



The Influence and Potential Use of Values in Swedish Forestry

From the perspective of private forest owners and interactive methods

SOFIA NYRELL 2023
MVEM30 THESIS FOR MASTER'S DEGREE 30 CREDITS
ENVIRONMENTAL SCIENCE | LUND UNIVERSITY



The influence and potential use of values in Swedish forestry

From the perspective of private forest owners and interactive methods

Sofia Nyrell

2023



LUNDS
UNIVERSITET

Sofia Nyrell

MVEM30 Thesis for master's degree 30 credits, Lund University

Supervisor: Torsten Krause, LUCSUS, Lund University

CEC – Centre for Environmental and Climate Science

Lund University

Lund 2023

Abstract

The starting point of this study is the perspective of Swedish private forest owners. From that point of view, I aimed to discover the possible influences of values on climate mitigation and biodiversity in Swedish forests. The focus of both climate mitigation and biodiversity is of great importance as these are two major crises the world faces, and yet solutions are often seen as conflicting. By integrating both issues and by letting forest owners prioritize values with both issues in mind, a better understanding of the values behind choices made in the forest could be achieved.

The methodological approach is qualitative, and the methods used have been go-along interviews and Q methodology. Through these methods and a theoretical framework of the IPBES value typology and interactive governance the aim has been to answer questions of the values private forest owners hold in relation to their forests, how this impacts the choice of management methods and concern for climate mitigation and biodiversity conservation. I have also looked at the similarities and differences in values between those who use alternative methods and those who use clear-cutting methods and how the values are influenced by Swedish forest governance.

The results show that the forest owners who held anthropocentric values tended to prioritize production and carbon substitution in their forest. The owners who held more ecocentric values prioritized biodiversity conservation and carbon storage. Relational values held by anthropocentric owners did however mean they cared for biodiversity and nature's own right of existence even though they felt obliged to prioritize production because of societal demands. It suggests that by encouraging intrinsic values connected to relational values in the production forest, steps towards evening out the built-in conflict between climate mitigation and biodiversity conservation in the Swedish forest could be made.

Keywords: IPBES value typology; relational values; private forest owners; Swedish forestry; climate mitigation; biodiversity conservation; ecosystem services

Index

Abstract 4

Index 5

1. Introduction 7

- 1.1. *The Swedish Forest* 8
 - 1.1.1. Forest Governance 9
 - 1.1.2. Forest owners, management, and values 10
- 1.2. *Purpose and Research Questions* 11
- 1.3. *Limitations of Study* 11

2. Theoretical Framework 13

- 2.1. *Valuing Nature* 13
- 2.2. *Interactive Governance* 15

3. Methodology 17

- 3.1. *Go-along interviews* 17
 - 3.1.1. The go-along participants 18
- 3.2. *Q methodology* 20
 - 3.2.1. Participants in the Q methodology 23
- 3.3. *Method of analysis* 24
 - 3.3.1. Factor analysis, Q methodology 24
 - 3.3.2. Coding of interviews 24
- 3.4. *Ethical Considerations* 27

4. Results 28

- 4.1. *The Q method* 28
- 4.2. *Forestry methods* 30
 - 4.2.1. No management 31

4.2.2.	Biodiversity facilitation	32
4.2.3.	Selective management	34
4.2.4.	Clear-cutting	36
4.3.	<i>Values</i>	39
4.3.1.	The definition of a forest	39
4.3.2.	The bark beetle	41
4.3.3.	Beauty	43
4.3.4.	Economy	45
4.3.5.	Climate mitigation	46
4.3.6.	Nature values and biodiversity	47
4.3.7.	Regulation and trust	49
4.3.8.	The influence of values	52
5.	Discussion	54
6.	Conclusions	57
7.	Acknowledgements	58
8.	References	59

1. Introduction

The debate about the role of forests in the climate and biodiversity crises brings up questions of human-nature relationships, and how people relate to and value ecosystems and the services these provide. Simplified, values can be broken down to instrumental, where nature is understood as a resource for humans, or as intrinsic, i.e., nature and non-human species having its own right and agency independent of humans. Instrumental values are often but not always economical, place nature in relation to humans and value the benefit it can give in the form of resources, protection, or pleasure (Díaz et al., 2015).

Forestry is, as all debates about nature resources, a matter of priorities of values as the vast range of ecosystem services in forests will come with trade-offs. Natural processes provide habitat for species that in turn provide essential services to people, for instance through pollination, and support cultural and social values. In forestry the clashes between different values are commonly related to timber and biomass production which often requires silvicultural activities that undermine habitat quality or reduce cultural and social values of forests (Eggers et al., 2020; Makkonen et al., 2015; Saarikoski et al., 2015). Production forests might not be able to support high levels of biodiversity, creating a competition between biodiversity and production of fossil free materials and fuel (Angelstam et al., 2018; Eggers et al., 2020; Naumov et al., 2018; Ranius et al., 2018).

Actions that halt biodiversity loss can have important co-benefits for climate mitigation (Shin et al., 2022). The climate mitigation potential of forests in Sweden are however often connected to increased production and carbon substitution, where fossil materials are replaced by wood products (Holmgren & Arora-Jonsson, 2015; Schulte et al., 2022). Swedish research on carbon sequestration in boreal forests show that management and use of the forest instead of conservation is positive for carbon sequestration over time but may have negative effects for biodiversity (Jørgensen et al., 2022; Petersson et al., 2022).

The potential positive climate effects of production and substitution instead of carbon storage in standing forests is however a multifaceted issue, and the current Swedish clear-cutting forest management system is being criticized for its lack of capacity to support other ecosystem services than timber production (Schulte et al., 2022). Time perspectives are important to consider for climate mitigation and instead of just focusing on substitution, alternative forest management such as decreased harvests, longer rotation periods and place specific assessment of the storage capacity

of ecosystems are being suggested as more effective methods to increase forest carbon sequestration (Moreau et al., 2022; Schulte et al., 2022).

Forest products as replacement of fossil products and fuel is though emphasized as a main tool for climate change mitigation in Swedish forest and climate politics (Regeringskansliet, 2018). Thus, growing production forests are prioritized over the protection of older standing forests. Standing protected forests are also not associated to values such as innovation, business, income for forest owners and economic development in rural areas, as the production forests are (Holmgren & Arora-Jonsson, 2015).

In the Swedish forest policy context, climate change has become an argument for increased production, but further research of the prioritization of values in Swedish forest policy is necessary to get a more holistic understanding (Holmgren & Arora-Jonsson, 2015). In such studies it is necessary to combine the interlinked issues of climate change and the loss of biodiversity in forest research and policy (Jordan et al., 2018). A joint biodiversity-climate-society nexus in research and governmentality has been argued as essential (Pascual et al., 2022).

1.1. The Swedish Forest

The forest cover in Sweden is approx. 68% which translates into 27.9 million hectares including national parks and nature reserves. Of these, 23.5 million hectares consist of production forests (Swedish National Forest Inventory, 2022).

The Swedish forest landscape is dominated by wood production and clear-cutting, resulting in fragmented natural and older forests and biodiversity loss (Hertog et al., 2022; Naumov et al., 2018; Svensson et al., 2019). The most common age group within the Swedish forest is trees between 41-60 years, just 3.5 million hectares consist of trees older than 140 years, an age group which is important for many species. It represents 12.7% of Sweden's forest area.

Forests with trees above 140 years are mostly common in northern Sweden, with as little as 0,02 percent in the south where a lot of the forest is planted on land which was previously farmland (Swedish National Forest Inventory, 2022). A recent study showed that 19 % of all clear-cuts in Sweden since 2003 have been of old forests which were not previously cut and planted, a rate in which all natural old forests would be gone and replaced by plantations by 2070 (Ahlström et al., 2022).

The directions of logging in Sweden are traditionally based on clear-cutting methods, which is taught and reproduced in the Swedish forestry educations and by institutions (Hertog et al., 2022). The focus on industrial forestry by clear-cutting is also the mainstream management advice given by the most influential forest owner associations and lobby groups (Juerges et al., 2020). This has created a culture in

Sweden where alternative and continuous cover methods¹ of forestry are generally marginalized and looked down upon (Hertog et al., 2022).

1.1.1. Forest Governance

In 1993 a forest policy decision with an equal production and environmental goal was introduced with the objective of more diverse forestry. Until this point the production focus was central and the most common management method used was clear-cutting and re-planting (Holmgren & Arora-Jonsson, 2015). This policy manifested the already built-in conflict of goals between public and private interests in the forest, and created a new conflict between the goals of production and environmental quality (Appelstrand, 2007).

About 50% of Swedish production forests are owned by private individual owners (Swedish Forestry Agency, 2021). The current Swedish forest policy emphasizes the extensive responsibility of forest owners in protecting valuable sites in the forest, both through formal protection and by voluntary set-asides (Appelstrand, 2012). The equal goal of production and environmental protection has however not been reflected in practice and legislation, as the voluntariness of conservation of forests has not yet shown the desired results (Edwards et al., 2022).

Despite the insufficiency of the current policy in achieving desired results, further strengthened property rights and protection of forest based on voluntariness was approved in the parliament 2022 through the proposition *Strengthened property rights, flexible forms of protection and increased incentives for nature conservation in forests based on voluntariness* (Ministry for Climate and Enterprise, 2021). With stronger ownership rights and protection based on voluntariness, a lot of responsibility is given to individual forest owners to protect and prioritize among the diverse ecosystem services that forests provide, while at the same time producing timber with as little carbon emissions as possible.

Forest policy in Sweden has evolved from a state-controlled forest program to new modes of governance, based on softer means of steering such as information and advice, and an ambition of decentralization and freedom with responsibility (Appelstrand, 2012; Juerges et al., 2020). Research on the development on state power in European forests however show that this change has been quite unique for Sweden. It has resulted in a neoliberal model where powerful market actors, such as timber companies, have gained a strong influence in Swedish forestry. Meanwhile, the power of the state over the forest has transformed but still remains strong in other European countries (Juerges et al., 2020).

¹ Continuous cover forestry refers to promoting species and structural diversity through the use of irregular silvicultural systems and management methods (Hertog et al., 2022).

Although the Swedish Forest Agency gives advice to forest owners concerning managing methods and protection, their capacity to assist with consulting services to private forest owners is limited (Appelstrand, 2012). Instead, market actors such as wood processing industries have become influential in shaping the management methods through advisory services (Juerges et al., 2020).

1.1.2. Forest owners, management, and values

Because of the responsibility given to private forest owners, research on their approaches to forest management is growing. Studies aiming to understand the reasoning behind choices of management methods have grouped owners depending on their objectives, showing that economic benefits are seldom solely the most desirable (Hugosson & Ingemarson, 2004; Ingemarson et al., 2006; Polomé, 2016; Wiersum et al., 2005).

One example is a study of an EU-directive on the management of wood pastures. The researchers found that economic values in the form of subsidies can influence managing methods to a certain extent. When the management directives were too far from the farmers own experience and knowledge, the value of subsidies could however not overcome the cultural values of the traditional way of managing the wood pastures (Sandberg & Jakobsson, 2018).

Nevertheless, Swedish forest owners generally tend to have a negative view of biodiversity conservation and continuous cover forestry and are more positive towards carbon substitution and biodiversity measures where production rates are kept (Eggers et al., 2014; Eriksson, 2018; Eriksson & Fries, 2020; Eriksson & Klapwijk, 2019; Eriksson & Sandström, 2022). Social values, such as recreation, are seldom prioritized because of lack of knowledge in what it means to do so and what the benefits could be (Bjarstig & Kvastegard, 2016; Bjarstig & Stens, 2018). In all stages, participation and involvement by stakeholders and forest owners are found to be crucial for sustainable forest management (Eriksson, 2018; Eriksson & Klapwijk, 2019).

Values and beliefs as well as stakeholder affiliation (i.e. forest owners as a homogenous group) generally tend to be more important for understanding attitudes towards forest management than socio-demographic factors, such as gender, resident and non-resident forest owners etc. (Eggers et al., 2014; Eriksson, 2018; McFarlane & Boxall, 2003). Some differences in values have however been found between women and men owning forest, where women have stronger ecological and recreational values (Nordlund & Westin, 2011). Correct knowledge and advice has been proved to be important for private owners' attitude towards climate adaptation and mitigation (Laakkonen et al., 2018; Ugglå & Lidskog, 2016).

So far only a few studies have been done on the influence of values related to Swedish forest owners and management methods and these are mostly quantitative (Bjarstig & Kvastegard, 2016; Bjarstig & Stens, 2018; Eriksson & Fries, 2020;

Nordlund & Westin, 2011). No study has yet related the basic human-nature relations of instrumental and intrinsic values to private forest owners and managing methods. By using the different managing methods as a starting point, and analyzing the reasoning behind them, I see how my study can contribute with an in dept understanding in this field.

1.2. Purpose and Research Questions

The starting point of my research is the perspective of forest owners. From that point of view, I aim to discover the possible influences of the prioritized values on climate mitigation and biodiversity in Swedish forests. The focus of both climate mitigation and biodiversity is of great importance as these are two major crises the world faces, and yet solutions are often seen as conflicting. By integrating both issues and by letting forest owners prioritize values with both issues in mind, a better understanding of the values behind choices made in the forest could be achieved.

The purpose of this study is to understand:

- 1) What values do forest owners hold in relation to their forests?
- 2) How do these values effect the owner's choice of management methods and the concern for climate mitigation and biodiversity conservation?
- 3) Which similarities and differences in values can be found between owners who use mainstream methods such as clear-cutting and those who use alternative methods?
- 4) How are these values influenced by Swedish forest governance?

1.3. Limitations of Study

The focus of my study has been small-scale private forest owners. Some of the participants manage their forests through a private company but larger companies or institutions as owners have not been included in the study. In the study I focus on southern Sweden and more specifically the regions, Skåne, Småland and Dalsland where small scale private forest owners own most of the forest, see Figure 2. All owners are resident or live close to their forest, this have however not been a stated objective as previous research have found it to have little effect on values.

My study has focused on how values effect the choice of managing methods among private forest owners. The method is qualitative, and I have provided an in-depth analysis of a smaller group of owners. This means I cannot generalize about all

forest owners in Sweden, but rather focus on the deeper understanding an in-depth perspective can provide. I discuss this further in the methods section.

The results can in relation to previous research function as a basis for discussions on how to steer methods towards a more sustainable forestry. I will not however study the details in how or if the methods used by owners in the study provide best practice examples for climate mitigation or biodiversity conservation.

2. Theoretical Framework

The concept of values and the choices that determine which values that should be prioritized play an important role in this study. The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) values framework has guided me in the study to the answers on questions 1-4.

To understand the influence on values related to Swedish forest governance, the term interactive governance has been used. It explains how values are influencing difficult choices in natural resource governance.

2.1. Valuing Nature

IPBES has developed a conceptual framework for the interaction between the human societies and the non-human world (Díaz et al., 2015). As discussed above, nature and natural resources are valued in many different and often conflicting ways, and the conceptual framework can function to understand these conflicts. One element of the framework is nature's benefits to people, which is closely linked to the term ecosystem services and focus mainly on the mostly positive contributions from nature (Pascual et al., 2017). It includes all the benefits that humanity, individuals, communities, societies, and nations obtain from nature (Díaz et al., 2015).

The term value is by IPBES defined as both “importance, worth or usefulness”, but also “held values, principles or moral duties” (Díaz et al., 2015). These notions of value are relevant as the held values of individuals and groups are incorporated within various institutions. Therefore, these held values help determine which things a society perceives as being important, beneficial, or useful (Díaz et al., 2015).

Further the IPBES framework makes an important distinction between intrinsic values (inherent to nature, such as non-human species inherent rights to exist) and anthropocentric values. The anthropocentric values include instrumental (the notion of nature's benefit to people and good quality of life, spiritual enlightenment, aesthetic pleasure or the production or consumption of a commodity) and relational values (desirable relationships, including those between people and nature) (Díaz et al., 2015).

This system of understanding human valuation of nature makes it possible to study how different worldviews and knowledge systems define the way people prioritize in conflicts concerning natural resources. The framework is very similar to

the one of ecosystem services but aims to include values such as responsibility, reciprocity and respect for nature (Ipbes, 2022). The framework of how values are connected to different worldviews and knowledge system is seen in Figure 1 (Ipbes, 2022).

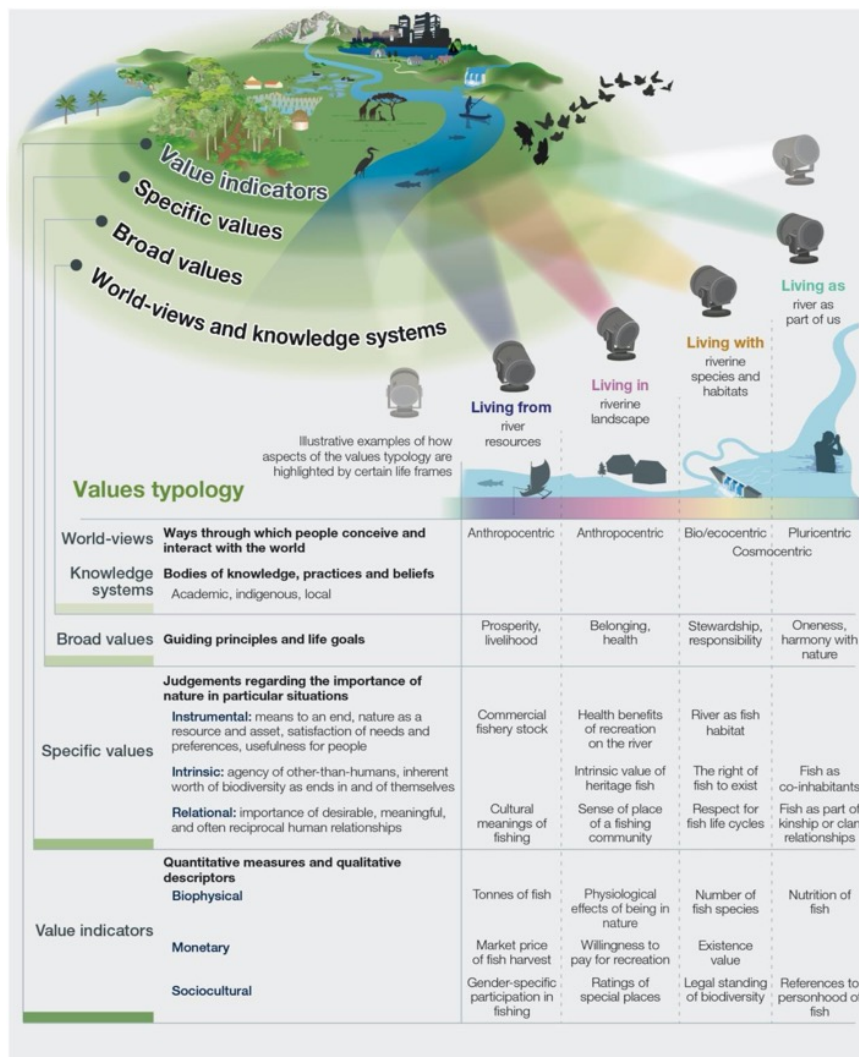


Figure 1 The IPBES values assessment typology which highlights key concepts and their interrelationships to understand the diverse values of nature (Ipbes, 2022).

Relational values have been proposed as a complimentary way of understanding how value is expressed and realized by people. Focusing on only instrumental or intrinsic values may fail to explain views on personal and collective well-being regarding nature and the environment. The relational values have been argued to not

be present in things, but rather in the relationships with nature or in the collective or personal responsibility for it, expressed by many worldviews as the notion of a good life (Chan et al., 2016). In this study I am using the definition of relational values as defined by Chan et al. (2016).

Even though relational values are categorized as mostly anthropocentric, it is its own category in the IPBES typology seen as different from instrumental values. This has caused critics to question the typology as they argue relational values often has an economic focus just as instrumental which cause already the debate about nature conservation to have too much focus on anthropocentric objectives (Maier & Feest, 2016; Piccolo et al., 2022). Piccolo et al. (2022) argue for a 'decolonization' of conservation by broadening the focus from ecosystem services and nature's contribution to people and more explicitly include ecocentric values and a people's moral obligations to nature. The argument partly builds on research of humankind's inability to tackle the issues of climate change and biodiversity loss because of the dominant understanding of humans as superior to nonhuman organisms (Taylor et al., 2016).

Connected to the Swedish forest, the same researchers argue that if relational values are connected to production of timber because of the Swedish forestry system, it will constitute a risk for biodiversity conservation (Piccolo et al., 2022).

2.2. Interactive Governance

Values, norms and principles are used in social and political science to describe the important, yet hard to define, implicit guiding mechanisms in governance (Kooiman & Jentoft, 2009). Kooiman and Jentoft use the perspective of interactive governance to describe societies as large numbers of interacting governance actors (individual and collective, public and private) whose agency is enabled or constrained by structures (this can consist of material and technical prospects, law, culture etc.) that delimit or expand their potential for action (Kooiman & Jentoft, 2009). They further show that difficult choices between values are imbedded in many areas of natural resource governance, and use the concept of sustainable development as they exemplify a built-in conflict between the two arguably contradicting values 'sustainable' and 'development' (Kooiman & Jentoft, 2009).

The built-in conflicts between production and protection in Swedish forest governance could be argued to contain the same difficult choice between values. Holmgren and Arora-Jonsson draw on the Kooiman and Jentoft definition of governance as choices between values, and argue that making values explicit is the key for legitimizing governance (Holmgren & Arora-Jonsson, 2015). The notion of interactive governance will be used to understand how choices on governmental level effects the choices of private forest owners on a local level.

3. Methodology

Even though my approach in this study is qualitative, I have used a mixed method where go-along interviews build a deep starting point and a semiquantitative Q method has provided further insight in the values held by different groupings within the forest owner group.

3.1. Go-along interviews

The go-along method was used, as described by Kusenbach (2003), to get a deeper understanding of the meanings and values the forest owners make in relation to the forest and everyday practices and experiences of forest management. It is an interview technique described as a hybrid between interview and observation, where the researcher follows the informants in their everyday activities, asking questions, observing, and actively exploring the informant's experiences and practices while interacting with their physical and social environment (Kusenbach, 2003).

The method can also contribute to leveling out a power imbalance that a traditional interview situation can entail (Bryman & Nilsson, 2011, p. 225). An interview in an environment which is not familiar can be experienced as an uncomfortable and possibly pressured situation (Scott, 2020). It could be argued to be of even greater importance when doing research about forestry and forest owners, a field where the ongoing debate about best practices could risk creating a feeling of mistrust and skepticism.

The instructions given to the forest owners beforehand was that I wanted to accompany them during some activity that takes place in their forest. It could be anything from recreation and supervision to some type of action, and that the time required therefore could vary depending on the activity. They were also told that during the go-along, they could talk about what is important to them in the management of the forest and the thoughts behind the choices they make.

The method consequently meant that I walked in the forest with the owners, who showed me places in their forests of specific interest. During the walks different subjects came up dependent on the forest and environment around us. The owners would point at trees to be saved or cut down, seedlings coming up, areas to be

protected or areas where felling had been done, which often brought out emotions of various kind.

The interviews took between three hours and a full day and sometimes included meals. This created a space for further conversations which usually was not part of the interview, but still gave an understanding of the owner's views on forest and forest management. At the same time, it was an opportunity for them to ask questions about me and the project.

3.1.1. The go-along participants

The informants were found through targeted selection (Bryman & Nilsson, 2011, p. 434) in contact with the environmental organization Protect the Forest, the forest owner organization and forestry company Södra, the organization for female forest owners Spillkråkan, and personal contacts. The goal was to get a group of informants that represented different views on forest management, hence this was a criterion in the search for participants and not necessarily that the group should represent the majority of forest owners in Sweden.

Seven go-along interviews were done, and the participants could be roughly divided into three groups, see table 1.

Table 1. The go-along participants with participant code G, divided into three groups depending on forest management profile. The size of the forest is indicated in hectares.

Informant group	Group profile	Participant code	Region	Forest size (in hectares)
1.	No goal of economic value or production.	G1	Dalsland	80
		G2	Dalsland	50
2.	Economic/production profile, partly using alternative methods such as selective felling.	G3	Skåne	150
		G4	Skåne	70
		G5	Småland	180
3.	Economic/production profile, based on clear-cutting methods.	G6	Småland	120
		G7 (phone interview)	Småland	100

The first group with two participants were forest owners who did not intend to do any felling at all in their forest except for personal use. The second group were three owners who used alternative methods such as selective felling and gap felling, part of their forest objectives was productivity. The third group consisted of two owners who used the most common forestry methods in Sweden of today, clear-cutting and planting. In this group one interview had to be done through phone due to sickness. After the interview I went to see parts of the forest myself. The groups are seen in table 1.

The owners are from three southern regions in Sweden, Skåne, Småland and Dalsland, all located within the area in Figure 2 where most of the forest is owned by small scale private owners.

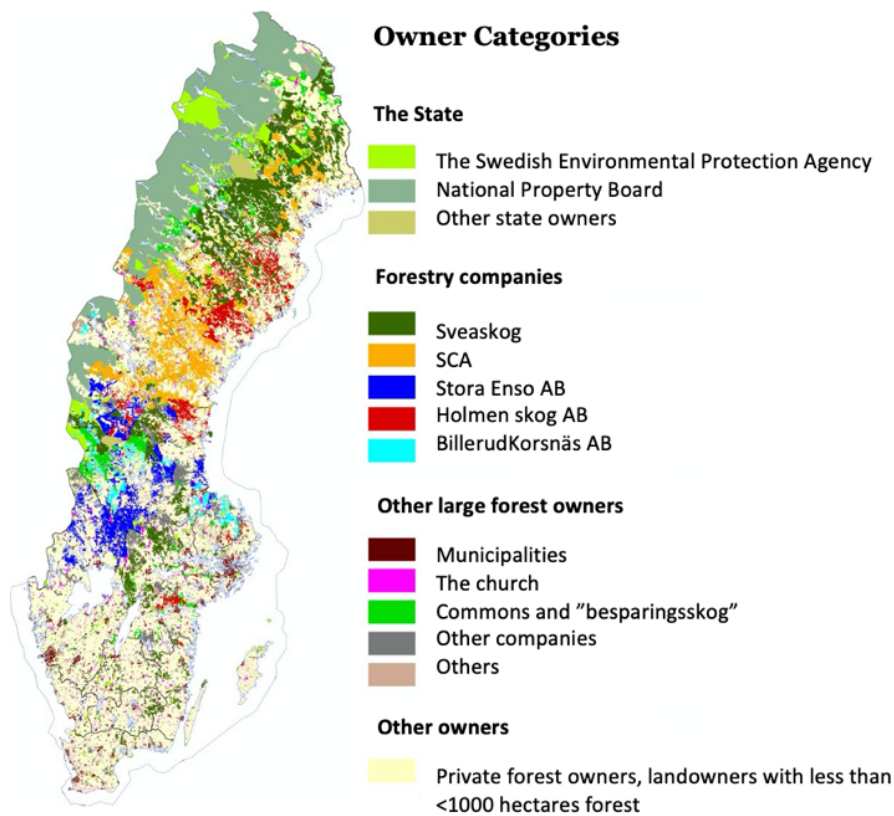


Figure 2. Owner categories in the Swedish forest (my translation) (Metria AB, 2020). The participants in this study are all from regions in southern Sweden where most of the forest is owned by the category "Other owners" in the map, small scale private forest owners. Skåne in the south, Småland in the east and Dalsland in the west.

3.2. Q methodology

As a compliment to the go-along interviews I used Q methodology. Its function was to provide a more structured assessment of social perspectives and a way to categorize attitudes and values more systematically among the forest owners (Hermelingmeier & Nicholas, 2017; Nijnik et al., 2014).

It is a semiquantitative method where the participants get to rank statements about a subject according to their personal views, this ranking is later analyzed to find groupings within the participants group. The researcher is not seen as neutral but play an active role during the whole research process (Zabala et al., 2018). As a participatory assessment method it has been used to understand people's perceptions of specific issues and to compare different interests and perceptions within a group (Kim et al., 2021).

Q methodology origins from psychology but has also been used in the field of environmental policy research and the valuing of ecosystem services (Hermelingmeier & Nicholas, 2017; Kim et al., 2021). As well as in nature conservation, where it has been used to identify conflicts that exist among stakeholders due to differences in their environmental management preferences (Kristin & Samantha, 2016; Zabala et al., 2018). In this study I have been inspired by this way of using Q methodology.

When doing research about values in the context of the debated Swedish forest, it is suiting compared to standard surveys, as it can mitigate certain response biases because respondents are required to engage explicitly with opinions that they might deem inappropriate or unexpected (Zabala et al., 2018).

In the execution of the Q method the participants, called the P-set, are presented to a sample of statements, called the Q set (table 2). They then get to rank the statements from their personal point of view (Kristin & Samantha, 2016).

The statements are collected to represent the discourse around the specific subject, in this case forest management methods (Kristin & Samantha, 2016). In this study I have collected the statements from previous research on the issue and the debate in Swedish media where voices from both industry lobby groups, and environmental NGOs have been published (Dagens Nyheter, 2021-2022; SVT, 2021). The interviews that were conducted before the Q set was distributed also inspired some of the statements and helped when formulating them.

When ranking of the statements the informants get a table where they have to sort the statements by disagree (-4), neutral/undecided (0), to agree (4) in a pre-arranged frequency distribution, see Figure 3. (Kristin & Samantha, 2016). Here the statements have to be prioritized. This step is referred to as the Q sort.

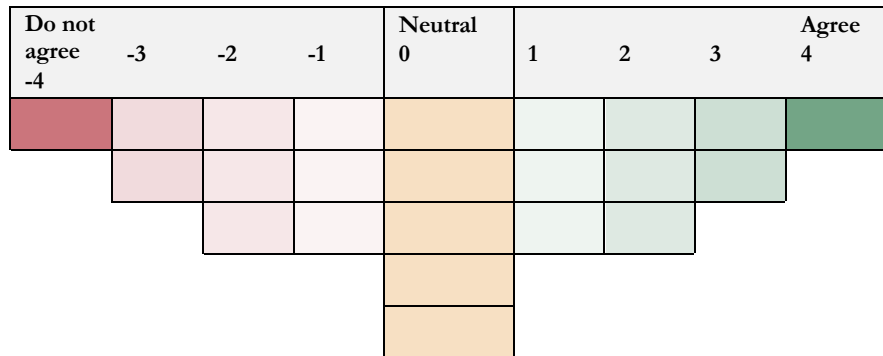


Figure 3. Pre-arranged frequency distribution, Q sort.

The participants had to sort the statements into a prearranged order, which means a prioritization had to be done. Here participants could also write comments or questions on the sorting

Table 2. Statements, the Q set

Statements collected to represent the discourse around Swedish forest management methods. The participants were asked to rank them related to their personal view of the statement.

	Statements
1	Forest management should be regulated by the state.
2	The amount of protected forest should be regulated by the state.
3	I trust management advice from timber companies.
4	I trust management advice from the Swedish Forest Agency
5	Companies, lobby organizations, and forest owner organizations should not be able to give advice on forest management and forest protection.
6	Voluntary set-asides means that those forests that need protection the most, because of biodiversity, are in fact protected.
7	The most important reasons to why I own my forest are economical.
8	I prioritize other values than economic in my forest.
9	Forestry must take social values such as the right of public access and recreation into account.

10	The production of timber must be prioritized.
11	The most important value of the forest is the ecosystems.
12	The forest and its animals have their own rights of existence independent of people and human use.
13	The forest does not need to be managed.
14	Forestry and its traditions are an important part of Swedish culture.
15	In Sweden we have a lot of tree plantations and very little forest.
16	Being in and with the forest is a way of life.
17	It is important to preserve a beautiful forest.
18	A high production in the forest is of great importance for the climate as it ensures that fossil fuel and fossil-based materials can be replaced by renewables.
19	As a forest owner I have the responsibility to manage my forest in a way that preserve its natural values and ecosystems.
20	Selective felling and gap felling can be a good complement and will benefit certain species, but it depends on which species you want to favor, and you have to count in less production.
21	We must radically reduce large-scale forestry and let the forest stand to benefit biodiversity, preserve carbon sinks, and store carbon dioxide.
22	If we continue using the Swedish forest the way we do, our children will not have a forest when they grow up.
23	Clear-cutting with soil preparation is preferable as the replanting can be done with refined plants that provide rapid growth and have good resilience in a future climate.

3.2.1. Participants in the Q methodology

The participants in the Q method (the P-set) are compiled in table 3. The owners participating in the go-along interviews took part in the Q method after the interview and were asked to share it with other forest owners. This took the form of a snowball method (Bryman & Nilsson, 2011, p. 434). It did however only result in one participant which was an owner I could contact myself. The ones who got the form through the participants without me getting the contacts did not reply. The form was also shared with personal contacts, the forest owner organizations and in Facebook forums for forest owners. This resulted in two replies from the Facebook groups, these were owners I contacted after they commented that they were interested in taking part but thought it was too complicated to do by themselves. In the end the personal contact with me as a researcher was crucial to get participants for the Q method.

Table 3. Participants, Q method.
The P-set

Groups of informants	Participant code	Number of participants
From the go-along participants	G1-6	6
Snowball method	S1	1
Facebook groups	F1-2	2

Both the statements and the table for distribution was sent to the participants by email and they were asked to fill it in and send it back. Each participant was also encouraged to write comments on the statements and why they distributed them the way they did. In some cases, further instructions were needed which were given by phone.

The Q method was generally seen as more complicated for the participants than just inviting me to come and visit their forest. When calling forest owners and asking them to fill in the form I got invited to come and visit instead. This is usually how forest management is discussed and advice given. Timber buyers, entrepreneurs or advisors come and look at the forest and discuss it while being physically present. It could be a reason the go-along was better received, as it felt more familiar.

3.3. Method of analysis

The analysis of the material was done in two steps. The Q sort was analyzed with the help of an analytical tool, and the interviews through a coding scheme.

3.3.1. Factor analysis, Q methodology

The next step after the Q sort in a Q study is a factor analysis, where groupings and patterns among the participants related to their understanding of a particular issue are identified (Kristin & Samantha, 2016). It is done by inserting the data from the Q sort in an analytical tool. For this study I used the program Ken-Q-analysis where all data was put in an excel file and then uploaded on the website (Banasick, 2019). Because of the low number of participants, I chose to focus on two factors, meaning two groups where the owners had done a similar sorting and consequently held similar values in relation to their forests. These two were clearly distinguished in the analysis.

As the number of participants was not enough to create a statistic analysis of this method, the factor analysis was used as a compliment to the interviews together with the comments in the Q sort.

3.3.2. Coding of interviews

The analysis of the go-along interviews was done by finding relevant themes in the interviews inspired by the IPBES value assessment typology and then coding the notes. The categories and example quotes can be seen in table 4. The first two categories help to define worldviews, while the next five relate more to specific values. The IPBES pluricentric worldview is not included as it was not visible in the material.

I have not inserted quotes in all categories. In these cases, none of the participants expressed a belonging to that category combination, or the combination is not compatible. This is the case with beauty and intrinsic values, more on that in the results.

Table 4. Analysis categories and example quotes or interview text.

The first two categories relate to worldviews and the next five to specific values. The anthropocentric worldview is split in two columns, anthropocentric – livelihood relates more to instrumental values and anthropocentric – belonging to relational.

Worldviews	Anthropocentric - Livelihood	Anthropocentric - Belonging	Ecocentric
The definition of a forest	“I don't really buy that it's a timber plantation, it looks like that in the beginning but then the forest becomes more mature and looks better. It is at its best just before it's cut down.”	The understanding of their role as forest owners as a link in a chain and bigger than their forest and their families, including coming generations.	“I don't own forest, I own plantations.”
The bark beetle	“I use short cycles of 50-60 years in my forest because the risk of pests and storms are too great if I leave the trees for too long.”	“We had to take down a John Bauer forest over here because of the bark beetle. It was really sad and I might have to bring a handkerchief when we go there.”	“We have made the bark beetle a pest because we have managed our forests wrongly. It is really just a part of nature.”
Specific Values	Instrumental	Relational	Intrinsic
Economy	“Of course we have to prioritize economy, otherwise you cannot run a company. It's what it is all about.”.	“The forest is more than money, if you just want to earn money from the forest, you mow it all down, you don't use all these other methods.”	“The man who sold us the forest said we could take out timber for 500,000 kr directly, but then we wouldn't have had any forest left, just rock and lingonberry.”

<p>Climate mitigation and adaptation</p>	<p>“The brushwood and biomass is our most important product. We sell it to the local heating plant that produces heat for our community.”</p>		<p>"Many people who count with the forest as a carbon sink forget the soil of an old forest. When they cut it down and prepare the land, they destroy all the micro-life in the soil that binds carbon. There are huge amounts in an old forest!"</p>
<p>Beauty</p>	<p>“I rather save NS areas (management required), all the dead wood in NO (no management allowed) areas gives like a sterile look that I don't like.”</p>	<p>"I want to walk in the forest and hear bird twitter and buzz from insects everywhere. So far it is still very quiet but, in some areas, it is starting to come.”</p>	
<p>Natural values and biodiversity</p>	<p>“It grows really slowly here so it is an area we have chosen as a set-aside.”</p>	<p>"I had intended to close the ditch here and recreate the wetland, but slowly so I could first take out some of the spruce trees for timber. But the beaver got ahead of me and has now created a wetland here already. (...) I'm trying to work with the beaver, I just have to speed up and take out the trees before they die. Or I'll just leave them as dead wood.”</p>	<p>"We are not individual organisms but dependent on microorganisms and fungi in and on our bodies, and the trees are not solitary trees, but part of the forest's ecosystem just as we are. When you understand that, it also becomes unimaginable to drive heavy machines in the forest that damage the land like this. It is like a rape on earth.”</p>
<p>Regulation</p>	<p>“Rather, non-profit organizations and the public should not be allowed to comment on private property. I'm not allowed to comment on other people's bank accounts”.</p>	<p>"I see it as a responsibility to own forest, if everyone had taken responsibility, we would not have needed any regulation. But not everyone does that and then it is needed.”</p>	

3.4. Ethical Considerations

As the method for the study is go-along interviews the informants must give consent according to ethical principles (Bryman & Nilsson, 2011). The first contact with the informants was through phone or text message with a short explanation of the study. They were then asked to share an email address where more information was given. Before the go-along interview or the Q sort, the informants had to give their consent to take part in the study. It was done through a form before the interview or a box they had to tick when filling in the Q sort.

All details about the informants, such as names and exact location of their forests are anonymous. The owners were also informed of how the study would be published, that they could stop the interview at any time or withdraw information given in the following two weeks after the go-along (Bryman & Nilsson, 2011). During the interviews none of the questions were related to political views or other personal information.

My study can be partly categorized in the field of ethnographic methods, and such a study can contain many types of materials. During the go-along interviews I took notes and photographs which form the basis for the analysis. In the analysis of the material different kinds of ethical and creative choices are unavoidably made to present the environment and the people in the study to the reader in an understandable way. Depicting a person and their views and values through this material comes with a responsibility to humanize and enabling an understanding of the research object in order to not fall into stereotyped categories (Eleonorasdóttir, 2021). I see this as an important factor to consider when conducting research with forest owners, due to the polarized and sometimes infected debate on Swedish forestry. These considerations, together with the anonymity of the participants have guided me all through the study.

4. Results

The empirical discussion is structured in three sections. The first one reports the results from the Q sorting, the second section shows the methods used by the owners who participated in the go-along interviews. This relates to the first and second research question. The third one combines the results from the Q sort with the interviews, forming seven categories related to the IPBES value typology, relating to question three and four.

The forest owners are referred to as G1-7, the participant number from table 1. The owners only participating in the Q method are referred to as S1 or F1-2 according to the participant number from table 3.

4.1. The Q method

The factor analysis of the Q method resulted in two factors relating to the worldviews of the participants. This was the clearest distinction in the analysis of the Q sort.

Most participants had sorted correlating to factor 1, the factor where the sorting related to an anthropocentric worldview. It included participants from both go-along group 2 and 3 plus the participants who only took part in the Q method. In this factor statement 10 “The production of timber must be prioritized” was ranked the highest. The lowest ranked statement was number 22, “If we continue using the Swedish forest the way we do, our children will not have a forest when they grow up” (see Figure 3).

Just two participants were found in factor 2 where the sorting corresponded more to an ecocentric worldview. Here the highest ranked statement was number 19, “As a forest owner I have the responsibility to manage my forest in a way that preserve its natural values and ecosystems.” The lowest ranked statement was number 23, “Clear-cutting with soil preparation is preferable as the replanting can be done with refined plants that provide rapid growth and have good resilience in a future climate”, (see Figure 4).

-4	-3	-2	-1	0	1	2	3	4
22	15	5	11	6	19	7	18	10
	13	2	3	23	17	14	16	
		21	9	1	12	8		
				4				
				20				

Figure 3. Average sorting of statements in factor 1. White boxes indicate statements distinguishing factor 1 from factor 2. Green boxes indicate consensus statements for both factors.

-4	-3	-2	-1	0	1	2	3	4
23	3	5	1	16	17	21	11	19
	7	6	18	20	9	8	12	
		10	14	2	22	15		
				13				
				4				

Figure 4. Average sorting of statements in factor 2. White boxes indicate statements distinguishing factor 2 from factor 1. Green boxes indicate consensus statements for both factors.

As shown in Figure 5, the participants who correlated with factor 1 had a high level of agreement. They did however also agree somewhat with factor 2. One participant G5, also from group 2, had much lower agreement with factor 1 than the

others in that group and a relatively high agreement with factor 2. The result seen in Figure 5 indicates that a study with more participants could have formed a third factor.

Consensus statements are indicated as green boxes in the composite Q sorts in Figure 3 and 4, these were ranked similarly in both factors. Number 12 “The forest and its animals have their own rights of existence independent of human use” and number 8 “I prioritize other values than economic in my forest”, show that even though the timber production is ranked as the most important by the participants in factor 1, other things more linked to intrinsic and relational values are still present.

The reasons for these factor analysis results can however be varied and they will be discussed further below with the help of the comments made by the Q method participants while they did the sorting.

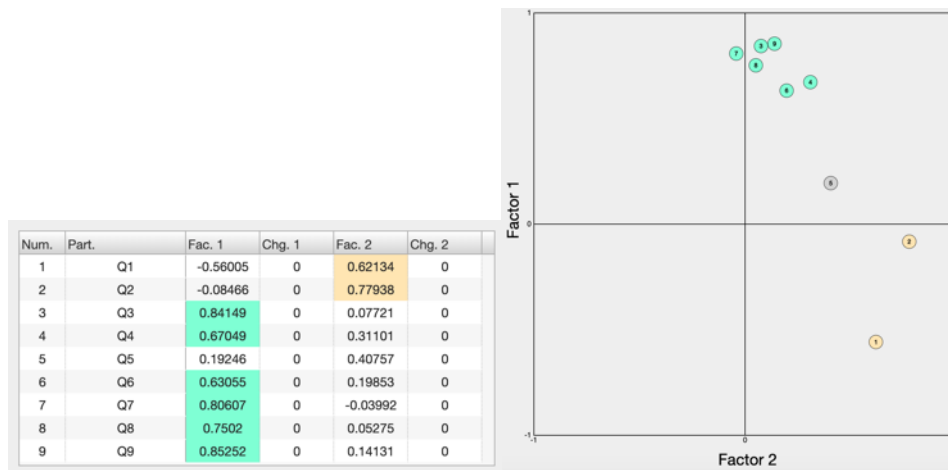


Figure 5. Factor loadings.

The number indicate the correlation of a participant with a factor. Numbers close to 1 indicate high correlation while numbers close to -1 indicate low correlation.

4.2. Forestry methods

The forestry methods used by the owners participating in the go-along interviews range from leaving the forest untouched with the objective of letting nature form the forest, to managing with the objective of enhancing biodiversity, to management with a production objective using clear-cutting and planting methods.

This division is specific to the owners in this study and is not proportionate to Sweden in general. Continuous cover forestry methods are used on 487 500 hectares by individual owners and 241 000 hectares by other owners which equals to approx. 0,03% of the Swedish production forest (Skogsstyrelsen, 2022).

4.2.1. No management

Owner G1 in group 1 had 80 hectares of relatively young forest in Dalsland (some parts together with the sister) which he took over from the parents five years ago. The parents had used clear-cutting methods, but his objective was to let the forest recover by doing no management at all which included no thinning or clearing of underbrush. He intended to take out timber only for use in his carpentry business.

The objective was increased biodiversity, carbon sequestration and storage. All deciduous trees were saved for biodiversity reasons, even the ones with lesser monetary value such as sallow. There was a forestry plan that had been done before his ownership, but he had no intention of felling according to it.

The first area we looked at in the go-along was an area with spruce trees with an estimated age of 120-140 years old. According to the forestry plan the trees were ready to be cut down, but he did not intend to do any felling. He had not yet found any high natural values but showed me lichen species on some trees which indicated older age (see Figure 6A).

In a clearing some trees had fallen due to wind coming from the neighbor's land who had done a clear-cut. According to forestry law fallen spruce need to be cleared to stop bark beetle infestations. The owner had however just removed the bark which would make the tree uninteresting for the beetle and he could leave it as dead wood (Figure 6B). It stirred some irritation and he mentioned that "It is wrong that I am the one who will be responsible to take care of this. They are doing wrong when they clear cut, and it damages my forest. But I am obliged to clear the trees."

Another area (Figure 6C-D) had been clear cut 15 years ago and was in an age where thinning should be made to optimize the growth of the trees, this had not been done. It was very dense, and he said it is the perfect hiding place for deer and wanted nature to do its own thinning. He pointed out many different species of deciduous trees. Figure 6E shows the owners suggested activity for the go-along, grilling sausages and supervision of the forest. During this activity he mentioned that it is harder to find dead wood for firewood in the forest now compared to when he was younger.



A: Spruce trees 120-140 years old, will be left without management or felling. Shows signs of lichen species connected to older trees.



B: Removed bark from a wind felled tree.



C: 15 years after a clear-cutting with no thinning.



D: 15 years after a clear-cutting with no thinning.



E: Recreation activity.

Figure 6. No management

Pictures from the interview with owner G1 who aimed to do as little as management as possible.

4.2.2. Biodiversity facilitation

Owner G2 had a similar approach as G1 with the same objectives of increased biodiversity and carbon storage, although G2 took a more active role in managing the forest towards these objectives.

The participant owner and his wife had bought the forest of 50 hectares five years ago but had lived next to it for 20 years. The participant owner was the most engaged in the forest and intended to create the best possible conditions for biodiversity and different biotopes. They had removed spruce seedlings on a previous clear-cutting and instead planted a “bee forest” with trees that will blossom from early spring to late autumn (Figure 7A). In the clearing in Figure 7B, spruce seedlings planted by the previous owner had also been removed. The clearing had previously been farmland and they planned to let people live off grid and use the area for cultivation again.

In the desire of creating a more diverse forest they planted deciduous trees such as beech in spots they found suitable and covered the seedlings to protect them from

grazing, Figure 7C. They used no method of thinning at all, but broke trees next to the ones that he wanted to favor such as sallow, beech and oak to imitate grazing by moose. The method can be seen in Figure 7D and was supposed to create trees of diverse size and to make it harder for the moose to get to the tree in the middle.

In another area of planted spruce, they had blocked a drainage ditch and recreated a wetland (Figure 7E). The spruce had died, and the goal was to have a wetland forest with birch and alder. Here they had noticed a drastic increase of species and they had seen the red listed Eurasian three-toed woodpecker for the first time in the area last year. By another drainage ditch a beaver had felled trees in an area where they also had planned to recreate a wetland. They did not intend to disturb the beaver more than necessary (Figure 7F-G).

Like owner G1, owners G2 intended to save old trees even though they were marked as ready to cut in the forestry-plan they had got from the previous owner. In this case it was pine trees that had been managed for timber by the previous owner and had quite some economic worth. They valued them more as standing and showed me nesting holes for birds and beetles (Figure 7H).



A: Previous clear-cutting with newly planted “bee-trees”.



B: An old meadow where planted spruce seedlings had been removed.



C: Protection of beech from grazing.



D: Breaking trees to protect the middle one.



E: Recreated wetland with dead spruce.



F: A beaver creating wetlands by felling trees and blocking a ditch.



G: A beaver creating wetlands by felling trees and blocking a ditch.



H: Older pines intended for timber by the previous owner, now for saving.

Figure 7. Biodiversity facilitation.

Picture from the interview with owner G2 who prioritized biodiversity conservation.

4.2.3. Selective management

The owners in group 2 used different variations of non-clear-cutting methods in parts of their forests, such as selective felling and gap felling. As an example, owner G3 had 150 hectares of which he estimated that 30% was managed by selective felling, but he could see it being extended. All owners had inherited their forest and had continued a path set out by their parents. The forests used for selective felling had in most cases been planned more or less that way by previous generations.

Very little thinning and clearing of undergrowth was done, and very little planting of seedlings. Instead, the forest was planned so that the gaps from when older trees were felled would create more inflow of sunlight and that way new seedlings and the smaller trees would grow. This created a mixed-type and many layered forests with trees of different ages, as can be seen in (Figure 8A-C). In some parts with deciduous trees such as oak more management was needed to stop the spruce from taking over (Figure 8D).

For owner G3 and G4 the main objective with their forests was production. Owner G5 had a goal of 50% production and 50% protection. All owners took pride in having high natural values and many red listed species in their forests. They were all doing a lot of the work in the forest themselves or closely monitoring the work where contractors were used.

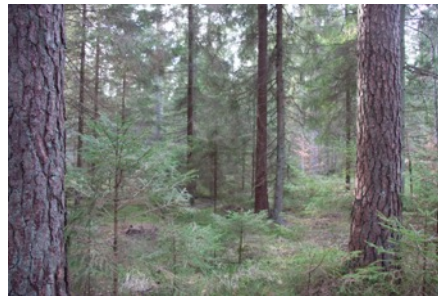
To not have to do the work connected with clear-cutting, such as thinning, preparing the soil after the final felling, and planting, were seen as positive effects of managing the forest with these methods. It was a way of saving money and time. Owner G5 believed her way of managing the forest gave a little less yield, while owner G3 had calculated that the yield was even greater than in the parts where clear-cutting was used. He could take out the large valuable trees regularly and that way get a steadier income.

The stump in Figure 8E was 140 years when it was cut in the forest of owner G3, and he showed on the annual rings how it had continued to grow quite a lot even the last years. For him this was proof that the forest in fact did continue to take up carbon and that it was worth to wait until the spruce grew older than around 80-100 to cut them in this kind of forest. The stump was left as dead wood after it had been cut and it showed marks of a black woodpecker. Tradition, carbon sequestration and biodiversity combined with good production yield was a reason for him to use this kind of method.

The selectively managed forests were generally seen as more beautiful. In Figure 8F, owner G4 showed a river which they valued highly, and they wanted to use selective felling here to keep the beauty of the area. He also pointed out that there was a lot of blueberries and lingonberries in this part of the forest, seen in Figure 8G, something they wanted to preserve as they enjoyed berry and mushroom picking.



A: Forest managed by selective felling.



B: Forest managed by selective felling.



C: Forest managed by selective felling.



D: Oak, must be managed or the spruce will take over.



E: The stump of a 140 year old spruce selected for harvest, with marks by a black woodpecker.



F: A river next to a forest managed with selective felling.



G: Lingon- and blueberries.

Figure 8. Selective management.

Pictures from the interviews with owners G3, G4 and G5 who used various kinds of selective management methods.

4.2.4. Clear-cutting

Clear-cutting and planting methods were used both in group 2 and 3, in 2 depending on the kind of forest. Many agreed that the risk of using selective felling in an evenly aged stock with spruce was not worth it and would not work. Gaps made by selective

felling was presumed to cause wind felled trees and bark beetle infestation in a spruce plantation.

These areas were often Norwegian spruce planted on land which had previously been pastures or fields where they grew quickly, sometimes causing less resilient trees. The owners could see no other alternative than to use clear-cutting and planting on this kind of land as the trees were evenly aged. It was also commonly agreed on in both group 2 and 3 that spruce trees in these planted forests had to be harvested before growing too old, or the risk of dead trees from rot (Figure 9G), bark beetle or storms would be too great and lead to economic losses. The age that was considered too old however varied. Owner G6 used cycles of around 60 years in his forest due to fear of storms and pests, which was among the shortest cycles. Two different spruce plantations are shown in Figure 9A-B, both are planted on land that was previously farmland.

In some cases, a clear-cut had been done earlier than planned, or even in forests that was not planned for a clear-cut at all, due to bark beetle infestation. Owner G5 had recently done a clear-cut because of the bark-beetle and had another one planned. She showed me what she called the “crying spruce”, Figure 9F, resin running on the spruce stem which is a sign of the beetle.

Different methods were used for regrowth after a final felling. Either to leave pine and birch to let them spread seeds and then create a pine or birch stand such as in figure 9C, or to prepare the ground and plant new spruce or pine. On these sites birch was often saved to create a more mixed-type forest that would be more resilient.

For some owners, especially G6 and G7 in group 3, this method was seen as the only possible choice, as their forest had been managed like this historically. They thought the risk of introducing other methods was too great and they could not see the benefits of it.

Owner G7 also worked in the forest as a contractor, and he argued that any other methods than clear-cuts would be unproductive and economically unsustainable. The argument was that large expensive machines would have to be used more often or all management done by hand with chainsaws, something he thought undoable. He believed selective felling would work only for those owners who could manage it all themselves. He however thought that the clear-cuts in Småland was relatively small and that the consideration for natural values required today still made the method a sustainable choice. A clear-cut done in the same area is seen in Figure 9E.

Clear-cutting was however not problem free, owner G6 had re-planted spruce on a clear-cut area five times because of the dry summers which caused the plants to die. He had got the advice of continuing with planting spruce and could not see any other choice in this area. Another area of planted spruce seedlings is seen in Figure 9D, the heavy snow could also be a problem because of break damages. He had however done some successful experiments with lark and poplar plantations, Figure 9H, which would grow much faster than spruce and could be used for pulp wood.



A: Spruce planted on a pasture; 30 years old.



B: Spruce soon to be cut due to risk of storms and bark beetle, planted on a pasture and peat land, to be made into a wetland again (owner G4).



C: The spruce cut and pine saved.



D: Planted spruce seedlings.



E: A clear-cut forest.



F: "Crying spruce" a sign of the bark beetle.



G: A stump from spruce with rot.



H: Poplar plantation, 10 years old.

Figure 9. Clear-cutting.

Pictures from the interviews with owners G3 , G4, G5, G6 and G7 who used clear-cutting in various ways and to various degrees.

4.3. Values

In the interviews and the results from the Q method seven categories which reflects the values behind priorities and choices in the forest were found, the definition of a forest, the bark beetle, beauty, economy, climate mitigation, nature values and biodiversity and regulation. The first two categories indicate reasoning connected to worldviews and the following five are more related to the specific values, intrinsic, instrumental, and relational.

4.3.1. The definition of a forest

The definition of a forests was reflected as two statements in the Q sort, 22 and 15, and a subject that came up in many of the interviews. It is grounded in the understanding of planted forests as plantations or “real” forests and relates to whether a forest is defined through the amount of biomass or its ecological properties and functions. The first could be seen as an indicator for an anthropocentric worldview with the forest first and foremost as a resource for human use, while the second could indicate a more ecocentric view where the forest is defined by its ecological functions and not seen as functionally intact when those have been disturbed.

This was also reflected in the Q sort where factor 1 ranked statement 22 “If we continue using the Swedish forest the way we do, our children will not have a forest when they grow up” as -4 and factor 2 ranked the same as 1.

The quote from owner G1 is an example of an ecocentric view of the forest,

“I don’t really own any forest at all, I own plantations. There are no high nature values. These trees are around 120 years old, and you can start to see the signs of lichen species connected to older age. But it is still not a real forest.”

Owner G3 and his wife brought up the statement about whether there are plantations or forests in Sweden. Concerning the forest intended for clear-cutting with spruce in rows, they asked “So, what do you think about this? Is it a forest or just money growing? For us it is security and something to cut for future generations”. Even though their forest had stands that were managed with different methods and objectives, no difference in the definition was made. For them it was all a forest.

The quality of the forest could also be part of the definition. In group 1, owner G2 pointed out a part of the forest where a group of thin old pines grew on a large bare rock.

"We will never cut anything there. It would take forever for it to grow back on the rock. It would be if someone really needed that kind of slow growing wood and wanted to pay very well for just one tree. Or, no, it's not even a lot of money that's important, but that someone really sees the value in a tree that has grown that slowly. That kind of wood is almost impossible to come by today”.

In group 3 owner G7 could see how planted trees could become a forest within the time frame of the clear-cut cycle. This quote indicates a more anthropocentric view than that of owner G1, as the forest is defined through the production system:

“I don't really buy that it's a timber plantation, it looks like that in the beginning but then the forest becomes more mature and looks better. And then it is at its best just before it is cut down.”

Shared by the owners in group 1 and owner G5 in group 2 was an understanding of their role as forest owners as bigger than their forest and their families, including coming generations. “A link in a chain”, as G5 expressed it. They felt a greater responsibility to keep values such as beauty, functioning ecosystems and carbon sinks for future generations and society, as well as for nature itself. Owner G2 explained his view of the forest ecosystem:

"We are not individual organisms but dependent on microorganisms and fungi in and on our bodies, and the trees are not solitary trees, but part of the forest's ecosystem just as we are. When you understand that, it also becomes unimaginable to drive heavy machines in the forest that damage the land like this (points at damage by vehicles from a previous thinning of brush just before they bought the forest). It is like a rape on earth.”

Owner G5 had a similar view on soil scarification (tilling) before planting, she thought about it as a violation of the land and did not enjoy the look of it. She was however unsure about not using it at all as she said she got the advice that the plants did not grow well without it, something she had experienced on one occasion. She however preferred self-sown trees before planting and to not have to use scarification. When walking past an area where they had taken out spruce and saved the pine, she happily and triumphantly noticed several self-sown pine seedlings growing under the large, saved ones.

4.3.2. The bark beetle

All seven owners saw the bark beetle as both a present and future threat, but how big of a threat the beetle was perceived to be was influenced by how they managed their forests. There was an agreement on the issues related to the infestation of the beetle, a pest that cause widespread death of spruce trees. The way it was expressed in the interviews and how the owners handled the risks differed however, and it showed similarities with how they defined a forest.

All forest owners had ways to hinder an infestation of the bark beetle. Owner G1 barked of the wind felled trees as mentioned above, then he could leave the dead wood without risking an infestation. Owner G3 took out infested trees completely to stop the spreading. He mostly saw problems in the evenly aged spruce plantations and the varied selective felled forest as a solution. He saw it as necessary to act quickly and continuously look for signs on the trees and he did not leave fallen spruce trees in his forest because of the risk.

Owner G6 had mostly evenly aged spruce planted on previous farmland and deemed the risk for storm felling and infestation so great that he used to clear-cut when the trees reached an age of around 60 years, which is a quite short cycle. He however continued with spruce plantations, but with a bit more variation by keeping birch and some other deciduous trees.

Owner G2 also saw the varied forest as a solution. He had removed plantations of spruce seedlings when he bought the forest and the spruce that grew in areas where it did not look healthy, he used for timber when he needed to. His quote is an example of how the understanding of the bark beetle correlates with the ecocentric definition of a forest as a functioning ecosystem:

"They haven't taken it (the bark beetle) seriously here in Dalsland until recently, now they panic and are felling everything! But they continue to plant spruce. I see it as a symptom for climate change, if the climate is too warm for the spruce, they will die one way or the other. The beetle is just the performer, not the cause. I try to plant trees that create resilience. A healthy forest where there is a variety of species is a forest that resists climate change, storms, and drought."

Owner G1 also did not view infestations as a major risk to his way of managing the forest and did not let it directly steer his choices. His way of looking at it was that “we have made the bark beetle a pest because we have managed our forests wrongly. It is just a part of nature.”

In the case of the owners in group 3 G6 and G7 and the owners with clear-cut areas in group 2, the system of spruce plantations, clear-cutting and planting made the bark beetle a serious threat and a risk for great economic loss. This reveals the path dependency that makes changes difficult and risky. Because of the way the forest had been historically managed, they could not see any alternative but to continue in the same way. Hence, the threat of the bark beetle became one of the tone-setters in the way they managed the forest. If they would start with selective felling the risk of storm felled trees and then infestations were too great.

The worldview of the owners cannot fully explain the path dependency that would allow no other choice but to use clear-cutting and planting. These owners did however prioritize production and economic values and could be said to have a more anthropocentric view of the forest. It could make it more difficult to see solutions based on alternative methods.

Even though the starting point was the same - the way forests have been managed historically steers the management of today - the solutions differed. In one case the owners had in different, sometimes radical ways, steered their forestry into more resilient methods. In the other case the forest had to be clear-cut in shorter cycles because of the risks, and the owners could not see any other reasonable solutions.

The reasons behind these choices are of course many. It was however also a matter of acceptance of the beetle as part of nature, and hence being able to see the need of other solutions. In the other case the beetle was a reason for economic loss which created a battle of who got the timber first, the beetle or the owner. The turn towards more resilient methods could be noticed in both group 1 and 2, even though the main priority in group 2 was production of timber.

The bark beetle was not only connected to loss of monetary value but of sentimentality and beauty, more connected to relational values. Owner G5 told me about a spruce forest which she had clear-cut recently due to bark beetle infestation even though the trees were much younger than when she would normally fell them. She said that it used to be a beautiful “John Bauer”²-forest and that she would need to bring handkerchiefs when we went there. She also took me to an area with spruce planted on an old ox-field which she remembered from when she was a child. She explained the trees had grown quickly and was not of the best quality, now it had got infested by the bark beetle and she had to cut it down. It was a great frustration for

² Refers to the Swedish illustrator and painter John Bauer who created illustrations of mythological forest landscapes.

her, and she did not like to visit this part of the forest where the trees were “crying”, a sign of the beetle (see also Figure 9F).

4.3.3. Beauty

Statement number 17 in the Q sort, “it is important to preserve a beautiful forest”, was one of the consensus statements. In both factors it was placed on the agree side of the distribution table. A comment from owner G5 however captured the complexity of the statement:

“One question, no. 17, is impossible to answer. Beauty is in the eye of the beholder, and we all see different things. A "messy" forest with lots of dead wood and fallen trees can be beautiful to me, because I know it is teeming with life. I think the spruce area we looked at is beautiful now, but I also see that the spruce will die because of the bark beetle, so at the same time I see a dead, ugly forest.”

Owner G3 had a similar comment to the statement:

“What is a beautiful forest? Who decides that? Maintenance is often needed to produce beautiful forests and keep it beautiful. As I showed at the first stop on our forest tour. The oak forest where spruce seedlings come up, which must be cleared, or they will take over”.

Values connected to beauty and the importance of preserving beauty was however something that occurred in all the interviews. Owner G3 described during the go-along that they could see beauty in all different forests. The planted and thinned spruce made a beautiful “John Bauer” forest with green moss in the end of the production cycle. They could also see the beauty but mostly the necessity in the clear-cut areas and the long rows of equally aged, planted spruce. However, the forest where they used selective felling was the one that many people liked to hike in, which they took pride in.

Beauty was also something that was considered when deciding which areas that should be saved for set-asides or selective felling. For owner G4 in group 2 beauty was one of the reasons for using selective felling in one specific area, they wanted to keep the beauty of the place with its river where they used to fish (Figure 8F). Owner G5 had saved an area with old spruce trees close to the house and said as we passed by, “I will never cut this area even though the timber buyers drool every time we walk past it! It is beautiful and we pass by it every day.”

Owner G6 explained how the aesthetics of a set-aside was part of the decision of which areas he preferred for protection:

“I rather save NS³ areas. All the dead wood in NO areas gives like a sterile look that I don’t like. In NS areas I can select the trees I think is suitable, like oak trees, and support them.”

Beauty could be argued to be an instrumental value because of the human nature of the concept. Because of the subjectivity of beauty, it could however also be relational when it is connected to sentimental values and memory. Owner G1 described a forest that was not his but that he often used for hiking. He described it as a “real” forest, compared to his own, and considered it beautiful because of its realness, but also because of childhood memories. This quote holds both intrinsic values related to saving high natural forest values, and relational values through feelings of responsibility and sentimentality:

“I have tried to talk to the County Administrative Board about it as I am afraid that it soon will be cut down even though it has high natural values. It's also a bit sentimental. It is the only forest left since I was a child. It is difficult for me to walk in the forest sometimes. The more I learn about how wrongly we use and have used the forest, the sadder it becomes to walk here. Even if I won't be able to see how my forest develops, there are others who come after me who will want a forest too.”

For owner G5 beauty was also important in a wider sense than just a beautiful forest close to the house. She told a story about when another forest owner in a forestry course had been upset that they could not do a certain logging in the forest because of protection rules. She had then told him that “Why do you destroy the forest here, just to earn money to be able to travel to parts of the world with beautiful forests where they do not allow this destruction. Why not keep the beauty at home?”

Both as an instrumental and relational value, beauty influenced the choices of the owners. In many ways it was a value which made the owners care for the forest because of other reasons than practical and economic.

³ NS = *Naturvård skötselkrävande* which translates to nature conservation where maintenance is needed.
NO = *Naturvård orörd*, translates to nature conservation, no maintenance allowed. The classification is set when the plan for the forest is made and depends on the type of forest.

4.3.4. Economy

Monetary values are what is most related to instrumental values and all the owners have varied thoughts about the priority of economy when planning the management of the forest.

To both the owners in group 1 the economic values had low priority. Owner G2 had bought the forest quite recently and said that “The man who sold us the forest said we could take out timber for 500,000 kr directly, but then we wouldn't have had any forest left, just rock and lingonberry.” He often felt the need to explain himself for not having any economic interests in the forest:

“I often have to explain why I have a forest that I am not interested in making money from. They say I too must make a living. But I have a job where I make my money, and while others buy an expensive car because it is their interest, why can I not buy a forest because it is my interest? I am interested in creating biotopes and not in making money from the forest.”

The two owners in group 1 actively chose not to use the forest for production, even though they had been in situations where they needed an income, such as house renovations. They were however both relieved and proud that they had been able to resist taking timber from the forest to cover these expenses. When talking about the monetary value of the forest, owner G1 said that:

“There was a time when you could have your forest as a source of income. But I think that time has passed, we have overconsumed it for too long. There is no forest left anymore and we must pay the price for what we have done. I am willing to do that.”

None of the participants in the Q sort ranked statement number 7 “The most important reasons to why I own my forest are economical” as the highest priority. In group 2 and 3, production was understood as possible to combine with other values such as biodiversity conservation, while economic values were seen more as an opposite.

Participant F2 said that he could have ranked statement number 7 the highest, but as he valued the environment and biological diversity highly as well, he chose not to. Instead, he put number 10 as the highest ranked statement “The production of timber must be prioritized”. He also thought his concern for biodiversity did not show in his sorting as he had to put the statements related to economy and production first. He then said that we no longer manage forests as insanely as before and we are more considerate of other values, however society demands forest products and then the forest needs to be used.

Owner G5 expressed that she managed her forest with a fifty/fifty goal of production and conservation. The monetary value was not the top priority for her. She said that “The forest is more than money, if you just want to earn money from the forest, you mow it all down, you don’t use all these other methods.”

Statement number 14 “Forestry and its traditions are an important part of Swedish culture” was ranked equally high as statement 7 in fraction 1. Many of the owners had inherited their forests from several generations back and managed it in similar ways as their parents had done. Feelings of duty towards older and future generations as well as society was part of the discussions around the prioritization of monetary values and production objectives.

Many of the owners had to at some extent prioritize economy though to make their business go around, as owner G3 said: “Of course we have to prioritize economy, otherwise you cannot run a company. It’s what it is all about.”

4.3.5. Climate mitigation

The feeling of duty towards society in terms of demand on forest products reflects the high demand on forests as a method for climate mitigation, as mentioned above in chapter 1. Owner G4 held the production of substitution products high, “We see the brushwood and biomass as our most important product. We sell it to the local heating plant that produces heat for our municipality.”

Owners in both group 2 and 3 commented on how the management of their forests contributed to carbon uptake, both with sequestration and substitution in mind. Owner G6 showed me the poplar plantation which he believed to be positive for the climate due to the rapid growth. That way, he argued it could take up a lot of carbon and still produce biomass for substitution much faster than for example spruce. Owner G4 saw his selectively managed forest as very important for climate mitigation. He argued the older trees continued to take up a lot of carbon even in the last years, and he showed me calculations he had done on a spruce tree felled at the age of 140.

This subject was where the differences in values among the owners was the most visible and mirrored the larger societal debate. In group 1, where the owners did not manage their forests to a large extent and held more intrinsic values in relation to the forest, climate mitigation and carbon storage was a driving factor. This quote is from owner G1:

“We just have to listen to what the research says, we know what we have to do. The government claims that biofuel is a solution. But we already have a debt to the climate, we are already in the red after all the emissions we have made. A really old forest binds a lot of carbon. If I cut down this 100-year-old pine tree, I again release the carbon that it has had time to bind from the trees that previously stood here, and it takes a long time to bind it again.”

Owner G2 who managed his forest with biotopes and biodiversity in focus said that:

"Many people who count on the forest as a carbon sink forget how much is in the soil of an old forest. When they harvest it and prepare the land, they destroy all the micro-life in the soil that binds carbon. That's huge amounts in an old forest!"

Later in the interview with both owner G2 and his wife we came back to the subject, and it was clear that it was connected to a lot of frustration, they said jointly that:

"I think many people do not understand what can happen if the earth warms as much as the forecast says. It annoys me when people complain that they will lose a little luxury, they don't know what to expect."

These owners too had a feeling of duty towards society and the climate but chose to act on it in different ways depending on beliefs and values.

The frustration, although directed differently, was shared by owner G4 who said that "the state registers our forest as a carbon sink when they report our numbers to the EU, but we get nothing for it." He worked in the forestry sector and said a lot of forest owners he met already did some selective felling or wished they could, but as it is not encouraged, they did not talk about or report it.

Owner G1, who saw any large economical earnings from his forest as impossible due to climate change and biodiversity loss, thought subsidies for carbon sequestration and storage was a reasonable solution to encourage standing forests.

4.3.6. Nature values and biodiversity

Biodiversity was closely connected to the discussion on climate mitigation in the interviews. It was also a subject where values had a lot of impact on the prioritization. In group 1 the more prominent intrinsic values influenced the management to a large extent. The top priority of biodiversity meant that the instrumental values such as timber had to adapt. In the interview owner G1 showed an area with planted spruce surrounded by a drainage ditch:

"I had intended to close the ditch here and recreate the wetland, but slowly so I could first take out some of the spruce trees for timber. But the beaver got ahead of me and has now created a wetland here already and as you can see the spruce has started to die from the wet. I don't mind, I'm trying to work with the beaver, I just have to speed up and take out the trees before they die. Or I'll just leave them as dead wood. My neighbor says the beavers cause so much damage, but he is the one who has done a great clear-cut on his land."

In group 2 biodiversity was a high priority even though production was ranked the highest in the Q sort. Owner G4 proudly pointed out several signs of red listed species in the interview, like nest holes of birds and insects. He also told me of having wolfs, lynx, black grouse, eagles as well as several bird species in his forest. Just as with climate mitigation there was a frustration connected to this too, owner G4 said:

“Small-scale landowners are often the ones who have high natural values, but they do not register it. A forest owner who is out in the forest and sees a tree with a woodpecker will probably save that tree, but they say nothing because they get nothing for it.”

Both owners G3 and G4 said that they did not register red listed species in their forest, even though they knew databases such as Artportalen (a registration database which everyone can use to report species) is an important instrument for knowledge about Swedish biodiversity. They feared that if the existence of these species became known, the land would be protected, and the management taken over by the County Administration Board. This was considered disastrous, not just because of the loss of income, but because they feared all their work in the areas with selective felling which had created a forest with high natural values would be in vain if they could not continue.

This also explained why they agreed the least with statement number 13, “The forest does not need to be managed”. The comment on that statement from owner G3 was that he had seen a nature reserve close to him that used to be a nice place for hiking. It was now a protected forest where spruce had taken over, he described it as because of lack of management the bark beetle had spread, and it was now just full of dead spruce. He thought it was great failure and dreaded what would happen in his forest if it would be protected. In the interview I asked about this fear, and he said, “I actually know that many forest owners do not let their forest reach high natural values even if they could because they fear it will become a nature reserve.”

These owners used selective felling as they believed it was a sustainable way to manage forests that were suitable for it. They had very little projects that were dependent on subsidies connected to biodiversity and the economy was not the main driver even though it was important. They rather took pride in their profession and knowledge to have a forest that could both give a good timber/biomass yield and at the same time host all these red-listed species.

In group 3 biodiversity was present but not prioritized. Owner G6 had created a pond which he got subsidies for as a wetland, and he had the set-aside areas he needed for the FSC-certification. These areas were however chosen according to land fertility, and he explained that the areas used as set-asides had low fertility and nothing would grow there.

The down-prioritization of biodiversity did however not mean it was not important to these owners. Owner F2 commented in the Q sort that:

“It’s like ranking the grades of hell. I had to prioritize the timber production, but that doesn’t mean I do not support biodiversity. I think that is very important and it does not show in my ranking. It is however the reason I did not put number 7 as agree the most. With the demand on timber and biomass from society today though, we must use and manage the forest.”

This comment illuminates the issue with high demand on forest products and the difficulties of prioritizing biodiversity when it is not financially rewarded. Owner G7 had both spruce and pine forests which he managed by clear-cutting, but also said that he “has quite a lot of protected forest with high natural values, like deciduous trees and orchids. We live with that present constantly.”

These owners however had much more trust towards the system of certification and voluntarily set-aside areas than the owners in group 1, and somewhat more than the owners in group 2. In the Q sort owner S1 commented her choice of statement number 6 “Voluntary set-asides means that those forests that need protection the most, because of biodiversity, are in fact protected” as an agree statement, with: “This presupposes that the Swedish certification system influences the forestry”.

4.3.7. Regulation and trust

On the topic of regulation of forestry in Sweden several of the owners expressed a difference between small-scale and privately owned forestry in southern Sweden and the forestry done by large companies and owners in the north. Owner G7 expressed it as:

“There may be a need for more regulation from the state in Norrland, where huge clear-cuts are made, here we think that a clear-cut of 10 hectares is huge. But those made there by Sveaskog and the big companies on up to 40 to 100 hectares or even larger than that. It affects the local climate and contributes to soil erosion. Maybe it is needed there to create an economy with large distances, I don't know, but it is unfair to compare with Småland. Here, farmer forestry is so small-scale, and we have no primeval forest left here and the land where there is spruce forest today was previously farmland, ditched peat land or pasture. I don't think the state should have a lot of power here, I think it's best with freedom under responsibility. All forest owners do and think differently, so there will still be diversity in it when it is so small-scale.”

On this subject the opinions in the groups were a bit more diversified. Owner G2 did not believe in state regulation but saw it as necessary in the current forestry system, "I see it as a responsibility to own forest, if everyone had taken responsibility,

we would not have needed any regulation. But not everyone does that and then it is needed.” Owner G1 on the other hand believed in regulation but ended up with a similar view:

“The only protection that helps is nature reserves. There is too little regulation when it comes to set-asides and it can change as soon as the forest owner decides to cut it down. Then all you have to do is set aside another area.”

Owner G4 had a strong opinion against regulation and a strong sense of integrity connected to his forest. In the Q sort he commented that regulation should function as framework laws with a lot of freedom. On statement number 5 “Companies, lobby organizations, and forest owner organizations should not be able to give advice on forest management and forest protection” he commented that “Rather, non-profit organizations and the public should not be allowed to comment on private property. I'm not allowed to comment on other people's bank accounts”.

This view can be related to the first category, the definition of a forest. If the forest was connected to instrumental values and seen as first and foremost private property and economic safety for the owner, regulations, and public opinions about it might be seen as an infringement. It was in the case of owner G4 not related to a wish to overstepping any regulations already in place, he already took more consideration of nature values than he needed, it was more of a dislike of not being able to do things his way.

If the ownership on the other hand was understood more through intrinsic values, and as a stewardship of nature, state regulations were not considered a threat in the same sense. The forest was seen as having its own integrity and the ownership a responsibility, this was expressed by owner G5 as “I own the forest, but I also don't. It is a responsibility, and I am only a chain in a link. What I am doing now, I will not live to see finished.” Owner G1 wanted to see more regulations and suggested that there should be a requirement for better knowledge to own forest, as he believed it difficult for forest owners to know everything and they then follow the advice of timber buyers who see no other values than financial.

For those owners who felt a need for better and tougher state regulations connected to protection of forests and biodiversity, it was often put in relation to the power of timber buyers and timber companies. They were not trusted to give advice with nature value in mind. Owner G2 said that:

"Timber buyers make it sound like they are forestry experts when they come, but they have no interest in the forest, they are only interested in buying timber. They might say you have to take these pines now or they will die soon anyway. Either they don't know, or they don't care to tell them that a pine can live up to 600 years and that these are only 100, that's exactly when it starts to have some natural value."

For owner G5 the trust had a lot to do with personal chemistry and mutual understanding of what was important in the forest. She had some experience of contractors causing great harm in the forest and advisors from timber companies who she thought had no consideration for nature values at all. Whenever she hired someone to work in the forest she would drive to the site and check on their work, she thought this was important as contractors often caused too much harm otherwise.

In the Q sort statement 2 “I trust management advice from timber companies” was ranked quite low by both fractions, -1 in fraction 1 and -2 in fraction 2. This suggests that the trust was quite low among most owners. Owner G7 also used contractors to do some work and said that:

“I do everything myself except the final felling because I have too small machines for that. That's what Södra does, which I'm a member of. It's hard today to get people to come out to the forest, 20 years ago officials could come out and look, but today they've become more like timber buyers. It has become a bit greedier.”

He did however not see any problem of using them to do the felling. For many owners doing everything themselves was not a choice. Owner G3 who however did a lot himself had mixed experiences with advisors from timber companies and commented:

“Södra's advice a couple of years ago was to clear the undergrowth in the selective managed stock and cut the large trees. It would be a preparation for final felling which, in my opinion, is completely reprehensible. They have a requirement of at least 60,000 cubic meters in procurement per inspector and this stimulates large fellings. But they are good at stock used for clear-cutting and silviculture.”

The advisors from the Swedish Forest Agency were more trusted but were not as utilized. Owner G5 had used them for information about subsidies for biodiversity and thought they were the only ones calling for something different in the forest management. She however thought it was a problem that they were not as visible as the buyers who could invite themselves and start to talk about forestry right away.

Owner G1 did not trust either timber companies or the Swedish Forestry Agency at all. He believed the Swedish Forestry Agency often runs the affairs of the forestry companies.

4.3.8. The influence of values

The use and influence of values on the forestry methods is concluded in Figure 10. The worldviews that were expressed around the subjects the definition of a forest and the bark beetle influenced to a certain extent the priorities in the forests. The influence of specific values on managing methods on the other hand depended on the worldview, but relational values were influential in all groups.

In group 1 where the owners prioritized intrinsic values they were closely linked together and the intrinsic values effected the outcome of the relational and vice versa, while group 2 and 3 where instrumental values were prioritized, the relational functioned as an underlying guiding mechanism.

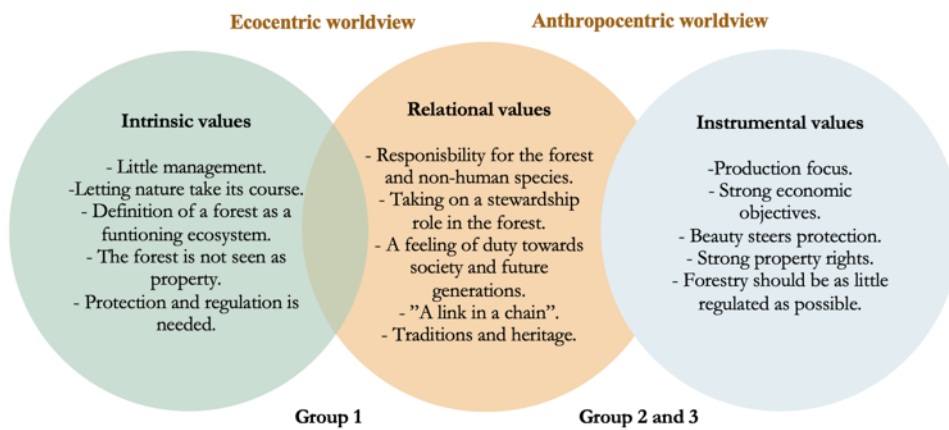


Figure 10: Prioritized values and the characteristics of the forest owner groups. Intrinsic and relational values are the most influential in group 1, where they are closely linked together. Instrumental values are most influential in group 2 and 3 where relational values function as an underlying guiding mechanism.

5. Discussion

The conflicting interests between forest biodiversity conservation and climate mitigation through substitution of fossil materials with forest products became visible in the results, mirroring the societal debate. The forestry methods used by the owners in the study were however influenced by a variation of factors.

For the owners in group 1 who had more prominent ecocentric values, beliefs and feelings of duty towards society concerning climate mitigation through carbon storage and biodiversity were strong factors effecting the management of their forests. Heritage and tradition, as in Swedish forestry tradition, was not given too much attention. Rather the owners I interviewed moved away from methods used in the forest before them.

To not do anything with the forest is not uncommon among small-scale private forest owners due to reasons such as lack of knowledge, sentimental feelings towards older forests, no interest, no economic need or lack of financial means to do the management needed (Lodin & Brukas, 2021). The forest of owner G2 was however managed with a clear and well-grounded objective of enhancing and supporting biodiversity and carbon storage instead of production.

In the groups 2 and 3 plus the three Q method participants, the production was the main focus together with economic objectives. The owners in these groups had a more anthropocentric worldview. Duty towards society was also a driver of the production focus in these groups because of the experienced societal demand on forest products. Tradition and heritage played an important role here. The owners who used clear-cutting methods did so much because of how owners before them had managed the land.

Even though production was prioritized higher than the nature's own right of existence in group 2 and 3, it was a consensus statement in the Q sort which both factors agreed to. In line with other studies it becomes clear that simplistic conclusions cannot be drawn (Eriksson & Klapwijk, 2019). The same study shows that forest owners tend to be positive towards biodiversity measures only when it is part of continued forest production and when production goals are not secondary (Eriksson & Klapwijk, 2019). This was reflected in this study where 7 of 10 owners had production as the most prioritized goal.

Care for biodiversity conservation was more prioritized in group 1, but it was not neglected in group 2 and 3. Rather it was a matter of how much the owners trusted the Swedish management system and certifications to care for biodiversity

conservation. For owners in group 2 it was highly present in the everyday management even though the production focus steered the direction.

Relational values proved to be very important to all forest owners when managing their forests. The care for the forest and feelings of responsibility could be found among all owners even if these values were expressed differently depending on other factors and worldviews. Relational values functioned as an underlying guiding mechanism for those prioritizing instrumental values and were closely linked to intrinsic values when these were important.

The critique of the use of relational values where they justify an anthropocentric focus in biodiversity conservation could be validated to some extent (Piccolo et al., 2022). When tradition, the sense of duty towards society in forms of carbon substitution and production, and the Swedish “production culture” was important, the relational values became instrumental. However, it was also relational values that made the owners care for natural values such as red-listed species in the forests, even though the objectives of the forest were mainly productive and economical. The prioritized values of the forest owners and how the group characteristics were influenced by these is illustrated above in Figure 10.

In other words, to completely prioritize biodiversity conservation and carbon storage required a forest owner who moved away from the mainstream path of production focus. On the other hand, to let natural values and biodiversity be a prominent part of the production forest, did not require an owner with an ecocentric worldview who held intrinsic values the highest.

The differentiating worldviews were however shown to influence the views on state regulation and voluntariness connected to set-asides. To the owners who saw themselves as caretakers more than owners of the forest, regulation was seen as necessary because of those who did not take responsibility for non-human species and carbon storage. When the importance of the ownership was more emphasized, the owners were less positive towards regulation of small-scale forestry. In group 2 this had little relation to if the owners would value biodiversity in the forest or not. It rather meant they did not trust authorities to care for the forest the same way they did.

In other studies, values have been shown to influence behaviors in forest management to a certain extent, but the importance of non-economical values decreased in relation to production and situational constraints (Eriksson & Fries, 2020). This was confirmed in the results as the path dependency of spruce plantations meant that no other alternatives were imaginable. It influenced the methods used and to some extent the values the owners held in relation to their forests. The production focus of the owners thus reflects the production focus of Swedish forestry through which cultural barriers can discourage alternatives (Andersson & Keskitalo, 2018; Hertog et al., 2022). The owners in group 1 who had taken radically different choices in their forests felt questioned and opposed because of this. For these owners the intrinsic values held in relation to their forests were important as motivators for acting against the norm.

The results of my study suggest that the use of alternative forestry methods and concern for biodiversity does not have to mean a radical change of the way the forest is understood and valued. Owners in both group 2 and 3 held similar values in relation to their forests according to the Q sort but used different methods. The general experience among the owners in the study was though that alternatives to the clear-cutting was not encouraged, not from the government perspective, nor from the industry. High production objectives were often motivated by a “demand from society”.

Encouraging and assisting forest owners in prioritizing relational and intrinsic values in their forest management could motivate better care for biodiversity and help to even out the conflicting goals of climate mitigation and biodiversity conservation in the Swedish forest.

6. Conclusions

My study is an in-depth analysis of the values that influence private forest owners' choice of management methods. The results show that basic values do influence the methods used by the owners. Especially relational values had a great impact on the management in relation to non-monetary values such as carbon storage and biodiversity conservation.

Encouraging forest owners to prioritize and care for relational values already considered important proved to be a potential instrument for making sure steps towards further biodiversity conservation are taken in the production forest. This however needs to be done with caution to not let the anthropocentric values steer the direction. In future research, the use of participatory and interactive methods on a larger scale could allow for a broader understanding of how relational values can be supported.

The Swedish forestry governance where climate substitution is seen as an important solution to the climate crisis, combined with a culture of clear-cutting and production does influence private forest owners and their choice of management methods. Creating trust among forest owners and allowing for high natural values to function as good examples and not something to be avoided in fear of losing the forest, could be a step towards better combining the objectives of climate mitigation and biodiversity conservation. This also calls for further research on how to support forest owners to move away from the path dependency of Norwegian spruce plantations.

7. Acknowledgements

I want to thank all forest owners who so generously have shared your time and knowledge with me. You are all important players in the story of the Swedish forest.

I also want to thank my supervisor Torsten Krause at LUCSUS for valuable guidance and engagement. Professor Vilis Brukas and PhD Keeli Curtis at SLU Alnarp for generous advice in the beginning of the process.

Without help and support from friends and family I could not have finished this thesis. Cecilia and Erik who so kindly have been reading, and my fellow thesis writing students at CEC, thank you for all your support!

8. References

- Ahlström, A., Canadell, J. G., & Metcalfe, D. B. (2022). Widespread Unquantified Conversion of Old Boreal Forests to Plantations [<https://doi.org/10.1029/2022EF003221>]. *Earth's Future*, 10(11), e2022EF003221. <https://doi.org/https://doi.org/10.1029/2022EF003221>
- Andersson, E., & Keskitalo, E. C. H. (2018). Adaptation to climate change? Why business-as-usual remains the logical choice in Swedish forestry. *Global Environmental Change*, 48, 76-85. <https://doi.org/https://doi.org/10.1016/j.gloenvcha.2017.11.004>
- Angelstam, P., Naumov, V., Elbakidze, M., Manton, M., Priednieks, J., & Rendenieks, Z. (2018). Wood production and biodiversity conservation are rival forestry objectives in Europe's Baltic Sea Region. *Ecosphere*, 9(3), e02119. <https://doi.org/https://doi.org/10.1002/ecs2.2119>
- Appelstrand, M. (2007). *Miljömålet i skogsbruket: Styrning och frivillighet*. Sociologiska institutionen, Lunds universitet. <https://portal.research.lu.se/sv/publications/miljömålet-i-skogsbruket-styrning-och-frivillighet>
- Appelstrand, M. (2012). Developments in Swedish forest policy and administration – from a 'policy of restriction' towards a 'policy of cooperation' [Artikel]. *Scandinavian Journal of Forest Research*, 27(2), 186-199. <https://doi.org/10.1080/02827581.2011.635069>
- Banasick, S. (2019). *Ken-Q-analysis (Version 1.0.8)*. In <https://shawnbanasick.github.io/ken-q-analysis/>
- Bjarstig, T., & Kvastegard, E. (2016). Forest social values in a Swedish rural context: The private forest owners' perspective. *Forest Policy and Economics*, 65, 17-24. <https://doi.org/10.1016/j.forpol.2016.01.007>
- Bjarstig, T., & Stens, A. (2018). Social Values of Forests and Production of New Goods and Services: The Views of Swedish Family Forest Owners. *SMALL-SCALE FORESTRY*, 17(1), 125-146. <https://doi.org/10.1007/s11842-017-9379-9>
- Bryman, A., & Nilsson, B. (2011). *Sambällsvetenskapliga metoder*. Liber.
- Chan, K. M. A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez-Baggethun, E., Gould, R., Hannahs, N., Jax, K., Klain, S., Luck, G. W., Martín-López, B., Muraca, B., Norton, B., Ott, K., Pascual, U., Satterfield, T., Tadaki, M., Taggart, J., & Turner, N. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences of the United States of America*, 113(6), 1462-1465. <https://www-jstor-org.ludwig.lub.lu.se/stable/26467652>
- Dagens Nyheter. (2021-2022). DN granskar skogsindustrin. *Dagens Nyheter*. <https://www.dn.se/om/dn-granskar-skogsindustrin/?offset=0>
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J. R., Arico, S., Baldi, A., Bartuska, A., Baste, I. A., Bilgin, A., Brondizio, E., Chan, K.

- M. A., Figueroa, V. E., Duraiappah, A., Fischer, M., Hill, R., . . . Zlatanova, D. (2015). The IPBES Conceptual Framework — connecting nature and people. *Current Opinion in Environmental Sustainability*, 14, 1-16. <https://doi.org/https://doi.org/10.1016/j.cosust.2014.11.002>
- Edwards, P., Brukas, V., Brukas, A., Hoogstra-Klein, M., Secco, L., & Kleinschmit, D. (2022). Development of forest discourses across Europe: A longitudinal perspective. *Forest Policy and Economics*, 135, 102641. <https://doi.org/https://doi.org/10.1016/j.forpol.2021.102641>
- Eggers, J., Lämås, T., Lind, T., & Öhman, K. (2014). Factors Influencing the Choice of Management Strategy among Small-Scale Private Forest Owners in Sweden. *Forests*, 5(7), 1695-1716. <https://www.mdpi.com/1999-4907/5/7/1695>
- Eggers, J., Melin, Y., Lundström, J., Bergström, D., & Öhman, K. (2020). Management Strategies for Wood Fuel Harvesting—Trade-Offs with Biodiversity and Forest Ecosystem Services. *Sustainability*, 12(10), 4089. <https://www.mdpi.com/2071-1050/12/10/4089>
- Eleonoradotter, E. (2021). "Det hade ju aldrig hänt annars" : om kvinnor, klass och droger. Avdelningen för etnologi, Institutionen för kulturvetenskaper, Lunds universitet. https://lucris.lub.lu.se/ws/portalfiles/portal/95764538/Emma_Eleonoradotter_H_ELA.pdf
- Eriksson, L. (2018). Conventional and New Ways of Governing Forest Threats: A Study of Stakeholder Coherence in Sweden. *Environmental Management*, 61(1), 103-115. <https://doi.org/10.1007/s00267-017-0951-z>
- Eriksson, L., & Fries, C. (2020). The Knowledge and Value Basis of Private Forest Management in Sweden: Actual Knowledge, Confidence, and Value Priorities [Article]. *Environmental Management*, 66(4), 549-563. <https://doi.org/10.1007/s00267-020-01328-y>
- Eriksson, L., & Klapwijk, M. J. (2019). Attitudes towards biodiversity conservation and carbon substitution in forestry: a study of stakeholders in Sweden. *Forestry: An International Journal of Forest Research*, 92(2), 219-229. <https://doi.org/10.1093/forestry/cpz003>
- Eriksson, L., & Sandström, C. (2022). Is voluntarism an effective and legitimate way of governing climate adaptation? A study of private forest owners in Sweden [Article]. *Forest Policy and Economics*, 140. <https://doi.org/10.1016/j.forpol.2022.102751>
- Hermelingmeier, V., & Nicholas, K. A. (2017). Identifying Five Different Perspectives on the Ecosystem Services Concept Using Q Methodology. *Ecological Economics*, 136, 255-265. <https://doi.org/https://doi.org/10.1016/j.ecolecon.2017.01.006>
- Hertog, I. M., Brogaard, S., & Krause, T. (2022). Barriers to expanding continuous cover forestry in Sweden for delivering multiple ecosystem services. *Ecosystem Services*, 53, 101392. <https://doi.org/https://doi.org/10.1016/j.ecoser.2021.101392>
- Holmgren, S., & Arora-Jonsson, S. (2015). The Forest Kingdom – with what values for the world? Climate change and gender equality in a contested forest policy context [Article]. *Scandinavian Journal of Forest Research*, 30(3), 235-245. <https://doi.org/10.1080/02827581.2014.1002216>
- Hugosson, M., & Ingemarson, F. (2004). Objectives and motivations of small-scale forest owners; theoretical modelling and qualitative assessment. *Silva Fennica*, 38(2), 217-231.

- Ingemarson, F., Lindhagen, A., & Eriksson, L. (2006). A typology of small-scale private forest owners in Sweden. *Scandinavian Journal of Forest Research*, 21(3), 249-259. <https://doi.org/10.1080/02827580600662256>
- Jordan, C. M., Veronesi, F., & Cherubini, F. (2018). Integrating impacts on climate change and biodiversity from forest harvest in Norway. *Ecological Indicators*, 89, 411-421. <https://doi.org/https://doi.org/10.1016/j.ecolind.2018.02.034>
- Ipbes. (2022). *Methodological assessment of the diverse values and valuation of nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (P. Balvanera, U. Pascual, M. Christie, & D. González-Jiménez, Eds.). IPBES Secretariat. <https://doi.org/10.5281/zenodo.6522522>
- Juerges, N., Arts, B., Masiero, M., Baskent, E. Z., Borges, J. G., Brodrechtova, Y., Brukas, V., Canadas, M. J., Carvalho, P. O., Corradini, G., Corrigan, E., Felton, A., Hoogstra-Klein, M., Krott, M., van Laar, J., Lodin, I., Lundholm, A., Makrickiene, E., Marques, M., . . . Pivoriunas, N. (2020). Integrating ecosystem services in power analysis in forest governance: A comparison across nine European countries [Report]. *Forest Policy and Economics*, 121. <https://doi.org/10.1016/j.forpol.2020.102317>
- Jørgensen, K., Granath, G., Strengbom, J., & Lindahl, B. D. (2022). Links between boreal forest management, soil fungal communities and below-ground carbon sequestration. *Functional Ecology*, 36(2), 392-405. <https://doi.org/https://doi.org/10.1111/1365-2435.13985>
- Kim, I., Lee, J.-h., & Kwon, H. (2021). Participatory ecosystem service assessment to enhance environmental decision-making in a border city of South Korea. *Ecosystem Services*, 51. <https://doi.org/10.1016/j.ecoser.2021.101337>
- Kooiman, J., & Jentoft, S. (2009). Meta-governance: Values, Norms and Principles, and the making of hard choices. *Public Administration*, 87(4), 818. doi: 10.1111/j.1467-9299.2009.01780.x
- Kristin, H., & Samantha, W. (2016). Oceans of Discourses: Utilizing Q methodology or analyzing perceptions on marine biodiversity conservation in the Kogelberg Biosphere Reserve, South Africa [article]. *Frontiers in Marine Science*, 3. <https://doi.org/10.3389/fmars.2016.00188>
- Kusenbach, M. (2003). Street Phenomenology: The Go-Along as Ethnographic Research Tool. *Ethnography*, 4(3), 455-485. <https://doi.org/10.1177/146613810343007>
- Laakkonen, A., Zimmerer, R., Kähkönen, T., Hujala, T., Takala, T., & Tikkanen, J. (2018). Forest owners' attitudes toward pro-climate and climate-responsive forest management. *Forest Policy and Economics*, 87, 1-10. <https://doi.org/https://doi.org/10.1016/j.forpol.2017.11.001>
- Lodin, I., & Brukas, V. (2021). Ideal vs real forest management: Challenges in promoting production-oriented silvicultural ideals among small-scale forest owners in southern Sweden. *Land Use Policy*, 100. <https://doi.org/10.1016/j.landusepol.2020.104931>
- Maier, D., & Feest, A. (2016). The IPBES Conceptual Framework: An Unhelpful Start [Article]. *Journal of Agricultural & Environmental Ethics*, 29(2), 327-347. <https://doi.org/10.1007/s10806-015-9584-5>
- Makkonen, M., Huttunen, S., Primmer, E., Repo, A., & Hildén, M. (2015). Policy coherence in climate change mitigation: An ecosystem service approach to forests as carbon sinks

- and bioenergy sources. *Forest Policy and Economics*, 50, 153-162. <https://doi.org/https://doi.org/10.1016/j.forpol.2014.09.003>
- McFarlane, B. L., & Boxall, P. C. (2003). The role of social psychological and social structural variables in environmental activism: an example of the forest sector. *Journal of Environmental Psychology*, 23(1), 79-87. [https://doi.org/https://doi.org/10.1016/S0272-4944\(02\)00080-4](https://doi.org/https://doi.org/10.1016/S0272-4944(02)00080-4)
- Metria AB. (2020). *Ägarkategorier skog*. Naturvårdsverket och Lantmäteriet Retrieved 2023-01-24 from <https://www.regeringen.se/491c5d/contentassets/8010961a5b09433aa7de76d68d4cf8b8/starkt-aganderatt-flexibla-skyddsformer-och-naturvard-i-skogen-del-1-sou-202073>
- Ministry for Climate and Enterprise. (2021). *Strengthened property rights, flexible forms of protection and increased incentives for nature conservation in forests based on voluntariness* (Prop. 2021/22:58) Stockholm Retrieved from <https://www.regeringen.se/rattsliga-dokument/proposition/2021/11/prop.-20212258/>
- Moreau, L., Thiffault, E., Cyr, D., Boulanger, Y., & Beaugerard, R. (2022). How can the forest sector mitigate climate change in a changing climate? Case studies of boreal and northern temperate forests in eastern Canada. *Forest Ecosystems*, 9, 100026. <https://doi.org/https://doi.org/10.1016/j.fecs.2022.100026>
- Naumov, V., Manton, M., Elbakidze, M., Rendenieks, Z., Priednieks, J., Uhlianets, S., Yamelynets, T., Zhivotov, A., & Angelstam, P. (2018). How to reconcile wood production and biodiversity conservation? The Pan-European boreal forest history gradient as an “experiment”. *Journal of Environmental Management*, 218, 1-13. <https://doi.org/https://doi.org/10.1016/j.jenvman.2018.03.095>
- Nijnik, M., Nijnik, A., Bergsma, E., & Matthews, R. (2014). Heterogeneity of experts’ opinion regarding opportunities and challenges of tackling deforestation in the tropics: a Q methodology application. *Mitigation and Adaptation Strategies for Global Change*, 19(6), 621-640. <https://doi.org/10.1007/s11027-013-9529-0>
- Nordlund, A., & Westin, K. (2011). Forest Values and Forest Management Attitudes among Private Forest Owners in Sweden. *Forests*, 2(1), 30-50. <https://www.mdpi.com/1999-4907/2/1/30>
- Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R. T., Başak Dessane, E., Islar, M., Kelemen, E., Maris, V., Quaas, M., Subramanian, S. M., Wittmer, H., Adlan, A., Ahn, S., Al-Hafedh, Y. S., Amankwah, E., Asah, S. T., . . . Yagi, N. (2017). Valuing nature’s contributions to people: the IPBES approach. *Current Opinion in Environmental Sustainability*, 26-27, 7-16. <https://doi.org/https://doi.org/10.1016/j.cosust.2016.12.006>
- Pascual, U., McElwee, P. D., Diamond, S. E., Ngo, H. T., Bai, X., Cheung, W. W. L., Lim, M., Steiner, N., Agard, J., Donatti, C. I., Duarte, C. M., Leemans, R., Managi, S., Pires, A. P. F., Reyes-García, V., Trisos, C., Scholes, R. J., & Pörtner, H.-O. (2022). Governing for Transformative Change across the Biodiversity–Climate–Society Nexus. *BioScience*, 72(7), 684-704. <https://doi.org/10.1093/biosci/biac031>
- Petersson, H., Ellison, D., Appiah Mensah, A., Berndes, G., Egnell, G., Lundblad, M., Lundmark, T., Lundström, A., Stendahl, J., & Wikberg, P. E. (2022). On the role of

- forests and the forest sector for climate change mitigation in Sweden [Article]. *GCB Bioenergy*, 14(7), 793-813. <https://doi.org/10.1111/gcbb.12943>
- Piccolo, J. J., Taylor, B., Washington, H., Kopnina, H., Gray, J., Alberro, H., & Orlikowska, E. (2022). "Nature's contributions to people" and peoples' moral obligations to nature [Short Survey]. *Biological Conservation*, 270. <https://doi.org/10.1016/j.biocon.2022.109572>
- Polomé, P. (2016). Private forest owners motivations for adopting biodiversity-related protection programs. *Journal of Environmental Management*, 183, 212-219. <https://doi.org/https://doi.org/10.1016/j.jenvman.2016.07.097>
- Ranius, T., Hämäläinen, A., Egnell, G., Olsson, B., Eklöf, K., Stendahl, J., Rudolphi, J., Sténs, A., & Felton, A. (2018). The effects of logging residue extraction for energy on ecosystem services and biodiversity: A synthesis. *Journal of Environmental Management*, 209, 409-425. <https://doi.org/https://doi.org/10.1016/j.jenvman.2017.12.048>
- Regeringskansliet. (2018). Strategi för Sveriges Nationella Skogsprogram [Strategy for Sweden's National Forest Programme]. In: Government Offices of Sweden, Ministry of Enterprise och Innovation Rosenbad
- Saarikoski, H., Jax, K., Harrison, P. A., Primmer, E., Barton, D. N., Mononen, L., Vihervaara, P., & Furman, E. (2015). Exploring operational ecosystem service definitions: The case of boreal forests. *Ecosystem Services*, 14, 144-157. <https://doi.org/https://doi.org/10.1016/j.ecoser.2015.03.006>
- Sandberg, M., & Jakobsson, S. (2018). Trees are all around us: Farmers' management of wood pastures in the light of a controversial policy. *Journal of Environmental Management*, 212, 228-235. <https://doi.org/https://doi.org/10.1016/j.jenvman.2018.02.004>
- Schulte, M., Jonsson, R., Hammar, T., Stendahl, J., & Hansson, P.-A. (2022). Nordic forest management towards climate change mitigation: time dynamic temperature change impacts of wood product systems including substitution effects. *European Journal of Forest Research*, 141(5), 845-863. <https://doi.org/10.1007/s10342-022-01477-1>
- Scott, N. A. (2020). Calibrating the go-along for the Anthropocene. *International Journal of Social Research Methodology*, 23(3), 317-328. <https://doi.org/10.1080/13645579.2019.1696089>
- Shin, Y.-J., Midgley, G. F., Archer, E. R. M., Arneeth, A., Barnes, D. K. A., Chan, L., Hashimoto, S., Hoegh-Guldberg, O., Inzarov, G., Leadley, P., Levin, L. A., Ngo, H. T., Pandit, R., Pires, A. P. F., Pörtner, H.-O., Rogers, A. D., Scholes, R. J., Settele, J., & Smith, P. (2022). Actions to halt biodiversity loss generally benefit the climate. *Global Change Biology*, 28(9), 2846-2874. <https://doi.org/https://doi.org/10.1111/gcb.16109>
- Skogsstyrelsen. (2022). *Statistik från Skogsstyrelsen, Åtgärder i skogsbruket 2021*. <https://www.skogsstyrelsen.se/globalassets/statistik/statistikfaktablad/jo0301-statistikfaktablad-atgarder-i-skogsbruket-2021.pdf>
- Svensson, J., Andersson, J., Sandström, P., Mikusiński, G., & Jonsson, B. G. (2019). Landscape trajectory of natural boreal forest loss as an impediment to green infrastructure. *Conservation Biology*, 33(1), 152-163. <https://doi.org/10.1111/cobi.13148>
- SVT. (2021, september 19, 2021 - oktober 2, 2021). *Vetenskapens Värld: Slaget om skogen*.
- Swedish Forestry Agency. (2021). *Allt färre och äldre skogsägare*. Retrieved 2022-09-23 from <https://www.skogsstyrelsen.se/nyhetslista/allt-farre-och-aldre-skogsagare/>

- Swedish National Forest Inventory. (2022). *Forest statistics*. Retrieved 2022-09-15 from <http://www.slu.se/foreststatistics>
- Taylor, B., Van Wieren, G., & Zaleha, B. D. (2016). The Greening of Religion Hypothesis (Part Two) Assessing the Data from Lynn White, Jr, to Pope Francis. *Journal for the Study of Religion, Nature and Culture*, 10(3), 306-378. <https://doi.org/10.1558/jsrnc.v10i3.29011>
- Uggla, Y., & Lidskog, R. (2016). Climate risks and forest practices: forest owners' acceptance of advice concerning climate change. *Scandinavian Journal of Forest Research*, 31(6), 618-625. <https://doi.org/10.1080/02827581.2015.1134648>
- Wiersum, K. F., Elands, B. H. M., & Hoogstra, M. A. (2005). Small-scale forest ownership across Europe: Characteristics and future potential. *Small-scale Forest Economics, Management and Policy*, 4(1), 1-19. <https://doi.org/10.1007/s11842-005-0001-1>
- Zabala, A., Sandbrook, C., & Mukherjee, N. (2018). When and how to use Q methodology to understand perspectives in conservation research. *Conservation Biology*, 32(5), 1185-1194. <https://doi.org/https://doi.org/10.1111/cobi.13123>



LUNDS
UNIVERSITET

WWW.CEC.LU.SE
WWW.LU.SE

Lunds universitet

Miljövetenskaplig utbildning
Centrum för miljö- och
klimatforskning
Ekologihuset
223 62 Lund