. It is less surprising that public and ecclesiastical owners have a more extensive planning process for nature conservation but is surprising that ecclesiastical owners had the lowest score of how important it is to preserve natural values. Commons on the other hand had the second highest score but was the only owner category who did not compile ELPs. These results contrasts each other and indicates that being keen to preserve natural values does not necessarily correlate to having elaborated conservation plans, see section 4.3.2 regarding certification.

All respondents except one had an FMP and there was a tendency that forest owners did not follow the plan as strictly for the proposed time and method for a specific activity than the proposed activity itself, which is not surprising. Time for an activity were influenced by more than what is optimal for the stands' development, such as seasonal changes and demand from industries and clustering of stands. The respondents had more similar thoughts of the strategical planning than the tactical planning. Half of the respondents claimed to have standing delivery demands or agreements, dividing the medium-sized forest owners into two groups independent

of the owner category. Three out of four tried to cluster stands for activities and around 80 % are compiling tactical harvest plans. The clustering of stands seemed to be a question regarding how fragmented the landholding was and for northern forest owners also a question of consideration to reindeer herding. Some tactical harvest plans were more specified than others, including information regarding volumes, assortments and were geographically specified. Even though most forest owners had a plan, the general impression of the open question answers is that it was not that important, and some distinguished the harvest plan from the reality, indicating that some forest owners make these plans roughly.

The use of DSSs followed the same pattern. Medium-sized forest owners did not adopt a common direction with about 40 % claimed that they did not use any DSS while compiling a plan. One problem with this question could be that it was asked wrongly. It was a multiple-choice question with six alternatives: Heureka, INGVAR, other thinning guides, do not know, no, and other. If it were a yes or no question, the number of respondents claiming that they do not use any DSS would probably have been higher than 40 % because this question was asked in a manner that they should use any of the listed DSSs, and some important DSS were missing.

The survey did not cover the operational planning process as much as the others, but the interviews gave a hint about it. The main result from the survey is that seasonal changes and single stands priority were the most important factors for how stands are chosen and prioritized in the short term, with demand from other industries slightly after. All parameters listed conflict with each other, and according to the results, forest owners were keen to adjust the activities by seasonal changes to avoid severe ground damages. This has to be balanced with single stands priority, but in forestry, the optimal time for harvest is not determined to a specific time of the year, but rather that this forest should be cut within the following years. However, in the last years, the spruce bark beetle has had a rapid increase (Wulff & Roberge 2020) and forced forest owner to reschedule the harvest plan to get the damaged timber out from the forest and to the industry as fast as possible, which could be one possible explanation to the high score for single stands priority.

4.3.2. Are there differences within the group? What are those and why do they occur?

There were differences within the group, but no systematic differences that were coherent for the entire survey, but some specific questions revealed more or less distinct differences among the forest owner categories. The small number of interviewees did not clarify or explain the differences as hoped but leaved the author more questions. Tactical harvest planning did not have many differences from the beginning, apart from the fact that it was less common among private owners, but

the complexity of the planning had some differences, with companies having the most detailed planning. The interviews confirmed the picture of companies and private forest owners, but not for the forest common. The forest common sold all wood on stumpage through offer and acceptance and had little control of when the stands will be harvested. Previous studies have shown that the management of forest commons differs, with the northern commons having lower harvesting quotas (Holmgren et al. 2004), explained by (Holmgren et al. 2010a) as them being more successful in addressing biodiversity. Given the thoughts shared by the forest common representative, it was not about the commons in the north being keener about preserving biodiversity than the others, but they did have a significant portion of old-growth forest. The interviewee expressed a fear of getting more forests set aside for conservation purposes.

The interviewee selection questions regarding standing delivery demands and agreements were not clarified in the interview. As written in the results, the private forest owner claimed not to have any of those in the survey but in the interview, the forest owner said that there were weekly quotas to fill, and the forest common did not have any agreements according to the survey but mentioned during the interview that they have more extended agreements regarding thinnings and road clearings. Therefore, this question turned out to be a question that does not reveal any differences for the owner categories.

The certification rate among different owner categories varies a lot. All ecclesiastical owners were certified in contrast to commons, for which a majority of almost 70 % were not certified. 64 % of the area was certified, compared to 63 % for all owners in Sweden (Swedish Forest Agency, 2020). The forest common interviewee expressed fear of forest land being transformed to protected areas and thought that the certification standard is not taking the long rotation periods in northern Sweden into account. The company also questioned certification, but for other reasons. Their main argument was that certification is in contrast with high wood production. The private forest owner holds the same view regarding production and thought that we need to increase wood production nationwide. An interesting aspect regarding certification is that certified forest owners had almost twice as high yearly harvest in $m^3f\ ha^{-1}$, which could be explained by forest commons being more common in northern Sweden where production is lower. Certification is not a guarantee that a forest owner rates natural values higher than other values since ecclesiastical owners were the most certified group but had lower interest in preserving natural values. That result is not significant, but a possible explanation to the difference in certification rate and valuing natural values might be that certification is a policy instrument and buyers can pay more for certified wood, indicating that certification is more about market adaptation.

One problem with few interviews is that some owner categories are not represented, causing some observed differences in the survey not being possible to answer. That is the case for long-term strategical planning, where public owners differed from the others by not conducting these plans to the same extent. Some of the public owners are state entities with unique objectives regarding their forest ownership, and public owners are also governed politically, and strategies can change after general elections.

4.3.3. How does the group relate to the traditional planning hierarchy?

The general picture of medium-sized forest owners is that they were more similar in the first two planning stages, strategical and tactical. It is hard to say much about the operational planning process, but for the forest common, the operational planning process was out of their control. The company had a considerable influence on the operational planning, but external timber purchasers did the actual production management. Surprisingly, the private forest owner had the most control of the operational stage. Generally, larger organizations play an essential role in production management for forest owners without own industry.

Most forest owners had strategical plans and a majority had plans regarding nature conservation, but the questions were rather broad and did not reveal much about the actual content, except for the examples given in the open answer questions. However, most of the respondents that wrote freely about long-term strategies mentioned parts of their strategy, and it was common to mention that their strategy is based upon assessments and data from their stand registers, for example, that they want an even age-class distribution. One factor regarding strategical planning that contrasts with the traditional strategical level is that a majority of slightly above 60 % did not compile ELPs.

Tactical planning is probably the stage where most medium-sized forest owners adapt traditional practices. Almost all respondents claimed to have an FMP, which is an essential tool for conducting tactical planning. Only about half of them had standing delivery demands or agreements, which is not a prerequisite for conducting tactical planning, but it can affect the tactical planning. On the other hand, clustering of stands is a core part of the traditional tactical stage, and more than three out of four owners tried to cluster their stands geographically, and for those who did not, a common explanation was that their landholding is too fragmented. Harvest plans for the upcoming years are strongly linked to tactical planning, and over 80 % claimed to do these plans.

4.4. Strengths and weaknesses

The apparent strength of this study is that it is bringing light to the planning process for medium-sized forest owners, which has not been studied in this context before. Even though the survey and interviews had their weaknesses, much information was obtained about this group, both generally and specifically about forest planning. The idea from the beginning was not to get specific results, but to get a basic overall knowledge about the group. From that, it was possible to suggest further research. One important finding is the low use of DSS and standing delivery demands or agreements, which might be of interest for DSS developers to examine further.

The mixed-methods approach to this subject was essential to answer the particular research question regarding differences within the group. However, the results from the interviews were relatively sparse and had little content, making it hard to give an accurate explanation about the differences, which also were affected by the small sample of interviewees. Nevertheless, the interviews gave the author an overview of that particular forest owner's planning process. More interviews with more representatives from each forest owner category would have made it possible to say something about the group based on the interviews.

A significant weakness is the coverage of the operational planning process, both in the survey and the interviews. The links between the three planning levels were not examined either.

4.5. Suggested research

This study revealed much information about medium-sized forest owners but has also left the author with questions. Some forest owners mentioned in the open answer question regarding long-term planning that the planning process cannot be explained reasonably and thoroughly through a survey, leaving the author to conclude that this study has only scratched the surface regarding forest planning. It is desirable to conduct more qualitative studies, performing more interviews with multiple respondents from each forest owner category.

It can be questioned if the target group of this study is interesting to further examine by the same definition of a medium-sized forest owner. It would probably be more valuable to examine a specific category, for example municipalities, in order to get a better understanding of how they conduct their planning, what challenges they have. This study does not reveal much information of a specific forest owner category within the sphere of medium-sized forest owners, maybe with exception

of ecclesiastical owners who had a lot of the respondents being medium-sized by our definition.

4.6. Conclusions

Medium-sized forest owners are a diverse group, but they shared several ideas regarding forest planning. There were significant differences in the group, such as certification and ELPs, but generally, the group conducts forest planning similar.

Objectives and forest associated values differed among the respondents. Whether planning is conducted or not is not affected by having specific values or objectives. However, the actual plans and strategies might differ.

The results indicate that some forest owner had no control of the operational planning while some had complete control, but these results need to be validated in future research. The tactical planning horizon is where most medium-sized forest owners adapt the traditional planning structure. Most owners had long-term strategical plans, but fewer had plans regarding nature conservation and less than 40 % had ELPs, which is identified as an essential aspect of traditional strategical planning.

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Acknowledgements

Patrik has been a helpful and encouraging supervisor, guiding me in the ongoing work with this thesis. Patrik is very well-informed about forest planning and in general, which proved to be very important for me to avoid certain mistakes.

Thank you.

I also want to thank Dianne Staal Wästerlund, Karin Öhman and Tomas Lämås for constructive feedback! Also, my friends have been crucial for me to complete my studies at SLU, thank you!

/Martin Persson

June 2021

Appendix 1

Hej!

Stort tack till att du tar dig tiden att svara på denna enkät. Enkäten utgör dataunderlag för ett examensarbete vid Sveriges lantbruksuniversitet (SLU) och syftar till att öka förståelsen för skoglig planering hos mellanstora skogsägare (5000 - 200 000 ha produktiv skogsmark). Att tänka på när du gör enkäten:

- Var noga med att svara korrekt på frågan om ägaren till fastigheten är en juridisk person eller fysisk privatperson.
- Enkäten innehåller en del frågor med öppna svar, dessa är inte obligatoriska, men era svar är väldigt värdefulla för oss.
- Vi har försökt formulera frågorna lättbegripligt, men läs igenom frågorna noga. Varje sida har
- ett visst antal frågor, skrolla ned för att se samtliga innan du går till nästa sida. Det går att backa.

Enkäten tar mellan 10-25 minuter att genomföra beroende på om man skriver något på de öppna frågorna eller ej.
Den som svarar på enkäten bör ha insikt i förvaltningen av skogen, även om förvaltningen görs av extern förvaltare.
Ett fåtal skogsägare kommer senare att erbjudas en intervju. Urvalet grundar sig på svaren i enkäten, men i det resultat som presenteras kommer allt vara anonymiserat. Genom att skicka in enkäten godkänner du SLU:s hantering av personuppgifter.

Stort tack till att du bidrar till den skogliga forskningen på SLU.

Med vänlig hälsing,

Martin Persson, student vid jägmästarprogrammet
Patrik Ulvdal, doktorand och handledare till examensarbetet

**Juridiska personer är exempelvis aktiebolag, föreningar och allmänna ägare. Fysiska personer är enskilda personer som själv eller tillsammans med andra äger skog, vilket ofta ägs genom enskild firma.*

Vem är du som svarar på denna enkät?

- ☐ Ägare
- ☐ VD
- ☐ Ordförande
- ☐ Skogligt sakkunnig
- ☐ Extern förvaltare
- ☐ Annan (ange) _____

Är ägaren till skogsinnehavet en juridisk person eller privatperson?

- ☐ Juridisk person
- ☐ Privatperson

Vem/vad styr främst er målsättning med skogsägandet?

- ☐ Egen filosofi
- ☐ Familjetradition/plikt
- ☐ Annat (ange) _____

Här har du möjlighet att utveckla hur er målsättning styrs

_____
_____

Vad har du (ägaren) för könstillhörighet?

- ☐ Man
- ☐ Kvinna
- ☐ Annat

Vilket år är du (ägaren) född?

Om du inte vet svaret eller inte vill uppge, hoppa över frågan

Hur fastställs målsättningen för ert skogsbruk?

Genom...

- ☐ Politiska beslut
- ☐ Medlemmar
- ☐ Styrelse/VDDo
- ☐ Ansvarig person för skogsbruket
- ☐ Majoritetsägare
- ☐ Vet ej
- ☐ Annat (ange) _____

Här har du möjlighet att utveckla hur målsättningen fastställs

_____
_____

Ange enligt vilken/vilka standarder ert skogsinnehav är certifierat

Välj ett eller flera svarsalternativ

- ☐ PEFC
- ☐ FSC
- ☐ Ej certifierad
- ☐ Annan skoglig certifiering (ange) _____

Om du vet, ange ungefärlig årlig avverkning i närmaste tusental (m3sk).

_____
_____

Har ni extern förvaltning av skogsinnehavet?

Ja
Nej
Vet ej

- [ ] **Har ni stående leveranskrav/avtal till annan industri eller virkesköpande företag?**
- [ ] Ja, till annan industri
- [ ] Ja, till virkesköpande företag utan egen industri
- [ ] Nej
- [ ] Vet ej
- [ ] **Här har du möjlighet beskriva hur leveranskravet eller avtalet ser ut (tidsmässigt, volymer, sortiment osv).**
- [ ] _____
- [ ] _____

Har ni egen industri/förädling att leverera virke till?

- [ ] Ja, majoriteten av avverkat virke förädlas vid egen industri
- [ ] Ja, mindre än hälften av allt avverkat virke förädlas vid egen industri
- [ ] Nej
- [ ] Vet ej

Vilken typ av egen industri/förädling har ni?

Välj ett eller flera svarsalternativ

- [ ] Sågverk
- [ ] Massabruk
- [ ] Bioenergianläggning
- [ ] Specialsortiment (ange) _____

Här har du möjlighet att utveckla mer angående er egna industri, exempelvis volymer som förädlas, sortiment osv.

_____
_____

Ange hur viktiga följande värden är för er

På en skala från 1 till 10. För juridiska personer, svara utifrån de uttalade mål och värden ni har om så är tillämpligt.

Bevara naturvärden

Här syftas det på bevarandet av befintliga naturvärden, exempelvis frivilliga avsättningar av naturskog

Inte alls viktigt
2
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Mycket viktigt

Utveckla naturvärden

Här syftas det på skapandet av naturvärden, exempelvis genom anpassad skötsel

Inte alls viktigt
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Mycket viktigt

Utveckla naturvärden

Här syftas det på skapandet av naturvärden, exempelvis genom anpassad skötsel

Inte alls viktigt
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Mycket viktigt

Egen virkesförsörjning

Inte alls viktigt
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Mycket viktigt

Estetiskt tilltalande/trivsamma skogar för rekreation

Inte alls viktigt
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Mycket viktigt

Klimatnytta och kolinlagring

Inte alls viktigt
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Mycket viktigt

Bevara kulturvärden

Inte alls viktigt
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8
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Mycket viktigt

Estetiskt tilltalande/trivsamma skogar för rekreation

Inte alls viktigt
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Mycket viktigt

Föra vidare ett arv till kommande generation

Inte alls viktigt
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Mycket viktigt

Jakt

Inte alls viktigt
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Mycket viktigt

Ekonomisk avkastning

Inte alls viktigt
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Mycket viktigt

Här kan du utveckla dina tankar kring ovanstående värderingsfrågor. Exempelvis om du anser att det finns konflikter mellan olika värden och hur ni hanterar dessa.

_____
_____

Har ni strategier på lång sikt (ca en omloppstid) som påverkar de beslut ni fattar idag?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Här ges möjlighet att utveckla ert svar angående långsiktiga strategier.

_____
_____

Påverkar er målsättning med skogsägandet den långsiktiga (ca en omloppstid) skogliga planeringen?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Här kan du precisera vilken målsättning som påverkar den långsiktiga skogliga planeringen.

_____
_____

Har ni en utarbetad plan angående avverkningsnivåer över lång tid, ca en omloppstid?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Vill ni öka, minska eller hålla avverkningsnivåerna på jämn nivå över lång tid, ca en omloppstid?

- ☐ Vi vill öka avverkningsnivåerna på lång sikt
- ☐ Vi vill minska avverkningsnivåerna på lång sikt
- ☐ Vi vill ha en jämn avverkningsnivå på lång sikt
- ☐ Ej relevant
- ☐ Vet ej

Här kan du utveckla mer om avverkningsnivåer, vilka eventuella uttalade mål ni har osv.

_____
_____

Har ni en utarbetad plan angående naturvård över lång tid, ca en omloppstid?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Här ges möjlighet att utveckla hur ni jobbar med naturvård samt vilka uttalade mål och planer ni har angående naturvård.

_____

Upprättar ni ekologiska landskapsplaner (ELP) ?

Ekologisk landskapsplanering utförs på lite skilda sätt hos de stora svenska skogsägarna, men tanken med ELP är att bevara och utveckla naturvärden på landskapsnivå.

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Här kan du utveckla hur er ekologiska landskapsplan ser ut ifall ni har en sådan

_____
_____

Var vänlig och läs nedanstående text
En skogsbruksplan är i detta formulär definierat som den plan som traditionellt upprättas för en tioårsperiod för en fastighet, där innehavet är uppdelat i bestånd och varje bestånd har en beskrivning kopplat till sig med skogliga data, målklasser, huggningsklasser samt åtgärdsförslag. Ett skogligt register motsvarar en skogsbruksplan hos de stora skogsägarna, som inte gör skogsbruksplaner i den bemärkelse som angetts ovan. Det skogliga registret ska i sådant fall innehålla motsvarande information som i en skogsbruksplan för varje avdelning.

Har ni en skogsbruksplan alternativt skogligt register med avdelningsbeskrivning över skogsinnehavet?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Om ni har skogsbruksplan eller skogligt register, till vilken grad följer ni åtgärdsförslagen avseende typ av åtgärd, tidpunkt för åtgärd samt metod för åtgärd?
På en skala från 1 till 10. Försök att se till helheten, hur det är generellt, så att inte en enstaka avvikelse drar upp eller ner värdet dramatiskt.

Val av åtgärd

Här menas åtgärd som en skoglig aktivitet (ex. gallring eller slutavverkning).

Till en mycket liten grad
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Till en mycket hög grad

Tidpunkt för åtgärd

Till en mycket liten grad
2
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Till en mycket hög grad

Föreslagen metod för åtgärd

Med metod menas här hur en åtgärd föreslås genomföras (ex harv eller högläggare för markberedning).

Till en mycket liten grad
2
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9
Till en mycket hög grad

Här kan du utveckla hur ni jobbar med skogsbruksplan eller skogligt register.

_____
_____

Försöker ni att koncentrera gallringar och slutavverkningar till särskilda geografier/vägnät för en specifik period?

- ☐ Ja
- ☐ Nej
- ☐ Vet ej

Här ges du möjlighet förklara ditt svar på ovanstående fråga.

_____
_____

Upprättar ni en plan för hur mycket som ska avverkas under de kommande åren samt vilka bestånd som ska avverkas?

Exempelvis en avverkningsplan för kommande 5 eller 10 år. Ja, men

- ☐ endast för total volym och **inte** geografiskt specificerat
- ☐ Ja, men endast för total volym **samt** geografiskt specificerat
- ☐ Ja, både för volym och sortiment men **inte** geografiskt specificerat
- ☐ Ja, både för volym och sortiment **samt** geografiskt specificerat
- ☐ Nej
- ☐ Vet ej

Här ges möjlighet att utveckla varför eller varför ni inte upprättar dessa planer på medellång sikt.

_____
_____

Använder ni er av någon form av beslutsstöd när ni upprättar en plan? (Annat än skogsbruksplan/skogligt register)

Välj ett eller flera svarsalternativ Heurekasystemet

- ☐ INGVAR
- ☐ Annan gallringsmall
- ☐ Nej
- ☐ Vet ej
- ☐ Annat (ange) _____
- ☐

Här kan du utveckla varför ni använder ett specifikt beslutsstöd eller varför ni inte gör det.

_____
_____

Ange hur viktigt beslutsstödet är för ert beslutsfattande.

På en skala från 1 till 10

Inte alls viktigt
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Mycket viktigt

Använder ni er av någon form av GIS-system?

Välj ett eller flera svarsalternativ

- ☐ Ja, skogsbruksplan/skogligt register i digitalt format
- ☐ Ja, i en GIS-programvara (ex QGIS, VSOP, ArcMap)
- ☐ Nej
- ☐ Vet ej
- ☐ Annat GIS-system (ange) _____

Här kan du utveckla hur ni jobbar digitalt med GIS samt andra digitala system.

_____
_____

Hur viktiga är följande faktorer för hur ni väljer ut och prioriterar bestånd för åtgärd på kort sikt?
På en skala från 1 till 10.

Årstidsvariationer (väderförhållanden)

Inte alls viktigt
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Mycket viktigt

Efterfrågan från egen förädlingsindustri

Inte alls viktigt
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Mycket viktigt

Efterfrågan från andra industrier

Inte alls viktigt
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Mycket viktigt

Utifrån enskilda bestånds prioritet

Dvs de bestånd som har störst behov av åtgärd.

Inte alls viktigt
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Mycket viktigt

Annan fördelning (ange vad i textrutan nedan).

Om ingen annan fördelning, välj inget värde

Inte alls viktigt
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Mycket viktigt

Här ges du möjlighet att utveckla mer kring hur ni sköter er planering på kort sikt.

_____
_____

Vem/vilka utför majoriteten av manuell skogsvård?

- ☐ ***Plantering, röjning, samt motormanuell avverkning*** Själv/egna
- ☐ anställda
- ☐ Entreprenörer
- ☐ Via ett större skogsbolag eller skogsägarförening Vet ej

Vem/vilka utför majoriteten av maskinell gallring, slutavverkning och markberedning?

- ☐ Själv/egna anställda
- ☐ Entreprenörer
- ☐ Via ett större skogsbolag eller skogsägarförening Vet ej
- ☐

Här kan du utveckla de två senaste frågorna angående skogsvård och avverkning.

_____
_____

Om ni anser att frågorna hittills inte har varit designade för att fånga upp er planeringsprocess så lämnas denna fråga öppen för er att beskriva hur den skogliga planeringen fungerar hos er.

_____
_____

Detta är den sista frågan, och den lämnas öppen för er att fylla på med ytterligare kommentarer ni har angående er skogliga planering.

_____
_____

Tack!

Enkätundersökningen är nu genomförd. Vi är mycket tacksamma över att ni tog er tiden att svara på denna enkät.
Ha en fortsatt trevlig dag!

Med vänlig hälsning

Martin Persson
Patrik Ulvdal