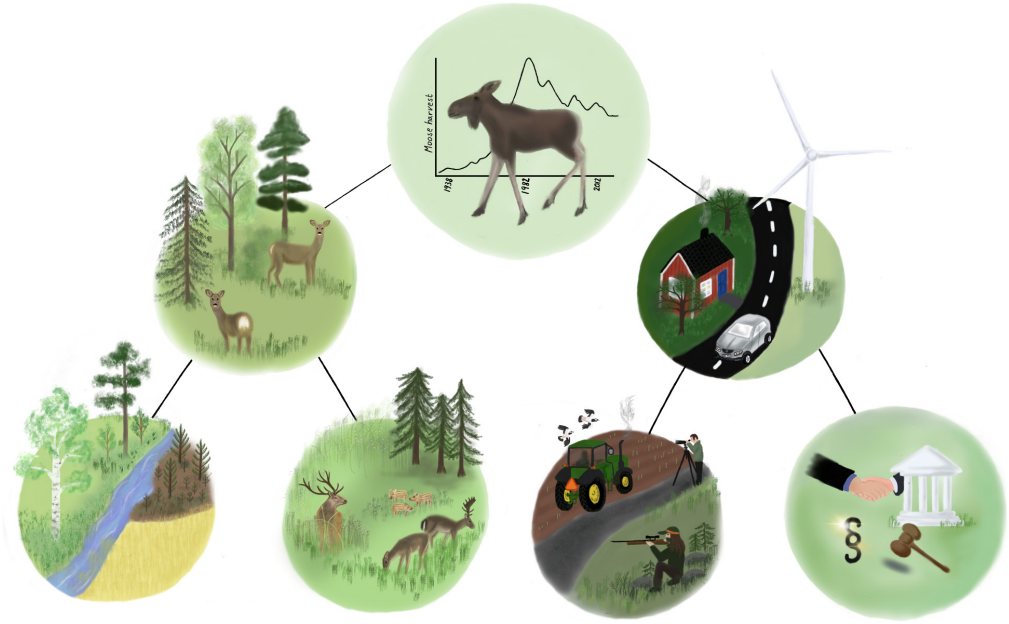
Acta Universitatis Agriculturae Sueciae

Doctoral Thesis No. 2020:30
Faculty of Forest Sciences

Social-ecological performance of collaborative wildlife governance:

The case of Swedish moose management

Sabrina Dressel



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Doctoral thesis
Swedish University of Agricultural Sciences
Umeå 2020

Acta Universitatis Agriculturae Sueciae
2020:30

Cover: Social-ecological system of moose management
(Illustration: A. Widén)

ISSN 1652-6880
ISBN (print version) 978-91-7760-578-2
ISBN (electronic version) 978-91-7760-579-9

Print: SLU Service/Repro, Uppsala 2020

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Abstract

Natural resources such as wildlife are part of social-ecological systems, which are characterized by inherent complexity, uncertainty, and changes. Therefore, collaborative, decentralized, and adaptive approaches tend to be preferred in environmental governance. Despite extensive research efforts, central questions about 'what works where, and why' remain. My thesis helps bridge this knowledge gap with insights from Swedish moose (*Alces alces*) management. In 2012, Sweden implemented a multi-level collaborative governance regime to manage moose in accordance with the ecosystem approach. This involved establishing Moose Management Areas (MMA), which are led by Moose Management Groups (MMG) consisting of landowner and hunter representatives. The aim of my thesis was to analyse the effects of context and institutional design on the social-ecological performance of the moose management system. I based my analyses on surveys, interviews, and workshops with actors on different governance levels, which I combined with information from management plans and ecological monitoring. My results revealed spatial and functional misfits created by the design and implementation of the system. In northern Sweden, large MMAs were created to match seasonal moose migration. This creates challenges for collaboration because large areas require more time investment from MMGs and processes that enable the integration of many stakeholders. Functional misfits occur in southern Sweden, where land use is more diverse and several other ungulate species co-exist with moose; both of these factors adversely affected moose quota fulfilment. Adaptations are needed to overcome these misfits. I found that linking and bridging social capital between governance levels were significant determinants of actors' perceived adaptive capacity. On the local level, perceptions of fairness also contributed, while sufficient resources and knowledge were important for MMGs. 'Good examples' (i.e. MMAs that achieved good social and ecological outcomes) were characterized by leadership, social capital, and innovation, which allowed them to use the available institutional flexibility to create processes that overcame the identified misfits. Overall, my thesis highlights the need for multi-level collaboration and locally adapted institutions that match the social-ecological context. The varying implementation of the governance system also created opportunities for policy learning. Forums for systematic learning across governance levels and regions could further increase the system's social-ecological performance.

Keywords: social-ecological system, collaborative governance, social-ecological fit, perceived adaptive capacity, multi-level governance, performance, ecosystem approach

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Social-ekologiska effekter av viltförvaltning i samverkan: Svensk älgförvaltning som exempel

Sammanfattning

I ett social-ekologiskt perspektiv är komplexitet, osäkerhet och ständig förändring, centrala aspekter som måste hanteras när olika naturresurser som vilt ska förvaltas. Därför präglas dagens styrning av naturresurser i allt högre utsträckning av samverkan, decentralisering och adaptiv förvaltning. Trots omfattande forskningsinsatser kvarstår en rad kunskapsluckor vad som fungerar var och varför. Min avhandling bidrar till att fylla kunskapsluckorna genom en analys av älgförvaltningen i Sverige.

År 2012 införde Sverige ett flernivåsystem med en ekosystemansats för att förvalta älgar (*Alces alces*). Älgförvaltningsområde (ÄFO) infördes som leds av en älgförvaltningsgrupp (ÄFG) bestående av markägare och jägare. Syftet med min avhandling är att analysera hur den institutionella utformningen av älgförvaltningssystemet och hur kontextuella förutsättningarna påverkar möjligheterna att nå båda sociala och ekologiska mål. Analyserna baserades på frågeformulär, intervjuer och workshops med berörda aktörer på olika förvaltningsnivåer, samt förvaltningsplaner och ekologiska inventeringsdata. Analyserna visar att det nya förvaltningssystemet har både rumsliga och funktionella utmaningar. I norra Sverige skapades stora ÄFO för att matcha älgarnas rörelsemönster. I norr uppstår rumsliga problem som påverkar förutsättningarna för samverkan och ledamöterna i ÄFG måste investera mer tid. I södra Sverige uppstår funktionella problem till följd av en varierad markanvändning och förekomsten av flera olika klövviltarter, som påverkar förutsättningarna att nå fastställda avskjutningsmål. För att de involverade aktörerna ska kunna hantera problemen krävs anpassningsförmåga. Avgörande för aktörernas upplevda anpassningsförmåga är förekomsten av socialt kapital som länkar samman aktörerna och förvaltningsnivåerna. Inom ÄFG-nivån bidrar den upplevda tillgången till resurser och kunskap till anpassningsförmågan. Inom den lokala nivån framstår rättvisa som en viktig förutsättning. Goda exempel, dvs ÄFO som når sina mål, kännetecknas av ledarskap, socialt kapital, innovation och att de nyttjar den befintliga institutionelle flexibiliteten för att skapa lokalt anpassade processer.

Sammantaget visar min avhandling på behovet av ökad regional och lokal anpassning samt att samverkan mellan olika nivåer utvecklas. Idag genomförs älgförvaltningen samtidigt i hela landet med varierande resultat, vilket skapat förutsättningar för lärande för alla aktörer. Plattformar för systematiskt lärande kan bidra till att ytterligare förbättra processerna och måluppfyllelsen.

*Nyckelor*d: anpassningsförmåga, flernivåförvaltning, klövvilt, naturresursförvaltning, samverkan, social-ekologiskt system, socialt kapital, socialt lärande, styrning

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Preface

"The real-world research problems that scientists address rarely arise within orderly disciplinary categories, and neither do their solutions"[1]

This was actually the first sentence written in my PhD notebook in 2015. I agreed back then, and I do so even more nowadays. Working in-between disciplinary boundaries is definitely not easy and it will never let you become an "expert in the field", but it might actually help you to make a difference.

[1] Palmer, C. L. (2013). Work at the boundaries of science: Information and the interdisciplinary research process (page vii).

Dedication

Für meinen Papa - danke für alles!

Progress is impossible without change, and those who cannot change their minds cannot change anything.

George Bernard Shaw (1856-1950)

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List of publications

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

I Dressel, S.*, Ericsson, G. & Sandström, C. (2018). Mapping social-ecological systems to understand the challenges underlying wildlife management. *Environmental Science & Policy*, 84, pp. 105-112.

II Dressel, S.*, Johansson, M., Ericsson, G. & Sandström, C. (2020). Perceived adaptive capacity within a multi-level governance setting: The role of bonding, bridging, and linking social capital. *Environmental Science & Policy*, 104, pp. 88-97.

III Dressel, S.*, Ericsson, G., Johansson, M., Kalén, C., Pfeffer, S.E. & Sandström, C. Evaluating the outcomes of collaborative wildlife governance: The role of social-ecological system context and collaboration dynamics. (submitted)

IV Dressel, S.*, Sjölander-Lindqvist, A., Johansson, M., Ericsson, G. & Sandström, C. Achieving social and ecological outcomes in collaborative environmental governance: good examples from Swedish moose management. (manuscript)

Paper I & II are reproduced with the permission of the publishers.

* Corresponding author.

The contribution of Sabrina Dressel to the papers included in this thesis was as follows:

I Main author. Designed the study with co-authors. Collected the data and carried out Q-sort workshop with co-authors. Analysed the data. Wrote the manuscript with contributions from co-authors.

II Main author. Designed the study and survey with co-authors. Carried out data collection with support from co-authors. Analysed the data. Wrote the manuscript with contributions from co-authors.

III Main author. Designed the study and survey with GE, MJ, and CS. Collected data with contributions from SEP and CK. Carried out workshop with CS. Analysed the data. Wrote the manuscript with contributions from co-authors.

IV Main author. Designed the study and interview guide with CS. Carried out all interviews with CS. Analysed the data with support from ASL and CS. Wrote the manuscript with contributions from co-authors.

Abbreviations

ÄBIN	Moose browsing damage inventory (*sv: Älgbetesinventering*)
CAB	County Administrative Board (*sv: Länsstyrelsen, LST*)
CBD	Convention on Biological Diversity
CGR	Collaborative governance regime
IFCG	Integrative Framework for Collaborative Governance
MMA	Moose Management Area (*sv: Älgförvaltningsområde, ÄFO*)
MMG	Moose Management Group (*sv: Älgförvaltningsgrupp, ÄFG*)
MMU	Moose Management Unit (*sv: Älgskötseområde, ÄSO*)
PCA	Principal component analysis
SAHWM	Swedish Association for Hunting and Wildlife Management (*sv: Svenska Jägareförbundet*)
SEM	Structural equation model
SEPA	Swedish Environmental Protection Agency (*sv: Naturvårdsverket*)
SES	Social-ecological system
SESF	Social-ecological system framework
WMD	Wildlife Management Delegation (*sv: Viltförvaltningsdelegation, VFD*)

1 Introduction

1.1 Social-ecological systems and their governance

Natural resources such as wildlife are components of complex social-ecological systems (SESs) (McGinnis & Ostrom, 2014; Liu *et al.*, 2007; Ostrom, 2007). The ecological subsystem of an SES comprises the ecosystem's dynamics and the interactions between species and their habitats, while the social subsystem comprises the dynamics between individuals, groups, and society as a whole (McGinnis & Ostrom, 2014). Both subsystems have multiple levels that cover varying spatial and temporal scales (Brondizio *et al.*, 2009). Individual preferences and societal goals steer the management of the ecological subsystem, which delivers multiple contributions to people. These interactions ultimately create outcomes whereby unsustainable use of natural resources or unfair distributions of cost and benefits can lead to ecological deterioration and societal conflicts (Ostrom, 2009; Dietz *et al.*, 2003). Natural and human-caused changes such as climate change influence the SES components and their interactions over time, creating additional complexity.

This systems perspective has implications for both research on and governance of natural resources and SES (Cinner & Barnes, 2019; Berkes, 2017). From a research perspective, it is obvious that neither natural science nor social science alone can fully describe SESs (Ostrom, 2009). Therefore, various interdisciplinary frameworks have been developed to describe, study, and understand the interlinkages in SESs (Binder *et al.*, 2013). They all highlight the intricate dynamics within the ecosystem and the social system, the existence of multiple levels of analysis, and the interactions between them (Binder *et al.*, 2013; Brondizio *et al.*, 2009). At the same time, the dynamic and changing nature of SESs implies that considerable uncertainty is inevitable even if extensive research is conducted. From a governance perspective, SESs require

therefore approaches that can handle complexity and uncertainty, and adapt to changes (Armitage *et al.*, 2009; Brondizio *et al.*, 2009; Pahl-Wostl, 2009; Dietz *et al.*, 2003). A variety of governance and management approaches[2] have been developed to make SESs socially, economically, and ecologically sustainable. Each of these approaches has been elaborated and presented in partly separated schools of literature with their own theoretical frameworks. Attempts to synthesize them are still limited (Cox *et al.*, 2016). Figure 1 shows some prominent approaches that have guided the governance and management of natural resources, including wildlife. While some of these examples have their origin in natural resource management, others originate from the commons, resilience, or public administration literature. Despite their different origins and variations in the use of terminology and concepts, central elements of these approaches overlap (cf. Bodin, 2017; Emerson & Nabatchi, 2015a; Chaffin *et al.*, 2014; Waylen *et al.*, 2014; Plummer *et al.*, 2013; Cox, 2011; Ostrom, 2009; Sandström, 2009). Notably, they all stress the importance of *context* (see *Paper I & III*), *collaboration* (see *Paper III & IV*), and *adaptation* (see *Paper II & IV*) for sustainable outcomes (Figure 1).

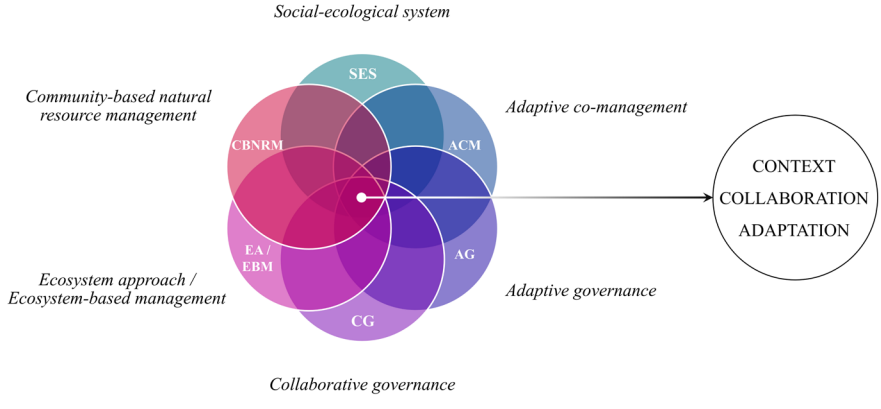

Figure 1. Selected scholarly fields relating to the governance and management of social-ecological systems for sustainable outcomes. Despite terminological differences, three central elements recur in this literature: context, collaboration, and adaptation.

2. The concepts of resource governance and management have been defined in different and partly overlapping ways. My understanding of these terms is in line with Pahl-Wostl (2009). I see resource governance as the full range of structures, regulatory processes, institutions, and actor groups involved in development and implementation of policies that guide human behaviour. Resource management is a part of resource governance, and refers to the specific measures taken to control or use natural resources and monitor them.

Context and the need to design governance and management approaches that fit the SES at hand are a common theme across the depicted frameworks (Figure 1). All of them stress the importance of considering local context and the issue of scale, i.e. the need to find the appropriate spatial, temporal, and functional scale for governance and management actions (Clement *et al.*, 2019; Newig *et al.*, 2016b; Yaffee, 2011; Ostrom, 2009). Social-ecological fit[3], which is also known as institutional fit, describes the alignment between institutions (i.e. the norms and rules governing human interactions) with the social-ecological context or, more precisely, the natural resource system of interest and the attributes of the involved actors (Guerrero *et al.*, 2015; Galaz *et al.*, 2008; Folke *et al.*, 2007; Cumming *et al.*, 2006). Misfits, which occur when institutions are misaligned with the ecological or social processes of the SES, threaten the effectiveness and sustainability of governance and management (Barnes *et al.*, 2017; Clement *et al.*, 2016; Plummer & Hashimoto, 2011). Governance and management approaches that work well in one context might not function in another or when applied to different resource issues (Young, 2011; Ostrom, 2009). Ignoring the social-ecological context and simply applying an approach without a careful diagnostic procedure of the resource issue at hand can therefore jeopardize the sustainability of outcomes (Bodin, 2017; Ostrom, 2007).

Collaboration refers to the inclusion of stakeholders in the governance and management of natural resources and is another common element of the identified frameworks (Figure 1). A rethinking of power distributions and optimal modes of governing nature has been noticed during recent decades (Jager *et al.*, 2019; Newig & Fritsch, 2009; Ansell & Gash, 2008). There has been a tendency in natural resource governance to move away from 'top-down' and 'command and control' approaches towards a dispersion of authority across scales and stakeholders (Berkes, 2017; Chaffin *et al.*, 2014; Armitage *et al.*, 2009). Stakeholder inclusion can enable incorporation of different knowledge systems such as traditional or local ecological knowledge and customary practices (Pahl-Wostl, 2009; Armitage, 2005). Furthermore, collaboration is supported by normative and instrumental views, and is also assumed to increase legitimacy, efficiency, and effectiveness, while improving ecological outcomes (Clement *et al.*, 2019; Newig *et al.*, 2018; Huitema *et al.*, 2009). However, the 'who' and 'how' aspects of collaboration differ slightly between the approaches discussed in the literature (Figure 1), which can range from self-governance (e.g. via community-based collaborative groups) to complex state-initiated institutional arrangements for stakeholder inclusion. Collaboration can also help to improve the social-ecological fit of governance and management approaches

3. I see social-ecological fit and institutional fit as synonyms describing the same concept. Therefore, I will only use the term social-ecological fit in the remainder of this thesis.

by linking actors and their collective actions across different spatial scales (Clement *et al.*, 2019; Guerrero *et al.*, 2015; Duit *et al.*, 2010).

Adaptation has multiple important roles within the different governance and management approaches for SESs (Figure 1). Adaptive management can reduce uncertainty, while adaptation to the context setting can improve the social-ecological fit, and overall changes within the SES may require continuous adaptations to safeguard the achievement of sustainable outcomes (Koontz *et al.*, 2015; Yaffee, 2011; Armitage *et al.*, 2009; Folke *et al.*, 2007). The latter two considerations are incorporated into the concept of the adaptive capacity of SESs. Adaptive capacity consists of "*two different components, namely (1) the capacity of the SES to cope with environmental contingencies (to be able to maintain or even improve its condition in the face of changes in its environment(s)) and (2) the capacity to improve its condition in relation to its environment(s), even if the latter does not change, or to extend the range of environments to which it is adapted*" (Gallopín, 2006, page 300). Depending on the framework, adaptive capacity can be seen as a prerequisite, a process attribute, or an outcome of different governance and management approaches. I see adaptive capacity as a systemic property that must exist at all levels of a system, and which can be increased or constrained by the interplay between institutions, organizations, and individuals (Engle, 2011; Eakin & Lemos, 2010; Nelson *et al.*, 2007; Vincent, 2007; Smit & Wandel, 2006; Armitage, 2005). Independent of the exact role attributed to adaptive capacity, governance and management approaches for SES seek to maximize it because it is seen as a positive attribute of the system (Barnes *et al.*, 2017; Karpouzoglou *et al.*, 2016; Engle, 2011; Engle & Lemos, 2010).

Despite the availability of multiple theoretical frameworks with clear commonalities (Figure 1) and considerable enthusiasm for their implementation, central questions about '*what works where, and why*' remain (Clement *et al.*, 2019; Bodin, 2017). Accordingly, the performance of some approaches has been questioned, suggesting that despite their idealized ideas, some approaches fall short in terms of delivering positive ecological outcomes and create costs for involved actors (Young *et al.*, 2020; Newig *et al.*, 2018; Biesbroek *et al.*, 2017). Empirical publications regarding social-ecological performance are widely scattered across the literature of different research fields and are somewhat limited in terms of analytical depth and breadth (Hornborg *et al.*, 2019; Bixler *et al.*, 2016). Performance is multifaceted; it can be evaluated in terms of the quality of the governance process or its productivity with respect to the delivery of ecological and social outcomes (Emerson & Nabatchi, 2015b). Previous studies have tended to focus mainly on process aspects or outputs and less on ecological outcomes (Scott, 2015; Koontz & Thomas, 2006). This is a critical

limitation from a policy perspective because SES governance and management approaches are typically implemented to achieve socially and ecologically sustainable outcomes, often in settings with a history of conflict and unsustainable resource use (Ansell & Gash, 2008; Ostrom *et al.*, 2007). Consequently, there have been calls for more systematic empirical analyses of the social-ecological performance of SES governance and management approaches, including studies on the cause-effect relationships between institutional design, collaboration, and outcomes (Koontz *et al.*, 2019; Heikkila *et al.*, 2018; Sharma-Wallace *et al.*, 2018; Biesbroek *et al.*, 2017; Bixler *et al.*, 2016; Bodin *et al.*, 2016). Unfortunately, the complexity of SESs makes performance evaluation difficult, and knowledge about causal pathways between context, social-ecological fit, and its implications for governance outcomes remains scarce (Bodin, 2017; Bixler *et al.*, 2016; Emerson & Nabatchi, 2015b; Guerrero *et al.*, 2015).

The case of Swedish moose (*Alces alces*) management offers an opportunity to address these knowledge gaps. In 2012, a new governance system that incorporates central elements of the approaches shown in Figure 1 was implemented across a diverse social-ecological context. This made it possible to systematically study the effects of the institutional design on the social-ecological fit and the performance of the approach. In the following section, I introduce the case before specifying the objectives of this thesis in more detail.

1.2 The case of Swedish moose management

Sweden's natural resources

More than half of Sweden's surface is covered by productive forest land and each year approximately 90 million cubic meters of timber are harvested (Swedish Forest Agency, 2014). The forest industry is an export-oriented sector and accounts for 9-12% of the country's exports, sales, added value, and employment (Royal Swedish Academy of Agriculture and Forestry, 2015). Sweden's standing timber volume has increased by over 80% since the 1920s (Swedish Forest Agency, 2014), and even-aged stand management with clear-cutting has been the dominant management strategy since the 1950s (Beland-Lindahl *et al.*, 2017; Kardell, 2016). The main commercial tree species are Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*), which account for 39% and 42% of the standing volume, respectively (Swedish Forest Agency, 2014). The Swedish forest model can be described as 'freedom under responsibility' and relies heavily on voluntary efforts by landowners (Beland-Lindahl *et al.*, 2017). Half of all forestland belongs to non-industrial individual

private owners (of which there were roughly 320,000 in 2012) while private-sector companies own another quarter and state-owned companies own 14% (Swedish Forest Agency, 2014).

Besides timber products, wildlife (specifically, ungulate species) are another valuable resource in the Swedish landscape. Hunting rights are based on land ownership: landowners may hunt themselves and/or grant or lease these rights to others (Kardell, 2016; Ezebilo *et al.*, 2012). Every year, approximately 280,000 hunting licenses are bought, and hunting is a culturally important leisure activity (Boman *et al.*, 2011; Heberlein & Ericsson, 2005). The moose is one of Sweden's most iconic species and is found in all regions of the country other than on the island of Gotland. Moose are the dominant game species targeted by hunters (Boman *et al.*, 2011), and are highly valued for their meat as well as their cultural importance (Danell *et al.*, 2016; Ljung, 2014). Besides these benefits, moose impose costs on the forest industry and private landowners because they commonly browse on Scots pine during winter, leading to loss of plants and limited growth (Wallgren *et al.*, 2013; Månsson *et al.*, 2007). A recent study indicates that browsing damage on Scots pine may be increased by the presence of other ungulate species (Pfeffer *et al.*, forthcoming). In recent decades, several ungulate species, namely red deer (*Cervus elaphus*), fallow deer (*Dama dama*), roe deer (*Capreolus capreolus*), mouflon (*Ovis orientalis*), and wild boar (*Sus scrofa*), have undergone considerable population growth in Sweden and have extended their range across the country (Linnell *et al.*, 2020; Liberg *et al.*, 2010). At the same time, populations of large carnivores such as the grey wolf (*Canis lupus*) have recovered across Scandinavia (Chapron *et al.*, 2014) and commonly prey on moose (Tallian *et al.*, 2017; Wikenros *et al.*, 2015). These developments reflect trends seen across Europe, where new multi-species communities have emerged in response to changes in land use patterns and are challenging established wildlife governance strategies (Linnell *et al.*, 2020; Apollonio *et al.*, 2017). Sweden has a history of changing wildlife populations and adapting governance approaches. In the next section, I give a short overview of the development of the governance system for moose.

History of Swedish wildlife governance

Moose were a driving force in the early development of Swedish wildlife governance (Danell *et al.*, 2016). At the beginning of the 20th century, the population was greatly diminished by unregulated overuse and illicit hunting (Figure 2) (Kardell, 2016; Liberg *et al.*, 2010). In 1938, a new hunting law was introduced, and the Swedish Association for Hunting and Wildlife Management (SAHWM) was mandated to provide education and guidance on wildlife management and hunting. The new legislation also made hunting more of a

collective activity conducted in hunting teams, and introduced game management areas with bag limits, leading to an increase in the moose population (Danell *et al.*, 2016; Liberg *et al.*, 2010). Swedish wildlife governance thus has a relatively long history of collaborative activity, and many of these early ideas live on in the current system. For example, the mandate given to SAHWM still exists, albeit in a slightly modified form.

In response to the introduction of bag limits, restrictions on calf hunting, and the more collective management style, the moose population increased further. This increase was enhanced by a shift from selective harvesting to clear-cutting in forestry, which boosted forage availability for moose (Liberg *et al.*, 2010; Lavsund *et al.*, 2003). The growth in moose numbers increased the species' impact on the forestry sector, leading to conflicts and requests to reduce the population (Figure 2). However, management strategies that worked well to increase the moose population were unsuitable for stopping the rapid population growth. Different hunting strategies and regulations were tested to reduce browsing pressure and the frequency of wildlife-related vehicle collisions during the 1980s (Figure 2) (Liberg et al., 2010). At the same time, more systematic monitoring procedures were introduced to generate knowledge to support the management system (Danell *et al.*, 2016).

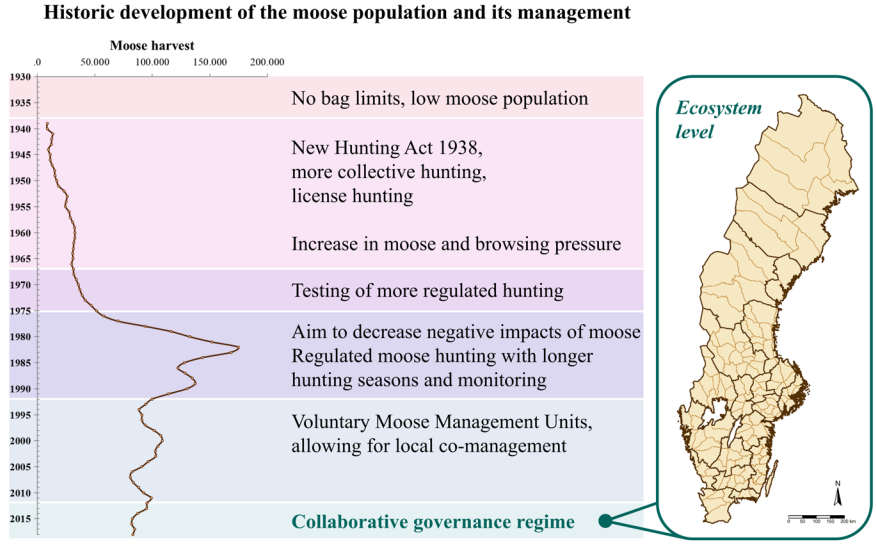

Figure 2. Historic development of the moose population and its management prior to the implementation of a new collaborative governance regime in 2012. The map shows the new ecosystem governance level of Moose Management Areas.

The intensity of browsing damage and associated conflicts varied across the country. In the beginning of the 1990s, more collaborative efforts were formalized to resolve conflicts via locally adapted management and the integration of different stakeholder interests (Wennberg DiGasper, 2008). On the local level, landowners could voluntarily collaborate with each other to form Moose Management Units (MMUs), which enabled them to suggest their own harvest quotas (Swedish Government Bill 1991/92:9). On the county level, Wildlife Management Committees were created to represent stakeholder interests during the decision-making process on ungulate management (Wennberg DiGasper, 2008). While the moose population decreased from its peak in 1982 (Figure 2), conflicts relating to its negative impacts persisted (Sandström *et al.*, 2013).

In 2009 the Swedish government assigned a committee to conduct an official investigation into the moose management system as part of its policy process (Official Report of the Swedish government 2009:54). The investigation described the interdependence and conflicts between hunting and landowner interests, which exist because moose are a valuable resource that delivers multiple ecosystem services while also creating high societal costs. These costs include moose-traffic accidents and the adverse effects of browsing on biodiversity as well as qualitative and quantitative losses in timber production. The investigation also showed that the quality of the moose population (e.g. calf weights, reproduction, and age structure) was declining locally, and that the increasing numbers of other ungulate species presented a management challenge. In addition to these negative ecological outcomes, the design of the management system itself was criticised. The successive addition of new elements (e.g. MMUs and different types of license areas) had made the system overly complicated, limited the scope for collaboration, and created a labour-intensive administrative process. At the same time, a holistic systems perspective was lacking, creating a social-ecological misfit because the moose population was not managed on the appropriate scale. This also hampered monitoring and the generation of knowledge about ecological dynamics. The system's complicated design also limited the potential for steering, demonstrated by the fact that MMUs reached only 54-58% of their set quotas in the years before the investigation (Sandström *et al.*, 2013; Wennberg DiGasper, 2008; Official Report of the Swedish government 2009:54). These outcomes reflect common problems with centralized command and control systems for managing resources that exist within a complex SES (Stöhr *et al.*, 2014), and similar challenges in ungulate management have been encountered across Europe (Sandström, 2012; Apollonio *et al.*, 2010). In summary, Sweden's moose management system in 2009 was characterized by a social-ecological misfit,

severe conflicts between stakeholders, and a lack of systems thinking, collaboration, and adaptation to local conditions (Sandström *et al.*, 2013; Wennberg DiGasper, 2008).

To remedy these shortcomings, the investigation committee suggested an institutional reform of the moose management system in line with the ecosystem approach of the Convention on Biological Diversity (CBD) (CBD SBSTTA, 2000; Official Report of the Swedish government 2009:54). Sweden signed the CBD in 1993 and thereby agreed to the conservation and sustainable use of its natural resources and a fair distribution of benefits arising from them (Wennberg DiGasper, 2008; Naturvårdsverket, 2007). The ecosystem approach is seen as a way to achieve this goal, and the 12 Malawi principles laid out in the Annex of the CBD provide guidance on implementing this approach (CBD SBSTTA, 2000). The Malawi principles apply a holistic SES perspective and overlap with common ideas of the approaches shown in Figure 1 (Waylen *et al.*, 2014). Key aspects are the view of people and nature as being interconnected, necessitating decentralized, cross-sectoral, and collaborative governance of ecosystem structures and functions at appropriate spatial and temporal scales, while integrating different types of knowledge and being adaptive to changes (CBD SBSTTA, 2000). An unfortunate consequence of this view is that there are no blueprint solutions; the implementation of the Malawi principles requires a deep understanding of SES at hand and an institutional design that is well adapted to the local and national context (i.e. one with a good social-ecological fit) (Bodin *et al.*, 2016; Waylen *et al.*, 2014). Multiple countries including Sweden have therefore struggled with the challenge of applying the ecosystem approach to wildlife management (Sandström, 2012; Jaren *et al.*, 2003).

Institutional design and implementation of the collaborative governance regime

Based on the investigation of the previous moose management system, the Swedish government decided to implement drastic institutional changes in 2012 (Figure 2). This was done to address the identified uncertainty regarding ecological dynamics and local variation, the interdependency between forestry and hunting interests, and to achieve sustainable outcomes in moose management which were previously not possible (Swedish Government Bill 2009/10:239). The new institutional design created mandates and incentives for actors representing different interests and jurisdictions to collectively resolve existing conflicts, with the intention to foster collaboration over repeated cycles and over longer periods of time. Given these attributes, the amended system can be seen as a multi-level collaborative governance regime (CGR). According to Emerson and Nabatchi (2015a) CGRs are *"a type of public governance system*

in which cross-boundary collaboration represents the predominant mode for conduct, decision making, and activity between autonomous participants who have come together to achieve some collective purpose defined by one or more target goals" (page 18). In the case of Swedish moose management, the collective purpose was to:

> *"…create a moose population of high quality that is in balance with available forage resources. The management should consider important public interests such as large carnivores, avoidance of moose-traffic accident, damages in the forest and effects on other biodiversity. Future moose management should be characterized by collaboration between actors influencing moose populations. […]*
>
> *Moose management should be locally anchored and ecosystem-based. The goal is a viable moose population of high quality that is in balance with available forage and a reproduction-adjusted moose hunt. The administration of moose hunting should be simpler. Moose hunting should be more goal-steered than before."*
>
> (Swedish Government Bill 2009/10:239)

Because a social-ecological misfit was identified in the old system (Sandström *et al.*, 2013) and the ecosystem approach aims to manage relevant ecological structures, a new ecosystem governance level was introduced to improve the fit: Moose Management Areas (MMA). An MMA should cover 80% of the range of a distinct moose population, which is suggested to correspond to an area of around 50,000 ha in southern Sweden and 100,000 ha or greater in northern Sweden (See Figure 2). The greater value for the North is intended to account for seasonal moose migration. MMAs are led by Moose Management Groups (MMGs) (Figure 3). An MMG consists of three representatives for landowner interests and three for hunter interests. In the northernmost counties, one hunting representative is replaced by a representative for reindeer husbandry (Swedish Government Bill 2009/10:239). MMGs play a central role because they collectively decide on goals for their MMA that are acceptable to all interest groups and then formulate 3-year adaptive management plans for the entire MMA based on those goals. If the representatives are unable to reach a consensus, one landowner representative serving as the chairperson of the MMG will have the casting vote. MMGs also play a central role in knowledge generation and dispersion because they plan monitoring activities and gather, summarize, and analyse monitoring data. This newly introduced ecosystem level and the system's general multi-level design was seen as a way to accommodate locally adapted management strategies while safeguarding the achievement of regional and national goals.

On the national level, the Swedish Environmental Protection Agency has overarching responsibility for wildlife management and has specified more detailed regulations for moose management (Naturvårdsverket, 2011). The Swedish Forest Agency ensures that national forest goals are met, conducts forest monitoring, and provides advice on browsing damage and food availability (Figure 3). On the county level, County Administrative Boards (CAB) are responsible for upholding the rule of law and the administration of moose management in their counties. Because they are independent from the government, CABs have certain discretion regarding policy implementation (see *Paper IV*). CABs appoint representatives to the MMG after receiving suggestions from interest organizations, and affirm MMA and MMU management plans (see *Paper I & III* for a more detailed list of tasks). CABs are complemented by Wildlife Management Delegations (WMDs), which are collaborative forums of 15-19 representatives of different land use and public interests. WMDs decide on strategies and/or goals for different regional wildlife issues, including moose management. They were established before the CGR was implemented (Swedish Government Bill 2008/09:2010) and can be seen as an evolution of the Wildlife Management Committees of the 1990s.

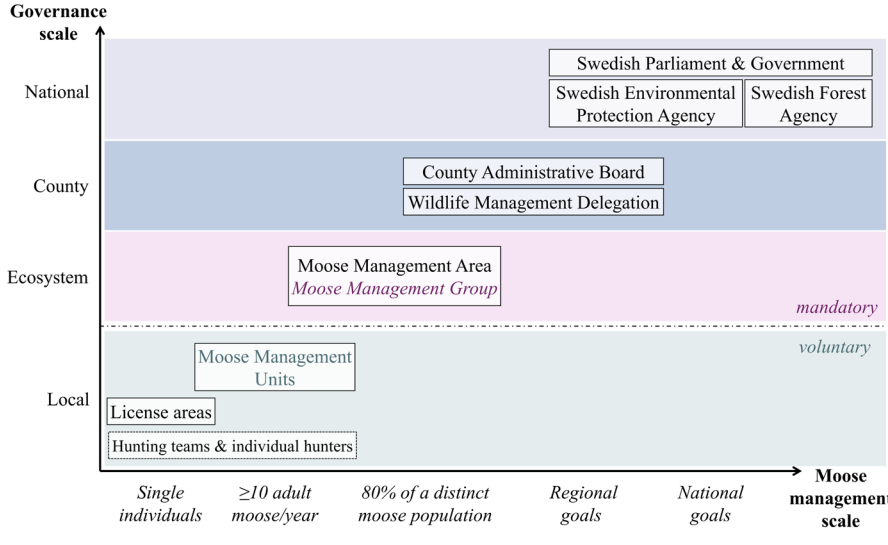

Figure 3. Institutional design of the multi-level collaborative governance regime for moose.

On the local level, the previously existing MMUs were retained as voluntary self-organized groups of local landowners and hunters. MMUs are required to be large enough to sustain a yearly cull of 10 adult moose (Figure 3). As an incentive for local actors to form MMUs, they can formulate their own 3-year

adaptive management plans. These plans are then sent to MMGs, who give feedback before the relevant CAB approves the plans. Since the formation of MMUs is voluntary and incentive-based, there if no formalized structure for the representation of specific interests. As an alternative to MMUs, hunting teams or individual hunters can register License Areas, which then receive quotas from the CAB in line with suggestions from the relevant MMG (Figure 3). In areas not registered as License areas or MMUs, only calves can be hunted within a hunting period of 5 days.

While the policy that introduced the CGR highlighted collaboration as a central instrument for achieving its overarching goal, it did not explicitly specify how "collaboration and consultation" among governance levels should be implemented (Swedish Government Bill 2009/10:239). Actors at the county, ecosystem, and local levels are thus responsible for developing processes for multi-level collaboration and creating links between the system's formalized and voluntary parts, and can exercise considerable discretion when doing this. The fact that goals are formulated at each of these levels implies a need for collaboration to achieve goal alignment and policy coherence (Sandström *et al.*, 2020).

The implementation discretion given to the actors created different structural patterns across the country. The number of MMAs per county ranges from 2-16, and their geographical extent can range from 20,000 ha to over 2.5 million ha (see Figure 2). Furthermore, the number of MMUs and License areas per MMA also varies drastically, from one to over 100 (see *Paper I, III & IV*). These differences in implementation may influence the collaboration dynamics, goal alignment, and ultimately the outcomes of the CGR.

As part of the ongoing policy process, the CGR has undergone government-mandated evaluations since its implementation (Naturvårdsverket, 2018; Naturvårdsverket, 2015), which have highlighted potential shortcomings of the system. The first evaluation in 2015 revealed problems with the system's economic sustainability; the original aim was to create a self-financing system in which the income from moose licenses would cover administrative costs (Naturvårdsverket, 2015). The second evaluation in 2018 criticized the achieved levels of quota fulfilment and levels of browsing damage. It also raised issues concerning a lack of steering opportunities in areas where set goals were not reached (Naturvårdsverket, 2018). The evaluations and their results reveal an empirical need to analyse the processes and outcomes of the introduced system more thoroughly in order to understand how these shortcomings can be addressed to safeguard sustainable outcomes.

1.3 Objectives and outline of this thesis

The overarching aim of this thesis is to analyse the effects of the context and the institutional design on the social-ecological performance of the moose management system. Social-ecological performance relates to both the processes and the outcomes of CGR. To meet this objective, I explore three broad research questions:

1 How does the institutional design and implementation of the CGR affect its social-ecological fit and performance?

2 What contributes to the adaptive capacity of the CGR?

3 How do 'good examples' operate to overcome challenges and achieve positive outcomes?

Swedish moose management can be seen as a quasi-experimental set-up in which a multi-level CGR has been implemented across a diverse social-ecological context. The discretion granted to actors within this system has created additional diversity in terms of network structures and multi-level collaboration across counties and MMAs. This creates an opportunity to explore my research questions via a systematic and comparative study of *context, collaboration dynamics, adaptive capacity* and *outcomes,* which could contribute to the theoretical understanding of the social-ecological performance of CGRs. (Figure 4).

My reflections on empirical evidence collected over five years from a diverse set of sources can also support policy learning by revealing critical factors that influence the effectiveness of the system and ways to improve the adaptive capacity of actors to address challenges. Furthermore, the systematic analysis of best-practise cases (i.e. 'good examples') can directly feed into policy learning and horizontal knowledge transfer within the system (Figure 4).

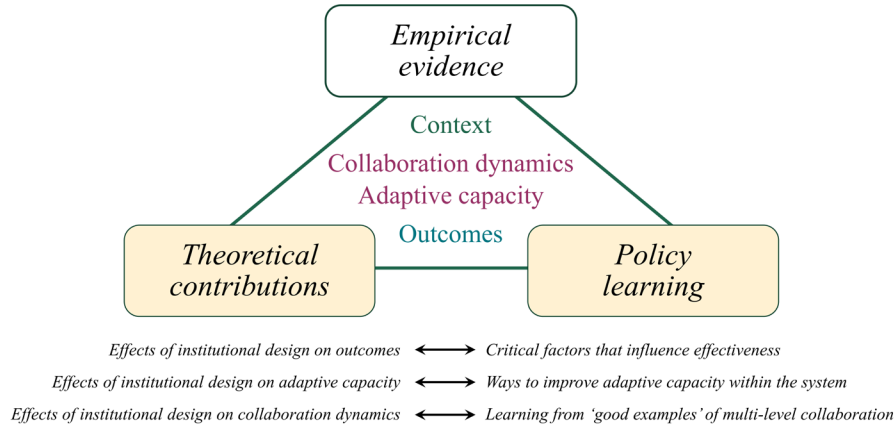

Figure 4. Overview of the aims and contributions of this thesis.

The four appended papers, which constitute the core of this thesis, overlap in their coverage of *context, collaboration dynamics, adaptive capacity,* and *outcomes.* They had the following specific objectives:

I. To explore the social-ecological *context* in which the CGR has been imbedded
II. To explain how multi-level *collaboration dynamics* influence actors perceived *adaptive capacity* and to evaluate its scale dependency
III. To evaluate the effects of the social-ecological *context* on *collaboration dynamics* and *outcomes*
IV. To understand multi-level *collaboration dynamics* in cases that show good social and ecological *outcomes* across different *context* settings

In the next chapter, I describe the analytical framework that connects the central concepts of the thesis and the different articles. This is followed by an overview of the methodology and material that was collected and a short summary of the main results. Lastly, I discuss the collective findings of this thesis to answer my three research questions and reflect on the CGR and its social-ecological performance.

2 Analytical Framework

As mentioned in the introduction, different complementary bodies of scholarship have accompanied the current trends in environmental governance (Figure 1). To analyse the social-ecological performance of the CGR for moose, I combined and adapted concepts from several theoretical frameworks to create a comprehensive analytical framework to meet my research objectives (Figure 4). This is a common practice in environmental social science and systems analysis, and allowed me to combine research focusing on the governance system, social processes, and individual attributes (Cooper & Larson, 2020; Bennett *et al.*, 2017).

My analytical framework is based on a combination of Ostrom's Social-ecological system framework (SESF) (Vogt *et al.*, 2015; McGinnis & Ostrom, 2014) and the Integrative Framework for Collaborative Governance (IFCG, Emerson & Nabatchi, 2015a), which I supplemented with additional elements relating to social capital and adaptive capacity (Figure 5).

The SESF and the IFCG have common attributes as they are both built on substantive empirical, theoretical, and practice-oriented work, and can be seen as organizing frameworks. These attributes make them accessible to researchers from a broad disciplinary audience and offer possibilities for further theory development. This also helps make them 'living frameworks' that have changed over the years. Furthermore, both frameworks seek to find a balance in their nested set-up of included variables such that they are neither too simplistic nor too specific (Emerson & Nabatchi, 2015a; Ostrom, 2007). I identified unique strengths in both frameworks, which led to my decision to use them to develop my analytical framework. The SESF provides a detailed diagnostic tool that can be applied from the local to the national level, and pays equal attention to social and ecological attributes and the reciprocity between them (Binder *et al.*, 2013). The IFCG on the other hand includes causal pathways within collaborative governance and allows for a detailed evaluation of its performance and testing of causal models (Emerson & Nabatchi, 2015b). I elaborate further on the

advantages and disadvantages of these frameworks when describing them below.

The IFCG consists of nested dimensions, of which the outermost is the system *context* in which the CGR is embedded. From the system context, drivers lead to the initiation of the CGR. Within the CGR *collaboration dynamics* create outputs and actions which then generate *outcomes* and lead to possible *adaptations* (Emerson & Nabatchi, 2015a). I kept this nested set-up within my analytical framework (Figure 5).

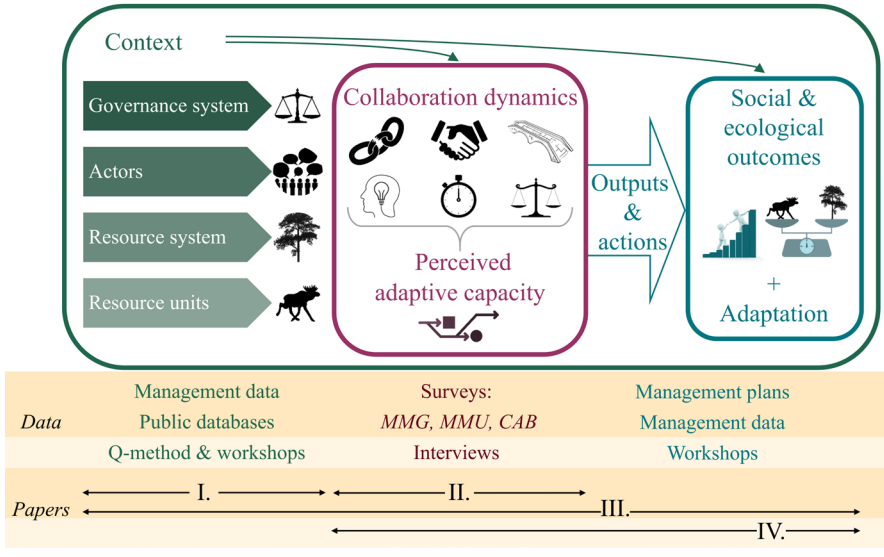

Figure 5. Analytical framework for studying the social-ecological performance of the collaborative governance regime for moose in Sweden, including an overview of the collected empirical data and the papers in which it was included. Pink and turquoise elements relate to the process performance and the productivity performance of the CGR, respectively. Light and dark yellow backgrounds indicate qualitative and quantitative data collections, respectively.

The IFCG identifies four key drivers for the initiation of CGRs: uncertainty, interdependence, consequential incentives, and initiating leadership (Emerson & Nabatchi, 2015a, page 45). My description of the Swedish moose management system (page 20-22) shows that all of them were present in this case. The state acted as the initiating leader and externally directed the implementation of the CGR. Forest resources and moose are interdependent resources that create connections between hunting and landowner interests. The long history of conflict and pressure on both resources created consequential incentives for actors to collaborate. Lastly, there was uncertainty about ecological dynamics, ongoing changes in the ungulate populations, and ways to find a balance between moose and their forage resources.

Context and social-ecological fit

The IFCG specifies six rather broad *context* variables: Public service or resource conditions, policy and legal frameworks, socioeconomic and cultural characteristics, network characteristics, political dynamics and power relations, and history of conflict (Emerson & Nabatchi, 2015a, page 41). From an ecological view, I found the 'resource conditions' variable insufficient to describe the complex ecological system addressed by the CGR and its dynamics. The same is true for 'history of conflict' because there are multiple conflict dimensions in the studied case. I therefore chose to combine the IFCG with the SESF, which enables a more nuanced understanding based on the *Governance system, Actors, Resource system, Resource units*, and their *Interactions* (Figure 5 & 6). The SESF thus allows for a careful comparative analysis of the context, which is needed to evaluate the cumulative effects of social and ecological attributes on the CGR and its performance (Waylen *et al.*, 2019; Nagendra & Ostrom, 2014).

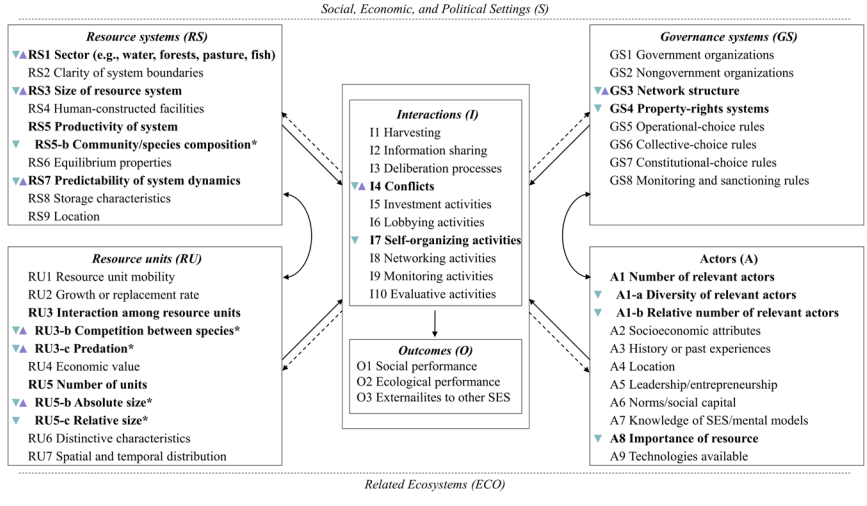

Figure 6. Social-ecological system framework used to analyse the context of the CGR. * indicates variables adapted from Vogt *et al.* (2015). Triangles indicate the operationalized variables within this thesis, with turquoise referring to *Paper I* and purple to *Paper III.*

As mentioned before, the SESF also has a nested set-up with multiple tiers. Ostrom and colleagues developed the SESF from the Institutional analysis and development (IAD) framework, partly as a response to ecologists requesting an interdisciplinary framework that integrates a finer understanding of ecological dynamics (Cole *et al.*, 2019; Ostrom, 2011). They included 9 second-tier variables for the Resource system and 7 for the Resource units. From an

ecological perspective, I found these variables too broad to describe the interactions between multiple ungulate species, large carnivores, and the forest conditions in the Swedish moose case. I therefore used a slightly modified version of the SESF by Vogt *et al.* (2015), which proposes additional ecological attributes. This is one example of how the SESF as a 'living framework' has been adapted over time to fit the empirical and theoretical needs of different disciplines. Figure 6 shows the 'unfolded' SESF including the first-, second-, and third-tier variables used in *Paper II & III*.

The SESF originated from political science and theories on common-pool resources and collective action, and has been applied to a wide range of natural resource issues (Ruseva *et al.*, 2019; Binder *et al.*, 2013; Epstein *et al.*, 2013). In line with the IAD, at the heart of the SESF are action situations in which Interactions (I) lead to Outcomes (O). The system's performance can be measured in terms of the social and ecological sustainability of its outcomes (Figure 6) (Ostrom, 2009). Action situations (and thus social-ecological performance) are directly shaped by the Governance system (GS), involved Actors (A), the ecological Resource system (RS), and attributes of the natural Recourse units (RU) (McGinnis & Ostrom, 2014). At the same time, action situations deliver feedback to the ecological and social subsystems (dashed arrows in Figure 6). The inclusion of detailed lists of second- and third-tier variables is not intended to suggest that all of them must be analysed in all cases but to give researchers an overview of variables that can be important in SES governance (McGinnis & Ostrom, 2014; Nagendra & Ostrom, 2014). Variable should be selected based on the issue at hand and previous empirical and theoretical understandings of it, which often necessitates the use of a mixture of inductive and deductive reasoning when applying the SESF (Epstein *et al.*, 2013).

My variable selection was guided by my focus on analysing the *social-ecological fit* of the CGR and identifying context variables that present direct challenges to collaboration dynamics or their outcomes. Extensive research has been done on social-ecological fit (Galaz *et al.*, 2008; Folke *et al.*, 2007; Cumming *et al.*, 2006; Young, 2002), leading to the identification of different types of misfit: spatial, temporal, and functional (Guerrero *et al.*, 2015; Galaz *et al.*, 2008). Spatial misfit arises when institutions create scales that are too large or too small for effective management of the ecological system. Temporal misfits can occur when institutions adapt too slowly to processes in the environment or target temporal scales that do not match those of the ecological dynamics (Galaz *et al.*, 2008). Functional misfits occur when institutions focus on resources that are interconnected with other resources within the ecosystem,

which can lead to unintended cascading effects or ineffective management (Guerrero *et al.*, 2015).

In the case of Swedish moose, the previous management system was criticised for focusing on an overly small scale that did not match the population (Sandström *et al.*, 2013). To analyse the current social-ecological fit, I choose SESF variables that described how the CGR has been implemented in terms of MMAs and MMUs (e.g. self-organizing activities (I7), network structures (GS3), and size of the resource (RS3)). Furthermore, because moose belong to complex multi-species communities and depend on forage availability, I included variables on predation, other ungulates, and forest dynamics (Figure 6) to analyse how the CGR matches ecological dynamics. *Paper I & III* and the methods section explain how variables were selected and operationalized in more detail.

While the SESF includes processes within the social and ecological subsystems and processes spanning both of them, the framework has so far mainly been used in static or descriptive ways and rarely for the analysis of policy processes (Cole *et al.*, 2019; Ruseva *et al.*, 2019; Epstein *et al.*, 2013). The SESF provides a detailed diagnostic tool but must be combined with theories to move from feedback links between all first-tier variables (see Figure 6) to specifying cause-effect relationships (Thiel *et al.*, 2015). This is where I expected that it would be beneficial to combine the SESF with the IFCG, which theorizes clear causal pathways between context, collaboration dynamics, outputs, and outcomes (Figure 5).

Social-ecological performance of CGRs

As mentioned before, the performance of CGR is multifaceted, making the assessment of it a complicated task. The IFCG offers guidance by using a logic model structure that depicts the causal links between inputs, process, outputs, and outcomes; this has been suggested as a way of analysing the performance of environmental governance (Koontz *et al.*, 2019; Thomas & Koontz, 2011; Yaffee, 2011). The IFCG thus also distinguishes between two different types of performance: *process performance* and *productivity performance*. Process performance relates to the level of functioning of *collaboration dynamics*, while productivity performance relates to the outputs, actions, *outcomes,* and adaptations arising from the collaboration dynamics (Emerson & Nabatchi, 2015a, page 185). Studying both types of performance deepens the understanding of the system's overall performance, especially since they influence one-another. I therefore included both types of performance in my analytical framework (Figure 5) and refer to them collectively as *social-*

ecological performance, because I want to emphasize that my analysis includes both social performance and ecological outcomes.

Collaboration dynamics and adaptive capacity

My analytical framework included multiple elements to analyse *process performance* relating to *collaboration dynamics* and *adaptive capacity* within the CGR. While there is a large body of literature defining enabling conditions for each of these concepts (Whitney *et al.*, 2017; Engle & Lemos, 2010; Ansell & Gash, 2008) the links between them have rarely been discussed (Cheng *et al.*, 2015; Emerson & Gerlak, 2014). Closer inspection reveals considerable overlap between concepts that are supposed to contribute to the adaptive capacity and collaborative capacity of a CGR: *social capital, knowledge, resources, leadership,* and *institutional arrangements* (Emerson & Gerlak, 2014). Cheng and Sturtevant (2012) even argue that "*in a broader sense, collaborative capacity can be thought of as key contributor to the adaptive capacity of social-ecological systems*" (page 687).

The ICFG describes collaboration dynamics as a virtuous cycle of three elements that foster each other: *Principled engagement, Shared motivation,* and *Capacity for joint action* (see *Paper IV* Figure 1 for illustration) (Emerson & Nabatchi, 2015a, page 59). All three of these elements are assumed to benefit effective collaboration and the performance of a CGR (Emerson *et al.*, 2011). Principled engagement describes the behavioural interactions that occur as actors discover, define, deliberate on, and determine a common understanding and plan of action. Shared motivation overlaps to a large extent with the concept of social capital and encompasses the relational ties among actors, and how trust, mutual understanding, internal legitimacy, and commitment to the group and the process are shaped. Capacity for joint action includes institutional arrangements, leadership, resources, and knowledge, which build the functional assets needed to enable the CGR. Through their collaboration dynamics, actors can establish a *Shared Theory of Change,* i.e. a common understanding and strategy for achieving their collective goals. (Emerson & Nabatchi, 2015a). While I integrated all of these elements into my analysis (see *Paper IV*), I focused particularly on concepts that overlapped between the IFCG and the adaptive capacity literature (*social capital, knowledge, resources, leadership,* and *institutional arrangements*) because substantial empirical evidence supports their relevance for successful implementation of adaptive and collaborative governance approaches (Sharma-Wallace *et al.*, 2018; Ansell & Gash, 2008).

Social capital refers to relationships and networks between individuals that are shaped by trust and norms of reciprocity (Nenadovic & Epstein, 2016; Pelling & High, 2005). It has been identified as critical for the performance of

environmental governance (Cheng *et al.*, 2015; Berkes, 2009; Dietz *et al.*, 2003) and the adaptive capacity of actors and systems (Armitage, 2005; Adger, 2003). Furthermore, social capital has shown to influence the willingness of actors to participate in natural resource governance (Nenadovic & Epstein, 2016; Grafton, 2005) and a potential to reduce transaction costs for involved actors (Pretty, 2003). Given that the studied case is a multi-level CGR that requires actors to collaborate within and across levels, I deemed it important to distinguish between the different types of social capital: *bonding, bridging,* and *linking*. Bonding social capital refers to social relationships between homogenous groups, bridging social capital exists between heterogeneous groups, and linking social capital describes relationships to organizations at larger scales (Agnitsch et al., 2006; Cinner et al., 2018; Pelling and High, 2005). In my study system, I see bonding social capital as the relationships within MMGs or MMUs, bridging social capital as the relationships with actors on a lower governance level, and linking social capital as trust in actors on higher governance levels (see *Paper II* Figure 2 for an illustration). The three types of social capital can serve varying functions within the multi-level CGR, with linking and bridging social capital that relate actors on different levels playing especially critical roles (Nenadovic & Epstein, 2016; Brondizio *et al.*, 2009). Linking social capital can give actors access to resources and knowledge, and increase their opportunities to provide input into management decisions that affect them (Pelling & High, 2005). Bridging social capital can foster rule compliance and be beneficial for the alignment of management actions and goals across spatial scales and governance levels (Brondizio *et al.*, 2009). Thus, both these 'vertically' aligned social capital types are central to the studied system and multi-level collaboration. Overall, a balance between the three different kinds of social capital is beneficial for collective action and successful natural resource governance (Whitney *et al.*, 2017; Agnitsch *et al.*, 2006; Grafton, 2005; Pelling & High, 2005). While there is a general consensus regarding the importance of social capital, how to measure it remains a point of discussion (Brondizio *et al.*, 2009; Paldam, 2000). My operationalization of it included social trust, communication, collaboration and perceived benefits from collaboration (see *Paper II*).

Actors' *knowledge* has been shown to be important for their adaptive capacity and their ability to assess risks and plan strategic actions (Villamayor-Tomas & García-López, 2017; Lockwood *et al.*, 2015; Nelson *et al.*, 2010). Knowledge is also often an incentive to collaborate because specialized knowledge might be distributed across different actors or governance levels (Ansell & Gash, 2008). In the studied CGR, knowledge can be seen as a valuable resource that must be shared across the different governance levels. This includes knowledge about moose populations and also knowledge about other ecological factors such as

the presence of other ungulate species and large carnivores, forage availability, and browsing pressure. Actors need sufficient knowledge of these factors to make adequate management recommendations, and higher levels of relevant environmental knowledge are assumed to increase the environmental quality of collaborative outputs (Jager *et al.*, 2019; Newig *et al.*, 2018). The collection of information (i.e. monitoring) is mainly conducted by local actors, but the results must be accumulated, analysed, and integrated on the MMU and MMA level. Knowledge sharing and knowledge co-creation are thus important processes within the studied system.

Resources can be of many kinds, including financial resources, necessary infrastructure, and organizational assistance. Resources availability has repeatedly been found to be critical for the adaptive capacity of actors (Whitney *et al.*, 2017; Gupta *et al.*, 2010) and the performance of environmental governance (Emerson & Nabatchi, 2015a; Ansell & Gash, 2008; Dietz *et al.*, 2003). In the studied CGR, most actors contribute labour during their free time and receive only limited financial compensation. Therefore, operational resources such as having enough time and support from the interest organizations they represent will influence their behaviour. From a systems perspective, the time that actors invest constitutes an important resource, especially that spent on tasks such as monitoring, analysing data, creating plans, and collaborating across levels to achieve goal alignment.

Leadership is a central prerequisite for both collaborative actions and adaptive actions, and is therefore often discussed in the adaptive capacity literature (Whitney *et al.*, 2017; Lockwood *et al.*, 2015; Gupta *et al.*, 2010) and the collaborative governance literature (Ansell & Gash, 2008). The exact types of leadership and the names they are given differ between fields of study. The ICFG suggests different types of leadership that are important, including champions, sponsors, conveners, facilitators, moderators, and experts, all of which have different functions (Emerson & Nabatchi, 2015a; Emerson & Gerlak, 2014). In general, the presence of multiple leadership types is considered as beneficial. Leadership can also have a central role in mobilizing adaptive capacity in adaptive actions within a system (Freduah *et al.*, 2018; Gupta *et al.*, 2010). Leadership could be crucial in the studied CGR because the institutional design did not explicitly specify how multi-level collaboration and coordination should be conducted.

Institutional arrangements have important effects on actors' adaptive capacity (Whitney *et al.*, 2017; Engle, 2011). The adaptive capacity literature often prescribes ideals (e.g. 'good governance principles') that institutions should exhibit, such as legitimacy, equity, responsiveness, accountability, and flexibility (Lockwood *et al.*, 2015; Gupta *et al.*, 2010; Vincent, 2007). Similar

ideals are found in the collaborative governance literature, which states that institutional arrangements should aim to create principled engagement and shared motivation among actors while also allowing for the effective administration of the CGG (Emerson & Nabatchi, 2015a). The institutional design of the studied CGR might therefore affect the actors' collaboration dynamics and adaptive capacity if they perceive decision-making processes and the representation of different interests to be unfair. This institutional design of the studied CGR also gives actors considerable discretion in their implementation of local and regional institutional arrangements, which could also affect collaboration dynamics and the adaptive capacity of actors.

As mentioned in the introduction, I see *adaptive capacity* as a systemic property that has to exist across all levels of a system (Engle, 2011; Eakin & Lemos, 2010; Vincent, 2007). It must therefore be understood at multiple levels because its presence at one level will not automatically confer adaptive capacity upon the system as a whole (Goldman & Riosmena, 2013; Juhola & Westerhoff, 2011). This implies that in the studied CGR, adaptive capacity must exist at all governance levels where adaptive behaviours are required. I decided to focus on the local and ecosystem levels in my analysis to understand what contributes to the adaptive capacity of the central actors. Since I was focusing on the actors, I also decided to assess their *perceived adaptive capacity* because an individual's perception of their abilities and constraints will ultimately guide their adaptive behaviour (Seara *et al.*, 2016; Grothmann & Patt, 2005). In addition, the perceptions of individuals will influence their collective capacity to act in response to external stresses or changes (Selm *et al.*, 2018). The study of social cognition can thus enhance the understanding of environmental governance regimes (DeCaro *et al.*, 2017). Similarly, I considered it beneficial to use actors' direct perceptions of collaboration dynamics to analyse the process performance of the CGR.

Outputs and Outcomes

My analytical framework includes multiple elements to analyse the *productivity performance* of the CGR. The IFCG highlights the importance of distinguishing between *outputs* and different types of *outcomes*. Direct outputs of collaboration dynamics can be agreements, plans, and collaborative actions, which are intended to create desired outcomes. Outcomes are the observed changes in the natural resources or the social attributes created by the CGR (Emerson & Nabatchi, 2015b). Outcomes can also be influenced by the surrounding context.

In the studied CGR, I see the management plans developed by the MMUs and MMAs as outputs of the collaboration dynamics. These plans document the collectively agreed goals in terms of the desired size and quality of the moose

population and acceptable levels of browsing pressure. They also specify the collective actions needed to achieve these goals in the form of hunting quotas and monitoring activities to measure their impact. The goals that are formulated within moose management specify the desired ecological outcomes; to achieve these outcomes, the set quotas must be achieved. I therefore see quota fulfilment as an intermediate ecological outcome that will ideally lead to the desired change in the moose population. At the same time, the desired ecological outcomes regarding the moose population and browsing damage can also be influenced by context factors (e.g. predation by large carnivores, presence of other ungulate species, and forage availability). Potential social outcomes are numerous and could relate to increased levels of trust and legitimacy. However, the scope for their analysis in this case is limited because measures predating the introduction of the CGR would be needed to assess the CGR's effect. Therefore, these social aspects are primarily addressed in the analysis of process performance.

According to the IFCG, *adaptations* are part of the productivity performance of CGRs (Emerson & Nabatchi, 2015a). I see adaptation as an important performance indicator because it reflects the presence of learning and the existence of the factors discussed above that are needed for adaptive capacity. Adaptations also have the potential to increase the efficiency, equity, and effectiveness of actions and the overall sustainability of the CGR (Emerson & Nabatchi, 2015a).

3 Methods

In the following section I reflect on the philosophical and ethical considerations of this thesis and give an overview of the data and main types of analysis that were used. In addition, I reflect on potential limitations arising from the study's design, data availability, and analytical methods.

3.1 Philosophical and ethical considerations

Reflection on research philosophy and research design

Multi-, inter-, or transdisciplinary research approaches must be used when applying a social-ecological system perspective because no single method or discipline enables the simultaneous study of all of a system's elements (Montana *et al.*, 2019; Bennett *et al.*, 2017; Binder *et al.*, 2013). This thesis is part of an interdisciplinary project and draws on elements from the natural and social sciences, which have different ontological and epistemological underpinnings (Moon & Blackman, 2014). I would therefore like to reflect on my research philosophy and its connection to the methodology and research design of this thesis.

My research philosophy aligns with what Robson (2011) describes as '*realism-lite for real world research*' or a '*realistic evaluation path*' (page 38). It pragmatically combines terminology and ideas from several 'new realism strands', such as critical realism. Thus it can be characterised by a) an emphasis on causation and its underlying structures and mechanisms, b) a view of social reality as complex and multi-layered, and c) knowledge generation as a social process (Robson, 2011).

Central elements of the realist idea are the *context* in which *actions* initiate certain *mechanisms* causing or preventing *outcomes* (Biesbroek et al., 2017). This perspective has many parallels to the chosen analytical framework of this

thesis and has been suggested as a promising approach to study governance of social-ecological systems (Biesbroek *et al.*, 2017). Due to my focus on the social-ecological performance of the CGR, elements of this thesis could also be classified as 'evaluation research' (Robson, 2011). Value judgements must always be acknowledged in evaluation research, necessitating careful reflection on the political dimensions, policy relevance, and possible limitations of one's work. Realist approaches are strongly rooted in evaluation research (Biesbroek *et al.*, 2017; Robson, 2011). A 'realist evaluation' tries to understand how individuals interpret and act upon newly provided resources or structures and how these processes/mechanisms influence outcomes (Robson, 2011). Ideas on mechanisms and contexts are often speculative because no empirical evidence from similar setting exists. In these situations, insights from practitioners or wider searches for evidence from other fields might help to identify an initial set of relevant mechanisms (Robson, 2011). Therefore, the study design incorporated multiple qualitative elements to collect practitioners' ideas regarding potential mechanisms (*Paper I & III*), built on previous work (e.g. material from Bjärstig *et al.*, 2014, and Sandström *et al.*, 2013) and used theoretical frameworks that have been supported and refined by substantial empirical work (see Emerson *et al.*, 2011, and Ostrom, 2009). In keeping with the realist focus on context, structures, and causal aspects, quantitative data collection methods and statistical analyses were used that allowed for testing of causal models. These were complemented with qualitative approaches to get a better understanding of mechanisms and structures.

As mentioned previously, the chosen research philosophy implies a stratified worldview in which social reality has multiple layers: individuals, groups, institutions, and the wider societal level (Robson, 2011). To account for this, the research design applies a systems perspective that acknowledges the multiple levels of the governance regime and the relationships between the individual and collective levels. My research efforts span from the national to the local level (see Table 3, page 56) and apply methods and analyses focusing on system context (e.g. social-ecological fit), group dynamics (e.g. collaboration), and individuals' perceptions (e.g. perceived adaptive capacity).

Given the view of knowledge as a contextual and social product, we used a complex mixed-methods approach within the research design. Qualitative methods were used to gather input for and validate quantitative parts of the thesis (*Paper I & III*), and also in their own right to gain a deeper understanding of collaboration dynamics and existing mechanisms (*Paper IV*). Practitioners assisted in the formulation of the survey instruments sent to MMGs and MMUs in order to combine theoretical and local understandings of the issue (*Paper II & III*). They also helped to identify critical context variables that create

challenges or influence goal fulfilment (*Paper I & III*). When applying these qualitative methods, we focused on including actors representing different interests and regions in order to create a balance in viewpoints. In keeping with the idea of knowledge co-production, presentations were made to various stakeholders across different governance levels throughout the research process. While these outreach activities were not always combined with strategic data collection, they definitely contributed to the development of this thesis.

Given my research philosophy and design, it is important to reflect on my role within the research process, which necessitates clear identification of my personal values. This thesis focuses on a study system that has been characterized by conflicts between forestry and hunting related interests (Sandström *et al.*, 2013; Wennberg DiGasper, 2008). I myself have an education in forest management (BSc) and wildlife management (MSc). Furthermore, I worked for one year in forestry and farming sector and for one year as a professional hunter. These previous experiences did not occur in Sweden but nevertheless made me familiar with the issues involved in the conflict. Throughout the research process, I sought to reflect critically on my personal perceptions regarding the subject to avoid possible bias during data collection, analysis, or interpretation. Objectivity in the research approach was further fostered by the diverse background of the research team and a balanced integration of different stakeholder groups. The description of the involved methods presents the efforts made to minimize bias and error during data collection and analysis in more detail.

Ethical considerations

Conducting research that involves people demands careful ethical consideration. None of our data collections included sensitive personal data or targeted vulnerable groups. Therefore, no approval was required according to the *Act concerning the Ethical Review of Research Involving Humans*. Nevertheless, we applied the highest standards to safeguard participants' privacy and rights, and followed recommendations for good research practice (Swedish Research Council, 2017). This necessitated several measures relating to data collection, storage, analysis, and presentation.

Our research design did not allow full anonymity but we handled all information confidentially. Personal data was handled in a way to avoid unauthorized access to it. Digital lists of personal data were password-protected, and physical copies were stored in a safe. As soon as data collection was finished, names and personal data were permanently deleted from the data file. Since May 2018, the processing of personal data within the EU and EEA has been regulated by the General Data Protection Regulation (GDPR, EU

2016/679[4]). Our data collections have been adjusted according to the new requirements and SLU's internal procedures.

When survey respondents were contacted for the first time, we informed them how their contact information had been retrieved, briefly described the research project and its goals, and informed them about the voluntary nature of their participation. We also offered them ways to contact the research team via phone or email if they had any questions. Online survey software tends to instantly (i.e. in real time) save all answers that respondents give. However, we decided to only use records that respondents officially submitted in the end of the questionnaire because we consider this equivalent to them giving consent. Informed consent is a cornerstone of proper research conduct (Swedish Research Council, 2017). During our qualitative data collections, we asked participants for their consent to be part of our study and to be digitally recorded during the interviews.

The target populations for our surveys and interviews were rather small; so the data analysis and description procedures were carefully designed to avoid the possibility of respondent identification. We see it as our responsibility to give respondents access to the results of studies in which they participated. Therefore, reports and fact sheets were written in Swedish and made available online, and we also presented our findings at various stakeholder meetings, and published scientific articles in the open access literature.

3.2 Data collection

3.2.1 Management & Public data (Paper I & III)

Parts of this thesis used data collected within the management administration or via other national monitoring regimes that are publicly accessible. Generally, data were first extracted from the relevant database at the finest available resolution and then rearranged to match the unit of analysis in the paper at hand. During this process, the quality and reliability of the data were assessed. The following section briefly describes the data used in this thesis.

Moose management data

As part of the moose management process, hunting teams are required to report their yearly moose harvest. This is done by a representative of the relevant MMU, License area, or unregistered area in one of three digital registries:

[4] https://eur-lex.europa.eu/eli/reg/2016/679/oj

Älgdata, Viltdata, or *Jaktrapport*. After the end of the hunting seasons, when all reports have been completed, records are accumulated in *Älgdata*[5]. Records identify the type of area (i.e. MMU, License area, or unregistered area), the area size, to which MMA and county they belong, number of harvested moose, and (if applicable) the quota that was set as goal. *Älgdata* also provides summary records on MMA, county, and national level. For the MMA records, wildlife managers at the county board can add goals (i.e. quotas) set in accordance with moose management plans.

I extracted all records for the hunting seasons 2012/13 to 2018/19. Inspection of the data revealed some inconsistencies in the reporting, especially during the new system's implementation. I therefore excluded these years from my data analysis. Furthermore, MMA-level goals were only available in 57% of the records. I therefore manually substituted records lacking this information with data from the collected management plans.

Information on area type and area size was used to calculate the structural diversity of MMAs and the level of self-organization in the form of MMUs (*Paper I & III*). The reported harvest was used as an index of moose density and to calculate quota fulfilment and quota alignment for MMAs (*Paper III & IV*).

Data from the Swedish Forest Agency

The Swedish Forest Agency (*Skogsstyrelsen*) conducts national inventories of moose browsing damage (*ÄBIN*) and moose forage availability (*Foderprognos*) (see *Paper I & III* for detailed descriptions of both inventories). Reports of these inventories are available as PDF documents on the agency's webpage with MMA- or county-level resolution. I retrieved all available documents from 2015 onwards and entered them into a database.

Inspection of the ÄBIN data showed that moose browsing damage inventories are performed every other year in most MMAs, but a few areas had only one record, giving rise to missing data in *Paper III*. Furthermore, the inventory method and the reporting format had changed several times over the study period. While I deemed the collected records sufficient to be used on county resolution for *Paper I*, it was not adequate for the analysis in *Paper III*. Thus, for *Paper III* we collaborated with the individuals responsible for ÄBIN at the Swedish Forest Agency to get access to raw data that provided a more consistent measure of browsing damage across areas.

Foderprognos uses a modelling approach to estimate the area of forest with high moose forage availability. Estimates are made with MMA-level resolution and predictions are adjusted when new input data is added for the area. The

[5] https://algdata-apps.lansstyrelsen.se/algdata-apps-stat

modelling data on fluctuations in forage availability for each MMA extracted in 2016 (*Paper I*) thus differed slightly from that extracted in 2019 (*Paper III*). The data for 2019 were also received in raw form from the individuals who manage the inventory at the Swedish Forest Agency.

Data from the Swedish Association for Hunting and Wildlife Management

Red deer (*Cervus elaphus*), fallow deer (*Dama dama*), roe deer (*Capreolus capreolus*), mouflon (*Ovis orientalis*), and wild boar (*Sus scrofa*) are not systematically monitored in Sweden. Voluntarily reported harvest data was therefore used as a density indicator for these huntable ungulate species. The Swedish Association for Hunting and Wildlife Management (SAHWM) owns and administers the previously mentioned *Viltdata* registry, in which hunting teams can report their annual harvest. I contacted the individuals responsible for managing this registry at SAHWM, who generously gave me county-level harvest data for the five ungulate species mentioned above in the 2014/15 and 2015/16 hunting season, which was used in *Paper I*. For *Paper III*, one of my co-authors retrieved harvest data for the five ungulate species with a finer resolution and accumulated it at the MMA-level (see *Paper III* for more details).

Because *Viltdata* is a voluntary reporting scheme and no other monitoring is carried out on a national scale, possible biases in reporting between species and areas can unfortunately not be assessed.

Management plans

In October 2018, I contacted 20 CABs and requested copies of all management plans established by MMGs between 2012 and 2018. I received copies of 468 management plans (MMA plans), which were entered into a database. MMA plans follow a template and include data on the current condition of the moose population, its impact (e.g. number of traffic accidents, and browsing damage), forage availability, presence of large carnivores, and natural mortality. MMA plans specify quantitative (i.e. population development and density) and qualitative (i.e. reproduction, sex distribution, and calf weights) goals for a three-year period along with a maximum acceptable level of browsing damage. In terms of management actions, they specify planned harvest quotas and monitoring intervals.

Inspection of the data showed that a few MMA plans were missing and that some of the early plans from 2012 did not adhere to the recommended template and did not specify quantitative goals. Unfortunately, it was impossible to determine the exact number of missing plans because the intervals at which they are revised differ between MMGs. I conducted a web-based search to fill

existing gaps in the data. I extracted from the plans information about predation by wolves and bears per MMA, which was used in *Paper III*. Additionally, I used the MMA plans together with data from *Älgdata* to compute *Quota fulfilment*, which was used as dependent variable in *Paper III*:

$$\text{Quota fulfilment} = \frac{Realized\ harvest\ reported\ in\ Älgdata}{Planned\ quota\ in\ MMA\ plan}$$

This approach also allowed me to calculate the differences between the quotas set out in the MMA plans and those set as goals for MMUs and License areas in *Älgdata*. These differences were used as an indicator of goal alignment in *Paper IV*.

Public data

Statistics Sweden is a government agency that provides statistics on a wide range of environmental, social, and economic issues, and collects information from 26 other authorities. I used their publicly available databases to extract information on land ownership and numbers of forest owners and agricultural businesses for *Paper I*. Additionally, openly available land cover data were used to evaluate land use diversity by computing a Shannon diversity index in *Paper I & III* (see the papers for more details on the extraction and calculation procedures).

3.2.2 Surveys (Paper I-IV)

Much of this thesis is based on survey data. Before reviewing the individual surveys that were conducted, I would like to address a few common design principles that were used to increase scientific quality.

We applied a tailored design method that is intended to maximize benefits and minimize costs for respondents by tailoring the survey design to the target population and research issue (Dillman *et al.*, 2014). This approach builds on social exchange theory and seeks to increase numbers of responses, while minimizing possible error sources. Tailored design typically involves making multiple contacts with the respondents, choosing a survey mode that is suitable for the respondents, and administrating the survey in a way that makes it convenient for respondents to answer (e.g. by including postage-paid return envelopes). According to Dillman *et al.* (2014), the cornerstone of good survey research is to minimize the total survey error. This requires a study design that simultaneously addresses coverage, sampling, nonresponse, and measurement error. Table 1 gives a short overview of these four error types and the remedies that were applied to minimize the corresponding errors in this thesis. More

details are given below in the sections discussing the different instruments, samples, and surveys.

Table 1. *Error types that are commonly associated with survey research and ways they were addressed in the study design*

Error type	Source	Remedies taken to minimize errors in the MMG and MMU survey
Coverage	Discrepancy between the target population and the sample frame (i.e. the list from which a sample is drawn)	• Manually created sample frames that contained all obtainable contact information • Send informants multiple reminders to collect information for all areas and units in the relevant county
Sampling	Selection of a subgroup (i.e. a sample) rather than the whole target population	• Used a total sample comprising all MMGs bar one • Used a total sample of all accessible MMU representatives from six counties
Nonresponse	Significant differences between those who answered a survey and those who did not	• Used a tailored design involving multiple contacts, a trustworthy sender, multiple modes, and a respondent-friendly questionnaire to increase response rate and avoid bias • Telephone follow-up of non-respondents in the MMG sample
Measurement	Question design or survey mode cause participants to give incorrect answers, intentionally or otherwise	• Adapted previously used and tested question items • Careful questionnaire design and item formulation to minimize bias • Thorough pilot testing of the instruments • Used a self-administered survey to avoid bias due to societal norms or interviewer characteristics • Made online and paper version of the instrument as similar as possible • Comparative statistical analysis of online and paper responses to rule out error based on survey mode • Statistical evaluation of construct validity and reliability

Instrument for MMG and MMU survey

The survey instruments sent to MMGs and MMUs were designed to investigate their perceived adaptive capacity, collaboration dynamics, and their general perception of the CGR. The development of the MMG instrument was preceded

by a literature search to identify constructs that should be included and existing items that could be re-used in this context. The guidelines by Vaske and Needham (2008) and Dillman *et al.* (2014) were followed when designing questions. We used at least three items to measure each construct that was used in the analyses. Table 2 lists the constructs, number of items, and the papers in which they were used. 'Time investment' aside, responses to all items were given on 5-point scales ranging from strongly disagree to strongly agree. The 'Fairness' and 'Social trust' constructs contained negatively formulated items, for which the scale was inversed before analysis. For 'Time investment', five answer categories were offered: 0 hours, 1-8 h, 9-20 h, 21-40 h, and > 40 h.

Following common standards, we conducted multiple rounds of pre-testing for the instrument to refine its wording and ground it within the context of moose management (Dillman *et al.*, 2014; Robson, 2011). Besides the constructs covered in this thesis, the 16-page MMG survey instrument included sections on quality of life, place attachment, and the respondents' social-demographic characteristics.

Table 2. *Summary of all constructs, the number of items used to measure them, and the papers in which they were used.*

Construct	No. of items	Paper
Perceived adaptive capacity	3	II
Social trust in WMD	4	II
Social trust in CAB	4	II
Social trust in level above	4	II
Communication within group	4	II & III
Collaboration within group	3	II & III
Social trust within group	4	II & III
Social trust in level below	4	II
Benefits through collaborations with level below	6	II
Knowledge base	13	II & III
Operational resources	3	II
Fairness	4	II
Time investment	12	III

The development of the MMU instrument was mainly guided by the results obtained for the MMG sample. We kept all constructs that worked well (i.e. showed sufficient reliability and validity) and only adjusted their wording to refer to the relevant governance level. Additional constructs were added based on the free-text answers and comments provided by the MMG sample. A new section on the structural composition of the MMUs was also added, resulting in

a 20-page survey instrument. This instrument was pilot tested to refine its wording and ground it in the reality of the target group.

We tried to make the visual appearance of the MMG and MMU instruments and the different modes (i.e. paper and online) as similar as possible to minimize measurement errors. The original Swedish survey instruments sent to the MMGs and MMUs can be found in Appendices 1 and 2, respectively, while *Paper II & III* include translations of all the items and detailed descriptions of the constructs.

MMG sample

I manually created a sample frame for the MMG by contacting the 20 CABs to collect e-mail and post addresses for all MMG representatives. The resulting list contained 765 individuals representing 139 of the 140 MMGs. We decided to use a total sample of the target population. Because the administration of moose management issues is mainly done via digital registries or e-mail, we decided to use an online survey. To increase response rates and because our instrument was quite long, we offered paper surveys as an alternative mode and when contacting respondents for the third time. I programmed the online survey using the open source program *Limesurvey*[6], which allowed me to use JavaScript code to adjust the survey's layout to match the paper version. Three personalized contacts were made in April 2016, starting with an e-mail invitation including an individual survey link and the offer to send a paper alternative. I monitored the response rate and decided to send the first online reminder after 5 days. The third contact was made two weeks later using handwritten envelopes containing a paper copy of the survey instrument, a signed cover letter, and postage paid return envelopes. We received answers from 624 MMG representatives, so the response rate was 82%. The online survey had a completion rate of 95% and accounted for the majority of the received responses; only 20% of respondents chose to answer on paper. No significant differences between the online and paper responses were detected. Despite the high response rate, we conducted 50 follow-up telephone interviews with randomly selected non-respondents. The interviews covered key constructs of the survey, including the dependent variable in *Paper II*. Statistical analysis revealed no significant differences between the collected data and the answers of the non-respondents. Furthermore, an inspection of response rates across regions and interest groups indicated that adequate coverage was achieved (county response rates ranged from 73%-94%; the hunter response rate was 82%, and the landowner response rate was 81%). I therefore consider the collected responses to be representative of the whole target population.

6. https://www.limesurvey.org/

The mean respondent age was 58 years, with a range from 26 to 82 years. The two interest groups were approximately evenly represented: 54% were hunter representatives and 46% represented landowner interest. Only 5% of respondents were female, but this reflects the gender distribution within the target population.

MMU sample

As with the MMG sample, it was necessary to create a sample frame manually. Because of restrictions in time and budget, we focused our sampling effort on six counties (i.e. Norrbotten, Västerbotten, Kronoberg, Jämtland, Västernorrland and Södermanland). These counties included roughly 30% of all MMUs at the time of the study and covered different social-ecological context factors (see *Paper I*). The creation of the sample frame was a multi-step process. First, I contacted the CABs in each county and requested a list of the contact persons for each of the 291 MMUs. We sent e-mails to each of these contact persons asking them to give us the names and e-mail addresses of all members of their MMU steering committee or board. After two e-mail reminders, 1380 sets of contact details for 245 MMUs were collected. As with the MMG sample, we decided to contact all these persons instead of a sub-sample. The survey instrument was again programmed in *Limesurvey* and data collection took place in June 2017. We started by sending each potential respondent three personalized e-mails including individualized links to the survey. We monitored the response rate closely and decided to offer another mode (i.e. paper) after the second e-mail reminder to increase the response rate. An online search was conducted, using the non-respondents' names and email addresses, to supplement the sample frame with their postal addresses. This information was successfully retrieved for 88% of the non-respondents. 646 paper surveys were sent out in handwritten envelopes containing the instrument, a cover letter, and postage paid return envelopes. We retrieved 979 responses in total (response rate = 71%), of which 13% were given on paper. No statistical differences between paper and online responses were detected. County response rates ranged from 62% to 80%. Because no telephone information was available, we were unfortunately unable to conduct follow-up interviews to exclude non-response error with certainty.

The age and gender distribution of the MMU sample resembled those for the MMG sample, with 98% male respondents and an average age of 57 years (range 24-85 years). We had no prior knowledge about the representation of different interests on the steering committees or boards of MMUs. Most of the respondents (65%) were simultaneously landowners and hunters; 31% were hunters only and 4% landowners only. Regarding their role in the MMU

committee or board, 73% said that they considered themselves to have a dual mandate to represent hunting and landowner interests, 24% represented hunting interests only, and 1% represented their own interests.

Q-method

The Q-method is a systematic way to study human subjectivity (i.e. patterns of prioritizing certain opinions) across a population (Brown, 1996). It commonly involves asking participants to rank a set of statements (called a Q-set) relating to an issue, and possibly then conducting a post-sorting interview to determine why a certain ranking-order was chosen (Watts & Stenner, 2012). The rankings supplied by the participants are then used to create a correlation matrix that is subjected to factor analysis to identify distinct viewpoints held within the participant group (Robson, 2011). Participants with similar views (i.e. ranking orders) will have high loadings on their common factor. The Q-method can thus reveal different framings of an issue (Brown, 1996).

We used the Q-method in a less rigorous manner as a participatory approach to guide our variable selection in *Paper I*. First, we developed a Q-sort based on previous interview material, a literature review, and the research team's experience in the field. The final selection of 25 statements covered different social-ecological variables. We used *Q-sortware*[7], an online-based tool for Q-method data collection, to program our Q-survey. The sample consisted of 90 participants of the 2016 'Wildlife manager conference' organized by the Swedish Environmental Protection Agency. We contacted participants two weeks before the conference via e-mail and asked them to fill in the online Q-survey. The central sorting instruction was "What do you perceive as a challenge in moose management? Please sort the following statements according to how much they complicate moose management in your county". We also asked them to specify the county they worked in, to identify potential regional variations in challenges for the CGR. The original Q-sort and sorting instructions are presented in Appendix 3.

After two contacts, we retrieved answers from 35 wildlife managers covering all counties (response rate = 39%). While this might seem like a low response rate, we were expecting this because the initial sample frame (i.e. a list of conference participants) also included individuals not directly involved in moose management. We therefore considered it more important to obtain responses from managers representing all the studied counties than to achieve a high response rate.

7. http://qsortware.net/home.html

Instead of individual post-sorting interviews, we held a workshop during the conference. We first presented the results of the statistical analysis and then held round table discussions in 11 groups with 6-8 participants each. During these discussions, respondents explained in more detail why certain factors are challenging (see *Paper I* Appendix B). This allowed us to examine the viewpoints of managers who did not complete the online Q-sort. We analysed the collected material to refine the selection of variables and indicators for *Paper I*.

CAB survey

To get insights into the routines for multi-level collaboration and goal alignment in each county, we developed a survey targeting wildlife managers at CAB. To establish a sample frame for this survey, we requested contact information for wildlife managers responsible for moose management when we contacted all CABs in October 2019 to collect management plans. This resulted in a list of 54 potential wildlife managers. We designed a short survey instrument that contained mainly open-ended questions on five themes: the processes of formulating goals at different levels, alignment and reviewing of goals, routines for follow-up and revision, perceived challenges for management, and future needs for development. We deemed open-ended questions most suitable to allow for rich data collection and unrestricted descriptions of the routines (Robson, 2011). Another objective of this survey was to identify 'good examples' for our interview study (*Paper IV*). We programmed the survey instrument using the online survey tool *Netigate*[8]. The original Swedish survey instrument can be found in Appendix 4.

Three personalized e-mails were sent to all members of the sample frame, giving a response rate of 60% (N = 28). We considered this sufficient because all counties were represented in the responses and the sample frame might have included managers who were not heavily involved in moose management. This was clearly the case because several of the contacted individuals informed us that they did not work directly on moose and referred us to a colleague. We suspect this might have been the case for several of our non-respondents too.

3.2.3 Interviews (Paper IV)

Paper IV can be seen as a 'case within a case' study (Case Within a Case, 2010). Within the case of Swedish moose management, we aimed to study cases of 'good examples' (i.e. MMGs with positive social and ecological outcomes). A

8. https://www.netigate.net/sv/

purposive sampling design was applied to identify such cases. From the responses to the CAB survey described above, we retrieved a list of 15 MMGs that were identified as 'good examples' by wildlife managers in the respective county. For these MMGs, we reviewed management plans, management data (i.e. goal fulfilment), and the groups' responses to the MMG survey. Based on this objective information on context, collaboration dynamics, and outcomes we made an initial selection of six MMGs. The cases came from Norrbotten, Uppsala, Örebro, Västra Götaland, Jönköping and Kalmar.

We sent invitations to participate in our interview study to the chairperson of these MMGs and scheduled Skype or phone interviews with them. All six MMGs agreed to participate. We encouraged the chairperson to include one representative of hunting interests in the interview. We conducted six semi-structured group interviews with 10 participants. Our study design was flexible with respect to sample size, but both I and the other interviewer felt that saturation was achieved after six group interviews so the data collection was closed after the sixth interview.

Interviews lasted 60 minutes on average. Each interview was recorded, fully transcribed, and checked for consistency, then the checked transcripts were sent to the participants so they could offer comments or clarifications as they saw fit. The Swedish interview guide can be found in Appendix 5. Questions related to the yearly collaboration and management processes of the MMGs, including the procedures used to formulate or revise management plans, collaboration with MMUs in the areas overseen by the MMG, follow-ups, and assistance with quota fulfilment during the hunting season. We also asked them about their relationships with actors at other levels of governance and future needs for support. Our interviews thus examined the respondents' behaviours, beliefs, and attitudes (Robson, 2011). We used probes to encourage further responses and followed the common recommendations for interview procedures suggested by Robson (2011, Chapter 11).

Both in quantitative and qualitative research, interviews can be influenced by the characteristics of the interviewer. It is therefore necessary to reflect on possible biases (Dillman *et al.*, 2014; Robson, 2011). Our research team has studied questions related to moose management for the past 20 years. This has involved collecting qualitative and quantitative data across different scales as well as direct interactions with stakeholders during presentations and workshops. These experiences inevitably influenced our approach to the study in terms of structuring the data collection and focusing on certain aspects within the interview process. We also want to acknowledge that several of the interview participants knew members of the research team from their prior involvement in

training and outreach activities. We see this as a strength because it created trust in the interviewers and encouraged open communication.

3.2.4 Workshops and Seminars (Paper I-IV)

During my thesis work, our group hosted several workshops related to our research. This was commonly used as a method to collect additional data or to validate our analysis. Besides the Q-method workshop mentioned before, I would like to describe one more workshop in detail because its output was directly integrated into *Paper III*.

In April 2019, we were invited by the CAB in Södermanland to organize a workshop on challenges in quota fulfilment. We saw this as an opportunity to validate factors that we assumed to influence collaboration and goal fulfilment. The workshop lasted for one hour and had 80 participants from three different governance levels (i.e. WMD, MMG, MMU) that were divided into heterogeneous groups. Each group received our initial list of factors and was asked to add potential barriers to quota fulfilment (see *Paper III* Appendix A for a list). They then had to individually rank factors according to their importance and have a group discussion on them. The workshop concluded with a panel discussion between all groups. We used insights from this workshop to select our context variables for *Paper III*.

Seminars and workshops have contributed to my research and understanding of the issues addressed in this thesis. Over the five years this study has taken, I have presented my research in Swedish to roughly 800 stakeholders, being involved from the local to the national level. I see these outreach activities as elements of the underlying material of this thesis that contributed indirectly to all of the papers and helped to validate the results.

3.3 Data analysis

3.3.1 Quantitative analysis

Quantitative data were generally first entered into *Excel* and screened for consistency. After entering survey data, I picked every fifth survey and compared it to the entered data to screen for possible miss-entries. The next step was to inspect the patterns and extent of missing data, and to develop a strategy for addressing it. This is an essential step before commencing any multivariate analysis (Hair *et al.*, 2013). *Paper I* had no missing data. Items used from the MMG and MMU sample in *Paper II* had fewer than 2% missing entries on

average, which seemed to be missing at random (MAR). I therefore decided to use the built-in full information maximum likelihood (FIML) substitution in *lavaan (Rosseel, 2012)*. For *Paper III*, I decided to remove respondents with missing data before calculating mean composite scores per group. Given the data structure of all variables in *Paper III*, I could not determine whether data was missing completely at random (MCAR). FIML is only appropriate if missing data is MAR or MCAR (Hair *et al.*, 2013), I therefore decided to instead use listwise deletion in *Paper III*. After inspecting missing data patterns and deciding on remedies, it is important to test the data for statistical assumptions that underlie a certain type of analysis (Hair *et al.*, 2013). Procedures for this are specified under the different analysis sections. All variables were treated as continuous and a statistical significance threshold of $\alpha = 0.05$ was applied.

Principal component analysis (Paper I)

Principal component analysis (PCA) is a factor-based method that allows researchers to summarize most of the variance in a dataset into a minimal number of underlying dimensions (i.e. components) (Hair *et al.*, 2013; McGarigal *et al.*, 2000). Ecologists commonly use PCA to identify and describe patterns in environmental factors (McGarigal *et al.*, 2000). Because it is a powerful tool for data reduction, it was used in *Paper I* to summarize and illustrate the variability in the social-ecological context of moose management. Principal components are weighted linear combinations of the original variables that capture the maximum possible variation among the data points (McGarigal *et al.*, 2000). The analysis thus allowed us to identify the greatest variation among counties along a gradient of different context variables while grouping context variables displaying similar patterns.

The dataset contained 19 continuous indicators representing 15 variables from the SES framework. PCA requires multivariate normality (Hair *et al.*, 2013), which our data unfortunately did not exhibit. However, if a PCA serves a purely descriptive purpose (as in our paper), departures from multivariate normality are acceptable (McGarigal *et al.*, 2000). Another requirement is that the sample has more observations than variables (Hair *et al.*, 2013), which was the case. A min-max normalization was applied to the data to facilitate interpretation of results and comparisons across indicators. The analysis was based on the correlation matrix (correlations among variables) and was performed in JMP 10.0.2. The appropriate number of principal components was determined by applying the latent root criterion (eigenvalue > 1), inspecting a scree plot, and requiring components to explain more than 5% of the total variance (Hair *et al.*, 2013; McGarigal *et al.*, 2000). The interpretation of the principal components was guided by the absolute values of its component

loadings from the variables. Different benchmarks for component loadings have been proposed, but absolute values > 0.63 are considered 'very good' and > 0.71 are 'excellent' because they indicate that the corresponding variable accounts for over 40% or 50%, respectively, of the component's variance (McGarigal *et al.*, 2000).

Structural equation modelling (Paper II & III)

Structural equation modelling (SEM) can be regarded as a combination of confirmatory factor analysis (CFA) and structural regression analysis, which are referred to as the measurement and structural parts of the model, respectively. The CFA makes it possible to account for measurement errors when using multiple items (i.e. indicators) to represent unobservable constructs (i.e. latent variables) (Hair *et al.*, 2013). Therefore, only the explained or common variance among items representing the same latent variable is extracted and used in the structural part of the model (Brown, 2015). SEM also offers the unique ability to combine multiple dependence relationships and to thereby test complex theories or conceptual models (Hair *et al.*, 2013; Vaske, 2008b). However, SEM is a confirmatory analysis and should not be used without a theoretical basis for the tested model. If this is available, SEM can be a powerful tool for empirical estimation of causation (Hair *et al.*, 2013).

Before fitting a SEM, datasets must be checked against certain underlying statistical assumptions. SEM assumes multivariate normality (Brown, 2015; Hair *et al.*, 2013), which was not shown by any of the datasets used in *Paper II & III*. I therefore used a robust version of the maximum likelihood estimator during the analysis, which was conducted using the package *lavaan* (Rosseel, 2012) in *R* (R Core Team, 2019). *Lavaan* offers multiple robust estimators whose relative performance depends on the model and sample characteristics (Maydeu-Olivares, 2017). Based on my datasets, I decided to use *lavaan's* MLR estimator (Rosseel, 2012), which calculates robust 'Huber-White' standard errors based on the observed information matrix and a robust likelihood ratio test statistic, which is asymptotically equivalent to the Yuan-Bentler T2* test statistic (Maydeu-Olivares, 2017). Another assumption of SEM is that multicollinearity between independent (i.e. exogenous) variables is within acceptable boundaries. I therefore inspected Pearson's product moment correlations between variables and the variance inflation factor (VIF). All models exhibited acceptable multicollinearity, so no remedies were needed.

Paper II presents a full SEM, which was fitted in two steps. First, the measurement model (i.e. CFA) was tested and then the full structural model was fitted. The use of inappropriate measurement models is a common cause of bad fits in SEM, especially when items used to measure a construct have not been

used previously (Brown, 2015). The use of multi-item measurements in surveys can be compared to calibrating one's measurement tool (Cooper & Larson, 2020). CFA results provide information about construct reliability (e.g. Cronbach's alpha or Raykov's factor rho coefficients) and construct validity (i.e. convergent and discriminant validity) (Brown, 2015; Vaske, 2008a). Multiple criteria were used to evaluate the quality of the measurement model (see *Paper II*). After a measurement model with 'good fit' was identified, the structural part of the model was added. This structural part corresponds to a path analysis, as described in *Paper III*. Therefore, path analysis is a special case of SEM. Importantly, both methods assume causal relationships between variables and use a probabilistic model of causation (Hair *et al.*, 2013; Vaske, 2008b). Multiple requirements must be met to infer causation: (1) there should be strong theoretical support for the cause-effect relationship, (2) a sufficient empirical relationship (i.e. covariance) between the variables should exist, (3) the predictor variable (i.e. cause) must occur before the dependent variable (i.e. effect), and (4) the cause-effect relationship must not be explained by another variable that is not included in the analysis (Hair *et al.*, 2013; Vaske, 2008b). I addressed the first two requirements in both papers by summarizing the theoretical support for my models and presenting statistical evidence for the relationships between variables. The necessary temporal sequencing of cause and effect was ensured in *Paper III* because the relevant variables were measured at different times. For *Paper II*, all measurements were conducted simultaneously within the same survey. Therefore, deductive theory-based reasoning was used to establish a cause-effect order in this case. Requirement four was addressed by assessing the multicollinearity of the exogenous variables and modification indices, and discussing potentially missing variables in each paper. I used SEM in a confirmatory modelling strategy without major model re-specifications. The fit of my hypothesised models was evaluated using multiple measures of both absolute fit (e.g. Chi-square and SRMR) and relative fit (e.g. TLI and RMSEA). *Paper II & III* provide more details of the fit indices and benchmark values used to evaluate goodness of fit.

3.3.2 Qualitative analysis

Interviews (Paper IV)

Interview material was analysed using a theory-driven thematic coding approach (Robson, 2011). Three broad themes on collaboration dynamics were deductively created from the theoretical framework of Emerson and Nabatchi

(2015a), namely *Principled engagement, Shared motivation,* and *Capacity for joint action*.

The analysis can be described as an iterative process involving four rounds. Before the actual coding, I read all the material to identify references to within-level and multi-level collaboration. The material was then coded to the three broad themes in round two. In the following round, coded segments were analysed based on the elements of the three collaboration components proposed by Emerson and Nabatchi (2015a). Elements and themes did not constitute strictly mutually exclusive categories, but rather helped me to organize the rich material in a way that supported systematic analysis. Finally, I identified similarities and differences between the six 'good examples'. I used QSR International's NVivo 12 software to perform the first two rounds of analysis. For the coding into elements, I switched to manual coding of paper copies, which also allowed me to evaluate my own consistency between coding round two and three. During the analysis, I only worked with the original Swedish transcripts. After the analysis was finished, I selected quotes that were then translated into English. All authors of *Paper IV* checked the translations to ensure their accuracy. As I had no previous experience in qualitative data analysis, my co-authors (who have extensive experience in this area) advised me during this process. This kind of 'apprenticeship' is common in qualitative work (Robson, 2011).

Workshops (Paper I & III)

Workshops were organized in a way that guaranteed the availability of detailed written documentation of participant views during the process. For the workshop connected to the Q-method, we used a digital service[9] to collect main discussion points from all groups. For the other workshops, groups were provided with paper material and step-by-step instructions on how to document their discussions and results. All workshops were hosted by multiple researchers, which contributed in several ways to our data analysis: it created opportunities to listen to multiple groups during their discussion process, improved documentation because each researcher took individual notes during the panel discussions, and allowed us to have reflection sessions within the research group after the workshops. As with the interview analysis, the approach we applied to the workshop material could be described as theory-driven thematic coding. First we grouped similar statements from participants into common themes, then we used the SES framework (Vogt *et al.*, 2015; McGinnis & Ostrom, 2014) to identify the variables to which these themes related.

9. http://www.roundup.se/eng/

3.4 Scientific standards for data collection

Table 3 lists the collected data and the papers it was used in. Of course, insights gained from one data source and its analysis cross-fertilized my study designs and the interpretation of later analyses, making it hard to draw clear boundaries between specific data collections and papers. For example, MMG survey data provided one indicator for *Paper I* and helped to select 'good examples' for *Paper IV*.

Table 3. *Data collections, sample sizes (N), the governance levels and geographic scales covered by each collection, and the papers the data was used in.*

Data collection	N	Governance level	Geographic coverage	Year	Papers
MMG survey	624	MMG	All counties	2016	II & III
MMU survey	979	MMU	6 counties	2017	II
Q-method + workshop	35 + ca 70	CAB	All counties	2016	I
CAB survey	28	CAB	All counties	2018	IV
Interviews	10	MMG	6 counties	2019	IV
Workshop on quota fulfilment	ca 80	WMD, MMG, MMU	Södermanland	2019	III
Additional workshops & seminars	ca 800	all	Local to national	2016-2019	I - IV

Because this thesis is built on a mixed-method approach, it is important to reflect on the different scientific standards that apply to quantitative and qualitative research. Applying inappropriate standards can lead to misjudgements of research quality (Moon & Blackman, 2014; Connelly *et al.*, 2012).

While quantitative data collection procedures use fixed designs to obtain standardized (identical) measurements across a population, the flexible design of qualitative methods allows for adjustment during the research process to improve dependability (Connelly *et al.*, 2012; Robson, 2011). Representativeness and generalizability were major concerns during my quantitative data collections but carry not the same weight during qualitative data collection (Robson, 2011). My qualitative data collections therefore focused on creating inclusiveness of diverse views and describing my methods and results thoroughly to enable confirmability (Connelly *et al.*, 2012). Overall, I applied methodological rigor in the use of these different approaches to maximize validity and reliability of my results.

3.5 Limitations in methodology and data availability

As explained previously, a realist view places a strong focus on the "how" and "why" aspects of research while acknowledging that the study system is open and may change during the research process. I must therefore acknowledge that while my research might be able to explain mechanisms and outcomes that have occurred, it is impossible to make definite predictions based on it (Robson, 2011). Ultimately, this view on research and reality also limits the replicability of results because the dynamic nature of open and changing systems means that the context and mechanisms at work may change over time.

As some of the research questions concern causal processes, it is important to reflect on the limitations of our understanding of causality and difficulty of proofing it scientifically. SES are complex adaptive systems with a diverse feedback links and extensive interconnectedness (Ostrom, 2007). Consequently, there could be unknown interferences in the study system. For example management actions in one MMA could influence goal fulfilment in a neighbouring one, or collaboration dynamics at the national level (e.g. between interest organisations) could affect local collaboration. The use of multiple approaches to study the same causal relationships in a fashion similar to triangulation has been suggested as a way to deal with interference issues in SES (Ferraro *et al.*, 2019; Young, 2011). The different approaches used in *Paper I-IV* thus contribute in different ways to a causal understanding of the connections between the social and ecological aspects of moose management. *Paper I* focuses on a descriptive understanding, *Paper II & III* infer causal effects while *Paper IV* aims to reveal causal mechanisms based on selected case studies. Taken together, these papers help to partially bridge some of the knowledge gaps regarding the social-ecological dynamics and performance of moose management.

The availability of data on context variables was a notable limiting factor in this work. County-level data on the social-ecological context (*Paper I*) was available, but it was not possible to retrieve the same variables on a finer spatial scale. Statistics Sweden reports most of its data on county or municipal scale, but this is not a meaningful resolution within the context of this work. Because there is no national spatial map of MMAs, MMUs, and License areas and borders have changed over the years, it was impossible to aggregate data on finer scales. One consequence of this limitation is that it was impossible to integrate landownership structures in *Paper III* even though it was highlighted as an important factor throughout the study.

The evaluation of outcomes within this thesis also has some shortcomings. In particular, a more thorough examination of the social-ecological performance of the CGR was limited by two factors. First, there is a lack of quantitative

'pre-treatment' data to evaluate potential social outcomes caused by the implementation of the CGR. While there is qualitative evidence on conflicts prior to its implementation (e.g. Sandström et al., 2013, and Wennberg DiGasper, 2008), no previous surveys exist that would allow me to evaluate the effects of the CGR on aspects such as social capital, legitimacy, or levels of conflict. Second, the availability of data on ecological outcomes was limited. Monitoring methods changed over time, which prevented me from evaluating ecological outcomes of the CGR such as changes in browsing damage or the quality of the moose population. It was therefore only possible to consider an intermediate ecological outcome variable, namely quota fulfilment, in my quantitative analysis.

4 Results

4.1 Social-ecological context (Paper I)

The objective of *Paper I* was to explore the social-ecological context in which the CGR has been embedded. Based on the literature review, previously collected interview material, and the insights gained from the Q-method, we selected 19 indicators representing 15 variables of the SES framework. The PCA generated four principal components explaining 78% of the variance. Table 4 shows the loadings of the social-ecological variables on their components.

The first component explained 38.8% of the variance and represents a continuous gradient extending from social importance (positive loadings) to ecological diversity (negative loadings). The mapping of this component revealed a clear north-south gradient (Figure 7). In northern counties, a relatively high proportion of people are actors directly involved in moose management, such as hunters or forest owners (A1b), and moose meat is a comparatively importance resource (A8). Northern counties also tended to have bigger MMAs (RS3), more predation by bears (RU3c_1) and higher numbers of moose-traffic accidents (I4_1). The other end of the gradient, which corresponds to southern Sweden, has greater land use diversity (RS1) and higher numbers of other ungulate species (RU3b), especially compared to moose (RU5c). These counties also have more diversity in forest property sizes (A1a) and a mixture of agricultural ownership types (GS4_2).

Component two shows a less distinct geographic pattern and represents a gradient from counties with high moose densities (RU5b) to counties with low forage availability (RS5b) or many sub-units per MMA (GS3) because less of the area is self-organized into MMUs (I7) (Table 4). The third principal component is characterized by a context setting with high browsing damage (I4_2) and high fluctuation in forage availability (RS7) on one end of the

gradient to counties with a high diversity in forest ownership (GS4_1) on the other end. The latter is more commonly found in central Sweden (Figure 7). The last component describes a tendency of counties to experience either higher levels of wolf predation (RU3c_2) or more disagreement between MMG members regarding the status of the moose population (I4_3). However, this component explained only 7.8% of the variance (Table 4).

Table 4. *Component loadings of the 19 indicators in the four retained principal components (PC) and the variance that each explains. Table adapted from Paper I.*

SES code	Name	PC1	PC2	PC3	PC4
A1b	*Number of relevant actors*	0.922			
RU3c_1	*Predation by bears*	0.829			
RS3	*Size of moose population range*	0.809			
A8	*Importance of moose meat*	0.789			
I4_1	*Traffic accidents*	0.770			
GS3	*Sub-units per MMA*	0.644	0.605		
RU5c	*Proportion of ungulate population*	-0.568			
A1a	*Forest owner diversity*	-0.749			
RS1	*Land use diversity*	-0.760			
GS4_2	*Diversity of agricultural ownership*	-0.788			
RU3b	*Presence of other ungulates*	-0.869			
I7	*Level of self-organization into MMU*		0.808		
RS5b	*Forage availability*		0.804		
RU5b	*Moose density*		-0.797		
GS4_1	*Diversity of forestry ownership*			0.835	
I4_2	*Browsing damage*			-0.723	
RS7	*Fluctuation in forage availability*			-0.779	
RU3c_2	*Predation by wolves*				0.622
I4_3	*Disagreement on population goals*				-0.685
Variance explained		38.8%	17.7%	13.3%	7.8%

Overall, the analysis showed clear geographic variations in the social-ecological context setting of the CGR. This was partly due to ecological factors such as the presence of other ungulate species and land use patterns, and partly created by the implementation of the CGR (e.g. differences in MMA size or the number of sub-units). This raises the question of whether the institutional design of the CGR can accommodate these variations to avoid a 'problem of fit'.

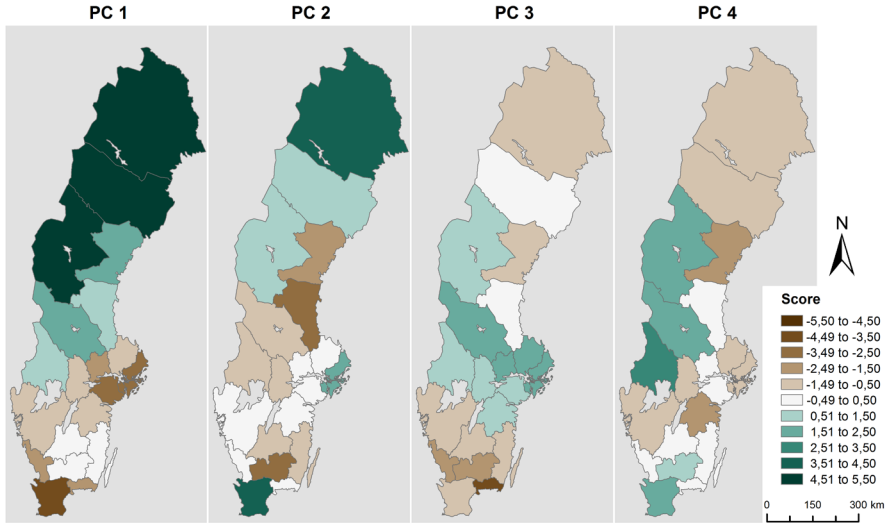

Figure 7. Social-ecological system maps showing challenges in Swedish moose management. The four principal components (PC) can be described as follows: PC1 represents a gradient from social importance (green) to ecological diversity (brown). PC2 ranges from high moose density (brown) to low levels or self-organization (green). PC3 ranges from a high diversity of forest ownership types (green) to high levels of browsing damage and fluctuations in forage availability (brown). PC4 ranges from presence of wolf predation (green) to disagreements within the MMG regarding the status of the moose population (brown). Figure from *Paper I*.

4.2 Multi-level collaboration dynamics and perceived adaptive capacity (Paper II)

The objective of *Paper II* was to explain how multi-level collaboration dynamics (i.e. linking, bridging and bonding social capital) influence actors' perceived adaptive capacity and to evaluate its scale dependency. The SEM analysis revealed similar effects of multi-level collaboration for MMG and MMU respondents. For both groups, linking and bridging social capital were critical determinants of perceived adaptive capacity. Actors who expressed trust in the management levels above them and perceived benefits through collaborations with levels below felt that the governance regime can handle future challenges and adapt to new circumstances (Figure 8). Interestingly, bonding social capital (i.e. trust, collaboration and communication) within the MMG or MMU had no significant influence on the perceived adaptive capacity of actors (Table 5). At the same time, responses regarding bonding social capital were the most positive in both samples (see *Paper II* Appendix A).

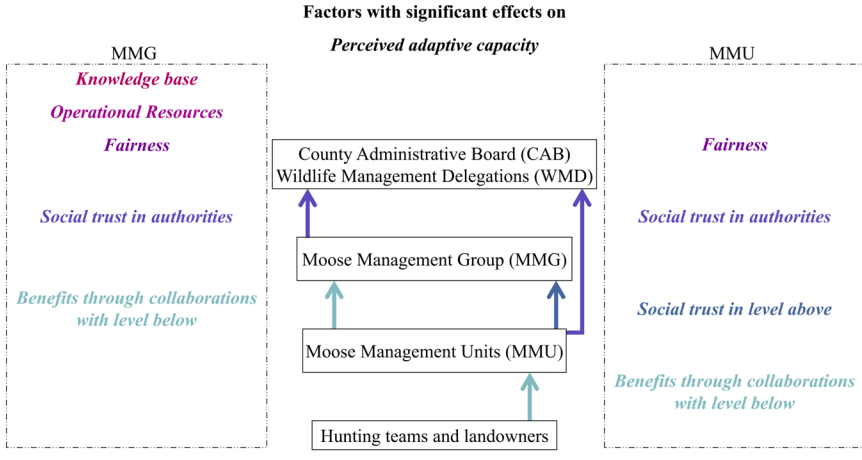

Figure 8. Overview of factors with a significant influence on perceived adaptive capacity within MMGs and MMUs. Figure adapted from Paper II.

Some differences between the two governance levels also emerged. Fairness regarding decision-making and inclusion of all interest groups had a stronger effect on MMU respondents than on MMGs (Table 5). Among MMG respondents, having sufficient resources, time, and support from their interest organizations (i.e. operational resources) influenced perceptions of the system's potential adaptability (Figure 8). These respondents also had more positive views of the system's adaptive capacity when they believed themselves to have a relatively good ecological knowledge base.

Table 5. *SEM results for determinants of 'Perceived adaptive capacity' within MMGs and MMUs. Table from Paper II.*

	MMG model	MMU model
Fit measures for structural model		
Robust Comparative Fit Index (CFI)	0.950	0.940
Robust Tucker-Lewis Index (TLI)	0.944	0.934
Robust RMSEA	0.036	0.038
SRMR	0.048	0.048
Determinants of *Perceived adaptive capacity*		
Knowledge base	0.17***	0.03
Operational resources	0.11*	0.02
Fairness	0.18*	0.35***
Social trust in authorities	0.17*	0.15*
Social trust in level above	---	0.18**
Bonding social capital	0.07	0.07
Social trust in level below	0.06	0.02
Benefits through collaborations with level below	0.16**	0.13***

*p < 0.05, **p < 0.01; ***p < 0.001

Overall, the results showed that perceived adaptive capacity of actors on both governance levels required good multi-level collaboration to establish linking and bridging social capital. The findings clearly illustrated the scale dependency of adaptive capacity, with access to resources and fairness having varying importance for actors on different governance levels.

4.3 Influence of context and collaboration dynamics on outcomes (Paper III & IV)

In *Paper III*, I aimed to evaluate the effects of the social-ecological context on collaboration dynamics and outcomes. Our workshop on quota fulfilment indicated that several of the context factors identified in *Paper I* also influenced actors' ability to meet set goals. A model including eight context variables was developed to test their effects on collaboration dynamics in MMGs and outcomes (i.e. quota fulfilment), along with direct effects of collaboration on outcomes (Figure 9).

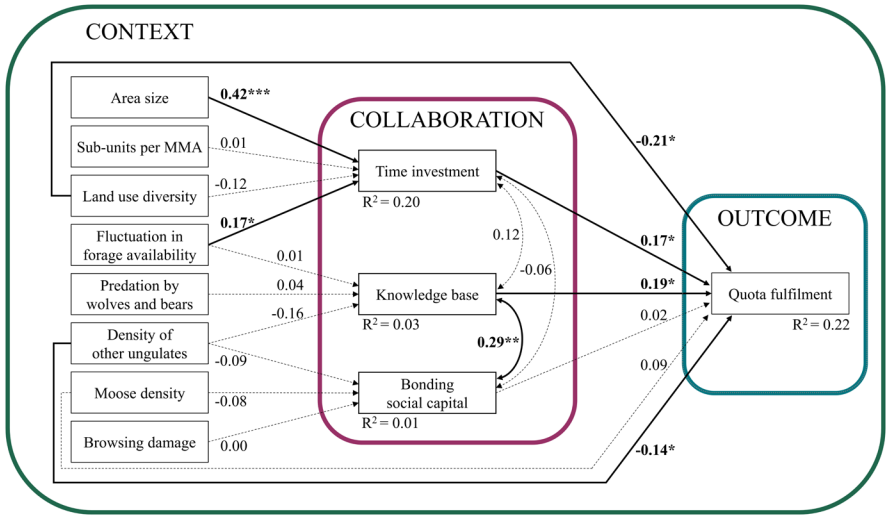

Figure 9. SEM results showing hypothesized and significant effects between context, collaboration, and outcomes for MMGs. Figure adapted from *Paper III.*

Context variables had no significant effect on relations within MMGs (i.e. bonding social capital) but did influence their capacity for joint action (i.e. time investment and knowledge base). MMG representatives invested more time in bigger areas and those with high fluctuations in forage availability. Unfortunately, it was impossible to identify the exact mechanisms responsible for this because the measurement of time investment included individual tasks

(e.g. self-education and analysing data), collaboration tasks (e.g. talking to MMUs) and activities connected to establishing management plans (e.g. meetings within the group). The model also suggested a negative effect of high densities of other ungulate species on the knowledge base of MMGs ($\beta = -0.16$), but the p-value of 0.069 for this effect was above the chosen threshold of statistical significance. However, this result should also be considered in conjunction with the findings presented in *Paper I*, which revealed strong geographic variation in the presence of other ungulate species. Thus, while this effect did not exceed the significance threshold in our national model, the presence of other ungulates might create a knowledge gap for MMGs at the regional scale. High numbers of other ungulates also had a significant negative effect on quota fulfilment (Figure 9). A similar effect was discovered for land use diversity: more heterogeneous landscapes negatively influenced moose management outcomes.

Collaboration had a positive effect on quota fulfilment through a higher capacity for joint action. Better outcomes were achieved in MMGs that invested more time and whose representatives considered themselves to have a good knowledge base concerning their area's ecology.

The model aggregated and combined data from different sources collected over several years, and explained 22% of the variation in quota fulfilment. It also revealed significant effects linking the social-ecological context, collaboration, and outcomes of the CGR.

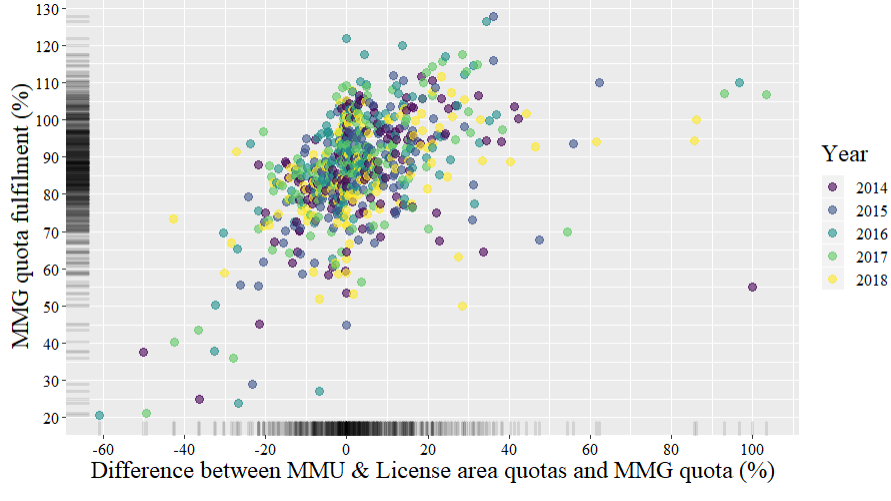

Figure 10. The relationship between outcomes (i.e. MMG quota fulfilment) and quota alignment between MMU & License areas and the corresponding MMG quotas. Figure from *Paper IV*.

The link between collaboration and quota fulfilment was further investigated in *Paper IV*. The assessment of management data revealed a significant correlation between quota alignment and quota fulfilment at the MMG level (*Pearson* r = 0.469, t = 13.87, df = 681, p-value < 0.001; Figure 10). This can be seen as an indicator of how multi-level collaboration and coordination influences outcomes of the CGR. Quotas and goals are set on multiple levels and collaboration between them is needed to align these goals.

4.4 Multi-level collaboration dynamics in 'good examples' (Paper IV)

The main objective of *Paper IV* was to understand multi-level collaboration dynamics in cases that show good social and ecological outcomes across different context settings. Our interviews revealed clear similarities between the six chosen cases (Figure 11). All of the groups displayed high bonding social capital, characterized by trust and a mutual understanding between group members, independent of the interest they represented. Several of the interviewees described how their previous experience in wildlife-related areas and social networks that existed before the implementation of the CGR helped them to quickly establish good relations within the MMGs. Another common factor was that 'good examples' tended to have had stable group compositions since the implementation of the CGR, and they felt that this continuity strengthened their relationships.

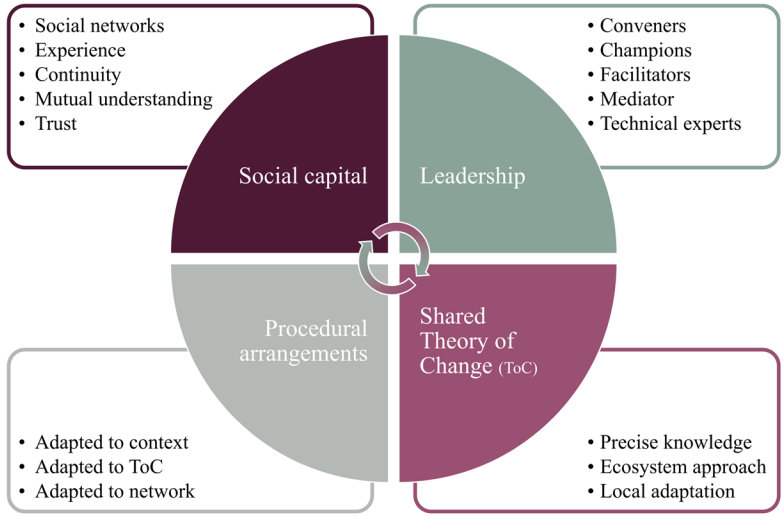

Figure 11. Summary of the main findings on collaboration dynamics within 'good examples'. Figure from *Paper IV*.

Leadership skills were present in all of the 'good examples', but the interviewees described different leadership roles that exist within their groups and are utilized in their collaboration with MMUs and License areas. Using the classification by Emerson and Nabatchi (2015a), we found evidence of MMG representatives acting as conveners, champions, facilitators, mediators and technical experts (Figure 11, see *Paper IV* for more details). Several of these leadership roles contributed to a "spillover" of good within-level collaboration towards multi-level collaboration. Groups represented their unity and tried to transfer their group-level mutual understanding between hunting and landowner interests onto actors on the local level.

We also discovered variability in the *Shared Theory of Change* that the different 'good examples' applied as a management philosophy (Figure 11). Knowledge generation, an ecosystem focus, and local adaptation are central ideas within the CGR, but the 'good examples' placed varying emphasis on these elements. Some groups saw precise knowledge as the key to reaching their goals and therefore strove to increase the monitoring coverage of their area or even created additional monitoring methods. Other 'good examples' focused on a 'holistic approach' targeting the whole ecosystem; therefore, they autonomously extended their mandate from moose management to multi-species management within their MMA. Lastly, some 'good examples' considered local adaptation to be essential for achieving their goals. These groups implemented procedures that supported active integration of local knowledge and locally adapted quotas.

This diversity of strategies and approaches gave rise to a richness of *procedural arrangements* designed to facilitate multi-level collaboration. All of the 'good examples' tailored their collaboration to their social-ecological context, network structures (i.e. number of MMUs and License areas), and their shared theory of change. They found innovative ways to support the principled engagement of many actors (e.g. via the use of Apps or questionnaires) and to achieve goal alignment between different levels (e.g. via mentorship programmes or large open meetings).

Overall, 'good examples' were characterized by dedicated individuals who believed in the ideals of the CGR and reflected on their working procedures to improve them further. Adaptation to the social-ecological context and the implementation of tailored collaboration procedures helped them to gain support from other governance levels and achieve positive outcomes.

5 Discussion

The overarching aim of my thesis was to analyse the effects of the context and the institutional design on the social-ecological performance of the moose management system. To this end, I explored three broad research questions by systematically studying context, collaboration dynamics, adaptive capacity, and outcomes as described in the four appended papers. In the following section, I discuss how the institutional design and implementation of the CGR affect its social-ecological fit and performance, what contributes to the adaptive capacity of the CGR, and how 'good examples' operate to overcome challenges and achieve positive outcomes. Lastly, I reflect more broadly on the CGR and its social-ecological performance.

How does the institutional design and implementation of the CGR affect its social-ecological fit and performance?

Social-ecological fit describes how well the rules and norms in place correspond to the underlying biophysical attributes of the system (Galaz *et al.*, 2008). A misfit between institutions and the context setting is assumed to create barriers to achieving desired outcomes by limiting actors' ability to carry out management actions at the appropriate scale (Bodin *et al.*, 2019). We observed substantial variability in the social-ecological context of the system (*Paper I*), which raises the question of whether this variability can be accommodated within a uniform national CGR design. Our finding revealed two potential problems of fit, namely spatial and functional misfit.

A spatial misfit can emerge as a result of areas being either too small to match the ecological functions or too large to be handled within existing institutional arrangements (Galaz *et al.*, 2008). In the northern part of the country, MMAs can extend over 17,000 km^2 and include up to 150 License areas and MMUs. This could create a spatial misfit because the MMG consists of six representatives who must coordinate and collaborate with all these sub-units

(*Paper I*). The decision to have larger MMAs in the North was motivated by the desire to match the ecological scale of seasonal moose migration. However, this choice directly influences collaboration dynamics and the capacity for joint action because larger areas required significantly greater time investments from MMGs (*Paper III*). This is consistent with previously discussed trade-offs between scale and participation in environmental governance (Newig *et al.*, 2016b). Accordingly, interviewees highlighted the difficulties of creating MMA plans for large areas with high variations in moose density or forage availability (*Paper IV*).

Functional misfit implies that the institutional design cannot match critical ecosystem dynamics (Guerrero *et al.*, 2015; Galaz *et al.*, 2008). In the southern parts of Sweden, moose play a minor role because there are high densities of other ungulate species, which can outnumber moose by as much as 63:1. At the same time, land use and landownership patterns are more heterogeneous in these areas (*Paper I*). This can impose functional limitations on the current institutional design. While the new policy was introduced as an ecosystem approach, the official mandate focuses solely on moose. Our results showed that land use diversity and the presence of other ungulate species have significant negative effects on moose quota fulfilment (*Paper III*). Furthermore, certain monitoring methods become unsuitable in the presence of other ungulate species (Spitzer *et al.*, 2019) and peri-urban settings are known to limit the use of common moose hunting practices (Hiedanpää & Pellikka, 2015). Workshop participants and interviewees from these areas confirmed that the multi-species ungulate communities create challenges and uncertainty, and impose limitations on moose management strategies (*Paper I, III & IV,* Johansson et al., 2019).

Besides these consequences of institutional misfits, the results of *Papers III & IV* showed that the institutional design and implementation of the CGR had further implications for its outcomes. The multi-level design created a strong interdependency between governance levels because each of them formulates goals and management plans, which should be aligned to achieve policy coherence (Sandström *et al.*, 2020). However, our assessment showed that quota alignment varied tremendously: The difference between the MMG quota and the sum of the corresponding MMU and License area quotas (expressed as a percentage of the MMG quota) ranged from –60% to +100% (*Paper IV*). This seems not to have changed over the years and no clear area patterns could be identified. At the same time, quota alignment had a significant effect on quota fulfilment. The CAB survey responses indicated that counties had varying processes for following up on goal alignment, and that considerable responsibility was placed on MMGs (*Paper IV*). Multi-level collaboration within MMAs is thus a critical function within the CGR. This aligns well with the

results of *Paper III*, which showed greater time investment by MMGs improved quota fulfilment. Our analysis considered the time invested in collaboration tasks (e.g. talking to MMUs and representatives of other interests), activities connected to establishing management plans (e.g. meetings within the group), and individual preparations (e.g. analysing data or educational activities). Each of these tasks can assist goal alignment. In particular, more frequent collaboration with MMUs and local landowners and hunters could lead to better anchoring of the set goals and planned management actions among the involved actors. This can increase the legitimacy of plans, create bridging and linking social capital between management levels, and increase the willingness of actors to work towards a common goal (Agnitsch *et al.*, 2006; Grafton, 2005).

In summary the institutional design and implementation of the CGR created regional spatial and functional misfits and affected both the process performance (i.e. collaboration dynamics) and productivity performance (i.e. outcomes) of the system.

What contributes to the adaptive capacity of the CGR?

If social-ecological misfits are not addressed, they can threaten the long-term sustainability and effectiveness of policy implementations (Plummer & Hashimoto, 2011; Galaz *et al.*, 2008). Therefore adaptive capacity is a critical attribute of the system that enables institutions to co-evolve in time with the ecological challenges (Pahl-Wostl, 2009). Adaptive capacity is a systemic property and must exist at all levels involved in collective action to change behaviour on the ground (Adger *et al.*, 2005). Thus, from a policy perspective it is essential to understand what contributes to or limits adaptive capacity across different governance levels.

Paper II highlighted the importance of multi-level collaboration (i.e. bridging and linking social capital) in this context. Both MMG and MMU members who felt that collaborations with levels below benefitted them and had trust in levels above them had more confidence in the system's ability to handle challenges (*Paper II*). Trust between levels is also essential for mobilizing the adaptive capacity within an area (Armitage *et al.*, 2009) and working collectively towards preferred goals (Cinner *et al.*, 2018; Adger, 2003).

Our results additionally revealed scale dependent effects of the institutional design on the perceived adaptive capacity of actors: fairness in decision-making and the inclusion of different interests had stronger effects on perceptions at the lower (MMU) governance level (*Paper II*). MMUs are self-organized and lack formalized collaboration structures. Our survey responses indicate considerable variety in how MMUs are steered and how interests are represented. This finding was supported by the workshops and interviews with actors in different parts of

the country. Fairness is closely linked to power; in areas with unbalanced power distributions, some actors might feel limited in their ability to act (Ansell & Gash, 2008). Perceptions of fairness might not only relate to processes within MMUs but also to the vertical design of the system. Many MMUs were established long before the CGR was implemented, and the introduction of the 'ecosystem' management level imposes an additional level of control on their actions because their plans must be approved by MMGs. This led to ambiguity concerning roles and responsibilities in the early implementation phase of the CGR (Lindqvist *et al.*, 2014; Bjärstig *et al.*, 2013). In areas where multi-level collaboration works well, power struggles might not occur. However, if collaboration with the relevant MMG is problematic, MMUs might perceive injustice when their locally made decisions are overruled by actors on higher management levels. This also relates to the finding that linking social capital (i.e. trust in higher management levels) has important effects on perceived adaptive capacity in MMUs (*Paper II*).

For MMGs on the other side, operational resources (i.e. time, resources, and support from representatives' parent organizations) and availability of adequate knowledge had significant effects on how actors perceived the system's capacity to adapt (*Paper II*). This could also be interpreted as an effect of the institutional design. MMG representatives have a central and challenging role in the system, and invested on average 98 hours (SD = 49.75 hours, *Paper III*) per year in their work. Financial resources within the governance system are limited (Naturvårdsverket, 2015), and MMG representatives receive only limited reimbursement for their efforts. Thus, they contribute much of their labour voluntarily, although some do it as part of their working duties. The freedom to invest sufficient time and support from a parent organization are thus important resources that can increase actors' perceived adaptive capacity. Adequate knowledge of ecological processes is a cornerstone for generating good management plans (Apollonio *et al.*, 2017; Raymond *et al.*, 2010). In our survey, members of all but one of the MMGs (138) stated that they require additional knowledge to support the management process (*Paper III*). It is thus unsurprising that knowledge crystalized as a critical determinant of actors' perceived adaptive capacity. As a remedy for limited knowledge, nearly two-thirds of the MMGs applied additional local monitoring methods alongside the officially recommended ones (*Paper III*). This can also be seen as realized adaptive capacity.

The results discussed so far relate mainly to actors' perceived adaptive capacity, which describes the cognitive dimensions of adaptation. However, actors' perceptions of their ability to adapt are only one of the factors that shape intentions to adapt and actual adaptation (Seara *et al.*, 2016; Grothmann & Patt,

2005). External circumstances and factors that can contribute to the activation of adaptive capacity such as leadership, institutional flexibility, social networks, and resources are equally important (Cinner & Barnes, 2019; Nursey-Bray *et al.*, 2018; Whitney *et al.*, 2017; Lockwood *et al.*, 2015). In *Paper IV* we found evidence of realized adaptive capacity within the 'good examples'. Representatives working within these 'good examples' collectively identified challenges and actively adapted their strategies (i.e. their theory of change) and procedural arrangements to achieve positive outcomes. I elaborate on these findings and what contributed to their adaptive capacity in the next section.

How do 'good examples' operate to overcome challenges and achieve positive outcomes?

The studied best practice cases were distributed from southern Sweden to the North and thus spanned very different social-ecological context settings (*Paper I*). Interviewees confirmed the quantitatively identified problems of fit as they described their efforts to overcome challenges relating to the presence of multiple ungulate species and the management of large heterogeneous areas with many involved actors (*Paper IV*). To overcome these challenges, 'good examples' adapted their local procedural and institutional arrangements. Our results indicated that this was favoured by bonding social capital within the groups and their leadership capacity. The policy design provided discretion, or what could be called room for manoeuvre, regarding the formation of multi-level collaboration (see introduction). 'Good examples' seized this window of opportunity and created locally tailored procedures that allowed them to effectively address problems of fit (*Paper IV*).

Spatial misfit caused by the size of the MMA, the number of involved MMUs and License areas, and heterogeneity of the area was mitigated by delegation of tasks and/or creating of effective communication strategies. The 'good examples' were very innovative and developed things such as mentorship programmes or technological solutions (e.g. Apps) that enabled collective fact finding and shared knowledge generation. This created principled engagement with MMUs and License areas, which in turn helped to strengthen bridging social capital. They further acknowledged the need for locally adapted goals, and matched this with flexibility in goal alignment and strategies to follow up and support quota fulfilment within these areas.

Functional misfit caused by high numbers of other ungulate species was allayed by MMGs autonomously extending their official mandate and including these species in their management activities (*Paper IV*). To support a 'holistic' approach, they developed locally adapted monitoring methods and tried to find

'non-bureaucratic' solutions to integrate other species into their moose management procedures.

Our results support previous reports indicating that windows of opportunity (i.e. institutional flexibility) in combination with leadership allow for adaptation and improved social-ecological fit (Sharma-Wallace *et al.*, 2018; Jones & Boyd, 2011; Galaz *et al.*, 2008; Olsson *et al.*, 2004). In these instances, cross-scale collaboration, multi-level coordination, and social capital (i.e. bridging social capital) further enhanced the effectiveness of adaptations (Sharma-Wallace *et al.*, 2018; Cheng *et al.*, 2015). Our 'good examples' support this finding because the interviewed groups displayed all these qualities. This was partly due to previously established social networks and the experience of MMG representatives, their commitment to the process, and continuity in their collaboration efforts. Our results also indicate a 'spillover' from within-level collaboration dynamics and bonding social capital to between-level collaboration and bridging social capital (*Paper IV*). The trust that MMG members expressed towards each other allowed them not only to split the responsibilities for collaboration with MMUs, but also to demonstrate acceptance and mutual understanding between landowner and hunter interests to actors on the local level.

As "*process champions*" or initiating leaders, 'good examples' collectively identified context challenges and used their professional and/or social networks and expertise to strengthen their collaboration with other governance levels (Emerson & Nabatchi, 2015a; Yaffee, 2011; Olsson *et al.*, 2004). For example, they assisted MMUs as conveners, mediators, facilitators, and technical experts. Positive feedback from MMUs and CABs together with the results of their efforts reinforced the established working procedures and created confidence in their theory of change (*Paper IV*). Given that we selected the studied cases based on their good outcomes (e.g. quota fulfilment), these results show again the importance of multi-level collaboration within the CGR.

Overall, 'good examples' achieved high process performance because they had well-functioning collaboration dynamics and displayed adaptive capacity in reaction to identified challenges. Because these examples were selected based on their good ecological outcomes, our findings show a link between process and productivity performance within the CGR. Learning from the local innovations of best-practice examples can provide valuable insight for policy reforms (Ratner *et al.*, 2013), and the quasi-experimental set-up of the CGR offers an even greater opportunity for parallel policy learning (Newig *et al.*, 2016a). Some procedural arrangements such as mentorship programmes and local monitoring methods can be directly adapted for use by other MMGs, while

other aspects such as the promotion of leadership skills might need more systematic investment.

Reflections on the CGR and its social-ecological performance

Uncertainty about ecosystem dynamics, interdependence between forestry and hunting interests, and the struggle of the previous management structures to solve conflicts and effectively manage the moose populations were central drivers for the initiation of the CGR. Using the typology of Emerson and Nabatchi (2015a, page 163), the studied CGR can be considered externally directed because the state led its national initiation and thereby mandated collaboration between the different interests. Ideally, this formative type is characterized by detailed pre-set institutional structures, which give participants only limited autonomy. Consequently, the formative type also affects initial collaboration dynamics. Externally directed CGRs can enable principled engagement because they often predefine the existing problem and a theory of change to address it. Thus, they "just" require the acceptance of these definitions by the involved actors, which should then develop a shared understanding over time. Procedural and institutional design and resources should in this formative type be directly available to create the capacity for joint action (Emerson & Nabatchi, 2015a, page 171). Reflecting on the case of Swedish moose management and my results, several deviations from this ideal typology can be identified and seen to influence the performance of the CGR.

The discretion in the implementation of the CGR and the design of multi-level collaboration gave actors room for manoeuvre (i.e. autonomy) to form their own rules. My results showed that in the presence of dedicated individuals and leadership capacity, this could lead to the development of well-tailored, locally adapted and successful arrangements for multi-level collaboration. However, these factors did not appear to be present in all MMGs, as I found limitations in linking and bridging social capital between governance levels and varying degrees of goal alignment. The lack of detailed institutional procedures thus made the performance of the CGR dependent on individuals, which could threaten its long-term sustainability in some areas.

The institutional design added a formalized governance level for collaboration above the pre-existing voluntary collaboration forums - MMUs. Some of these local MMUs had existed for 20 years prior to the implementation of the CGR. From the interviews and workshops, it became clear that these social networks have been integrated in varying ways within the CGR. Some of the 'good examples' reported a strong local history of working together, which of course gave them a different starting condition to areas with no previous collaboration between hunting and landowner interests. Others stated that they

used existing MMU structures in their implementation, and that MMU chairpersons took on a dual role as MMG representatives. Such areas have attributes that are typically more associated with 'self-initiated' CGRs (Emerson & Nabatchi, 2015a, page 171). From the outset, they had strong social relations, a common interest, and organically emergent leadership. This might not be the case in regions without previously existing MMUs.

Leadership emerged as a key driving force in the 'good examples' and allowed for successful local adaptations. This exemplifies the importance of individual-based attributes within the system. In general, the CGR relies heavily on voluntary and uncompensated efforts on the local and ecosystem levels to handle the inherent conflict between forestry and hunting interests. Hunting teams invest time in monitoring (since 2012, they have invested on average 5 million hours per year in moose observations[10]), while MMUs and MMG representatives invest considerable time into the development and follow-up of management plans, and most importantly into collaboration. If actors lack the time, organizational infrastructure, or liberty to engage to the same degree as their counterparts, power imbalances can emerge and negatively influence collaboration (Ansell & Gash, 2008). Collaboration also demands social skills from the involved individuals, and can create stress and internal conflicts among them (Young *et al.*, 2020; Johansson *et al.*, 2019). More than half of all MMG representatives who responded to our survey said they had experienced situations in which the CGR did not function as intended because of ecological or social problems. In such situations, individuals and groups must find coping mechanisms that serve themselves and the collective to resolve problems (Johansson *et al.*, 2019). This is a balancing act, and issues of accountability can further complicate conflict resolution within MMGs. Representatives in MMGs can feel accountable towards their individual values, the interests they are supposed to represent, the organization or company that pays/supports them, and the MMG, but also towards local actors and the public in their moose management area. This struggle between different accountabilities was brought up during workshops and interviews (Johansson *et al.*, 2019; Sjölander-Lindqvist & Sandström, 2019).

From a system perspective, accountability can be linked to performance (Clement *et al.*, 2016; Plummer *et al.*, 2013). There is thus a demand to deliver, which seems to have become a significant issue in the debate about moose management, leading to increased focus on quota fulfilment and reduction of browsing damage. The CGR was implemented partly in the hope of achieving substantial changes in some ecological indicators. However, collaborative

10. Reported time investment in systematic moose observations (*sv: Älgobs*) from https://algdata-apps.lansstyrelsen.se/algdata-apps-stat

governance is a time-consuming endeavour, especially if the starting conditions are defined by conflicts and mistrust (Ansell & Gash, 2008). Furthermore, CGRs go through different phases of initiation, early implementation, routinization, and adaptation (Emerson & Nabatchi, 2015a; Yaffee, 2011). The early implementation phase of the CGR was partly characterized by inconsistencies in the reporting of management data, particularly during 2012-2014 (see methods). Furthermore, qualitative research during these first two years revealed actors' unfamiliarity with their new roles and a lack of process skills (Bjärstig *et al.*, 2014). I would argue that the results of my thesis show that this phase has now ended and that the system is currently undergoing routinization and adaptation. On the MMG level, we observed relatively high bonding social capital (*Paper II & III*) and evidence of local adaptations (*Paper III & IV*). CABs reported that a variety of working routines have been developed and efforts to adapt the system to their regional context are underway. The implementation of a CGR also changed the role of public officers and demands different leadership skills from them (Zachrisson *et al.*, 2018; Ansell & Gash, 2008). Trust in actors at the regional level (i.e. CAB & WMD) emerged as a critical factor for the perceived adaptive capacity of MMUs and MMGs (*Paper II*). Furthermore, interviewees and workshop participants described how a lack of continuity in these positions could quickly change collaboration dynamics and trust. This is thus another example of the system's strong dependence on individuals and their skill sets and commitment.

6 Conclusion

The CGR for moose was introduced to create a moose population that is in balance with available forage resources while considering other public interests. Its design was guided by the ecosystem approach and aimed to overcome identified shortcomings of the previous system, namely the lack of social-ecological fit, a holistic systems perspective, and steering opportunities. My analysis of the institutional design and its effect on the social-ecological performance showed that these goals and aims were partly met, but challenges remain and local and regional adaptations together with multi-level collaboration are needed to resolve them.

The new ecosystem level tried to create a better social-ecological fit within the CGR. Finding the appropriate spatial scale to manage wildlife populations and managing multiple species in relation to each other are common challenges across many wildlife governance systems (Apollonio *et al.*, 2010). Creating large MMAs to match the migration patterns of moose created new challenges because it requires many actors to coordinate their actions. Best-practice examples showed how this can be achieved through innovation, leadership, and multi-level collaboration. The ecosystem approach provides guidelines on adopting a holistic systems perspective, but many countries struggle with its implementation in wildlife management (Sandström, 2012). I found that this continues to be challenging: while the CGR improved on previous systems by including a focus on moose populations, ecosystem management has yet to be achieved. This is clearly shown by the effects of high land use diversity and the presence of other ungulate species on the effectiveness of moose management. The best-practise examples overcame this by autonomously creating locally adapted multi-species management regimes. This confirmed that the implementation of an ecosystem approach relies heavily on several previously identified factors including social capital, knowledge, resources, leadership, and institutional flexibility (Sharma-Wallace *et al.*, 2018; Olsson *et al.*, 2004). These factors strengthened the collaboration dynamics between actors and the adaptive

capacity that enables them to overcome challenges, and should therefore be reinforced not only in the studied CGR, but also in other systems aiming to implement an ecosystem approach. From an ecological perspective, the implemented CGR improved steering, as demonstrated by the fact that the average quota fulfilment observed in this work was 88%, whereas that achieved under the previous system was only 54-58%. However, it should be noted that quota fulfilment is only an intermediate ecological outcome, and time is needed to determine the CGR's actual impact on the moose population and browsing damage.

Overall, my results indicate that the CGR continues to evolve since its implementation in 2012. There are regional differences in remaining challenges and social-ecological fit, but multi-level collaboration, committed actors and local adaptations can lead to good social and ecological outcomes. Just like the best-practice examples, the system contains a lot of knowledge on 'what works where, and why', which should be collected and analysed to assist adaptive policy learning. To enable this, an infrastructure for systematic learning across governance levels, existing networks, and regions would be needed but does not currently exist. Such an infrastructure could also lead to collaborative and social learning and improve the adaptive capacity of the system (Berkes, 2017; Pahl-Wostl, 2009).

Future research directions

I see this thesis as a step toward fully disentangling the complex relationships between the design of collaborative governance regimes and their social-ecological performance. The use of a novel combination of qualitative and quantitative methods enabled a close link between theory-driven and empirical research that allowed me to move from a descriptive analysis of the social-ecological context to testing theory-supported models. Additionally, because my research covered multiple scales, ranging from local to national, and included multiple levels of analysis, I was able to explore the scale dependency of different concepts and the influence of the multi-level design on the outcomes of the CGR.

I believe that future research could build on and complement the advances presented in this thesis in various ways. In particular, I see a need for further contributions to policy learning and theory development. From an empirical perspective, additional context factors such as landownership should be explored on a finer scale. The quickly advancing field of social-ecological network analysis could also deliver a better understanding of the vertical and horizontal interdependencies of actors and resources. Such research could provide a deeper understanding of the roles of linking and bridging social capital. Lastly,

continuous monitoring of social processes over time similar to the ecological monitoring regimes could deliver valuable insights into sustainability and the social-ecological performance of the system. From a theoretical perspective, the links between collaboration dynamics and adaptive capacity should be further investigated, to understand how collaboration can help to create adaptation within a governance system. *Paper IV* indicated a 'spillover' effect from within-level collaboration dynamics to between-level dynamics. More research on this relationship could assist the development of the IFCG and the general understanding of collaboration dynamics in multi-level governance systems.

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Popular science summary

Wildlife management is challenging because wildlife is part of complex social-ecological systems in which species interact with one-another and the landscape they live in. At the same time, both wildlife and the habitats they depend on are managed according to human interests. Some might prefer high densities of wildlife for hunting, while others might be more interested in agricultural and forestry productivity. However, these interests affect one-another. Wildlife species such as moose (*Alces alces*) and deer limit production by browsing and grazing, while forestry and agriculture determine forage availability. From a societal perspective, it is important to find ways to manage these social-ecological systems that balance different interests and enable sustainable harvesting of wildlife and other natural resources.

Swedish moose management exemplifies this challenge: its main goal is to strike a balance between a healthy moose population and acceptable levels of browsing damage to economically important tree species. To achieve this, a new locally anchored and ecosystem-based management system was introduced in 2012. This system includes Moose Management Groups (MMGs) consisting of three landowner and three hunter representatives, who formulate common goals for their Moose Management Areas (MMAs). An MMA represents the ecosystem-level and should ideally include a distinct moose population. On the local level, landowners can voluntarily form Moose Management Units (MMUs), allowing them to create locally adapted management plans. The new system has been implemented in slightly different ways across the country, creating an opportunity to explore the question of 'what works where, and why'.

The aim of my thesis was to analyse how the formation of the management system and the context in which it has been implemented influence its performance. More precisely, I studied the collaboration processes between different interest groups and between participants at the local and ecosystem levels, and the resulting outcomes. I based my analyses on surveys sent to individuals working at different management levels, interviews, and workshops

attended by participants at different management levels. In total, I gathered data from over 2000 people with different roles in the moose management system. I combined the gathered information on collaboration processes with management plans and ecological monitoring data. My research covered all of Sweden but also focused on local 'good examples', meaning MMAs that achieved good social outcomes (e.g. trust within the MMG and towards MMUs) and ecological outcomes (e.g. harvest quota fulfilment and low browsing damage). My analyses showed that the new ecosystem-based approach performs better than the previous management system but also revealed persistent and regionally varying challenges caused by social and ecological factors that influence management performance.

MMAs in northern Sweden are very large to reflect the seasonal migration of moose. This creates challenges for collaboration. MMGs need to invest more time than those responsible for smaller MMAs because they must coordinate management activities with many participants to ensure alignment of local and regional goals. At the same time, moose densities and forage availability vary substantially within these large areas, necessitating flexibility to adapt the harvest to local circumstances. 'Good examples' overcame these challenges by using diverse leadership skills at the MMG level and innovating by developing processes that enabled the inclusion of many stakeholders in the management process and the alignment of MMU and MMA goals. This created trust among participants and facilitated the discovery of locally functional management strategies.

Another challenge that became obvious relates to the presence of other game species such as roe deer, red deer, fallow deer, and wild boar. These species are common in southern Sweden, where landscapes are more diverse with a mixture of agricultural fields, open areas, and forests. MMAs in these diverse landscapes with high densities of other deer species struggled to meet their moose harvest quotas. Some of the studied 'good examples' overcame this challenge by actively integrating other deer species into their moose management process. This was made possible by good collaboration among local stakeholders and a shared understanding of the need for multi-species management. MMG representatives acted as 'champions', using their local social networks and leading this process.

I found the capacity of stakeholders to adapt to local circumstances to be essential for achieving good outcomes. My analyses revealed that stakeholders felt more prepared to handle challenges when they had trust in the management levels above them and perceived benefits from local collaboration. The confidence of local stakeholders in the system's adaptability was strengthened when they felt that decision-making processes and the representation of different

interests were fair. MMGs needed adequate resources and knowledge to feel sufficiently prepared to handle existing and future challenges.

Overall, my research underlined the importance of committed individuals with leadership skills who recognize local challenges and adapt their management strategies accordingly. Continuous communication and collaboration among MMGs and local stakeholders created trust and strong social relationships within MMAs. This made them more adaptable and provided the support needed to implement innovative working processes. The variation in social and ecological context factors showed that regional and local solutions must be found, as some MMAs have already done successfully. This offers a great opportunity for learning within the system to understand 'what works where, and why' in order to improve the system's overall performance. New forums for systematic knowledge exchange across areas and management levels could help spread insights from best-practice, and to ensure that mistakes are not repeated. The results presented here clearly demonstrate the need for regionally adapted management strategies; solutions that function well in one area might not work in other parts of the country. Furthermore, links between the different management levels should be strengthened because collaboration between the local and ecosystem levels was shown to improve goal alignment, adaptability, and system performance.

Populärvetenskaplig sammanfattning

Viltförvaltning är en del av komplexa social-ekologiska system. Olika arter interagerar med varandra och landskapet de lever i. Samtidigt förvaltas både viltet och landskapet enligt människors olika intressen. En del människor föredrar att ha en hög vilttäthet till förmån för jakt, medan andra vill minska viltets täthet för att skydda jord- och skogsbruk mot viltskador. Dessa intressen är svåra att förena, men intimt sammankopplade eftersom de arter som är eftertraktade för jakt, till exempel klövvilt, betar på trädslag och grödor av ekonomiskt värde. Frågan är hur man kan förvalta social-ekologiska system på ett sätt som balanserar olika intressen, minimerar konflikter, och möjliggör ett långsiktigt hållbart nyttjande av vilt och andra naturresurser.

Trots omfattande forskningsinsatser om både styrning och förvaltning av social-ekologiska system kvarstår en rad kunskapsluckor rörande ”vad som fungerar var och varför”. Förvaltningen präglas i enlighet med tidigare forskning i allt högre grad av samverkan, decentralisering och adaptiv förvaltning. Svensk älgförvaltning är ett exempel på detta. År 2012 infördes en ny lokalt förankrad ekosystembaserad förvaltning, där jägare och markägare samverkar i förvaltningen av älgstammen. En ny formell förvaltningsnivå, älgförvaltningsområde (ÄFO), introducerades på ekosystemnivå. ÄFO leds av en älgförvaltningsgrupp (ÄFG) med representanter från jägare och markägare, i norr även rennäring. ÄFG sätter upp förvaltningsplaner med målsättningar för älgstammens storlek, kvalitet och acceptabla betesskador. ÄFG ska samverka med Älgskötselområden (ÄSO) som på frivillig basis organiserar jägare och markägare på lokal nivå.

Syftet med studien är att analysera hur utformningen av älgförvaltningen, samt de varierande förutsättningarna i landet påverkar möjligheterna att nå sociala och ekologiska mål. Mer specifikt studeras samverkansprocesser mellan olika intressen och aktörer på ÄFO- och ÄSO-nivå och vilka resultat som uppnås. För att besvara mina forskningsfrågor använde jag frågeformulär riktade till personer aktiva på olika förvaltningsnivåer, samt intervjuer och workshops

med aktörerna inom förvaltningssystemet. Studierna inkluderade tillsammans mer än 2000 personer. Jag kombinerade den insamlade information om samverkansprocesser med förvaltningsplaner och ekologiska inventeringsdata på älg, andra klövviltarter och fodertillgången i skogen. Min forskning omfattade hela Sverige men jag fokuserade också på "goda exempel" dvs ÄFOn som når både ekologiska och sociala mål.

Ett ÄFO, dvs ekosystemnivån, ska omfatta en egen älgpopulation. Det innebär att ÄFOn i norra Sverige kan vara väldigt stora för att matcha älgpopulationens vandringsmönster. Det skapar i sin tur utmaningar för samverkan. Jämförelsevis måste till exempel ledamöterna i ÄFG i norr investera mer tid i förvaltningen, eftersom de ska samordna åtgärder med många berörda parter för att på så sätt garantera att lokala och regionala målsättningar motsvarar varandra. Samtidigt kan älgtätheten och fodertillgången variera kraftigt inom dessa stora områden, vilket kräver flexibilitet för att anpassa avskjutningen till lokala förhållanden. Intervjuer med ledamöter i ÄFOn som identifierats som "goda exempel" visade hur det går att hantera dessa utmaningar. ÄFOn som når sina mål kännetecknades av ledarskap, sociala relationer, och innovation. De utvecklade samverkansprocesser som gjorde det möjligt att inkludera många aktörer i förvaltningen och att anpassa lokala och regionala mål till varandra. Dessa processer skapade förtroende bland aktörerna och bidrog till att finna lokalt fungerande och accepterade förvaltningsstrategier.

En annan uppenbar utmaning är förekomsten av andra klövviltarter, som rådjur, kronhjort, dovhjort och vildsvin. Dessa arter förekommer främst i södra Sverige där landskapen dessutom är mer varierande med en blandning av jordbruk, öppna landskap och skogar, jämfört med landskapen i norr. ÄFOn i områden med flera klövviltarter upplevde problem att nå de fastställda avskjutningsmålen för älg. Genom att aktivt integrera övriga klövviltarter i älgförvaltningen, visade emellertid de ÄFOn som karaktäriseras som ”goda exempel” att det är möjligt att nå de fastställda målen även i den här typen av social-ekologiska system. Det möjliggjordes genom ett gott samarbete mellan lokala aktörer och en gemensam förståelse för att det i praktiken krävs flerartsförvaltning om målen ska nås i älgförvaltningen. Representanterna i ÄFG var starkt drivande i den här processen och använde sina redan etablerade sociala nätverk i områdena för att mobilisera och leda älgförvaltningsprocessen.

Resultaten av studierna visar att aktörernas förmåga att anpassa sig till lokala förhållanden är avgörande för att uppnå goda resultat. Aktörernas upplevda förmåga att hantera utmaningarna i förvaltningen är större om de har förtroende för de högre förvaltningsnivåerna och god samverkan med lokala aktörer. För aktörerna på ÄSO nivå var den upplevda anpassningsförmågan större när de uppfattade beslutsprocesser och representation av olika intresse som rättvisa.

Ledamöterna i ÄFG kände sig bättre förberedda att hantera befintliga och framtida utmaningar när de upplevde att de hade tillräckligt med kunskap och resurser.

Vidare pekar min forskning på vikten av engagerade aktörer med goda ledaregenskaper, som har god kännedom om lokala förutsättningar och förmåga att anpassa sina förvaltningsstrategier därefter för att nå framgång inom viltförvaltningen. Kontinuerlig kommunikation och samverkan mellan ÄFG och lokala aktörer skapar tillit och starka sociala relationer inom ÄFO. Det gör dem mer anpassningsbara och skapar det stöd som behövs för att utarbeta och genomföra innovativa arbetsmetoder. En jämförelse mellan det gamla och det nya förvaltningssystemet visar att det nya systemet når avskjutningsmålen i högre utsträckning, med delvis minskade konflikter.

Även om det nya förvaltningssystemet har införts samtidigt i hela landet, har det i praktiken utformats på lite olika sätt och nått olika resultat i olika delar av landet. Denna variation öppnar upp för möjligheten att undersöka "vad som fungerar var och varför". Det skapar i sin tur möjlighet för lärande och förbättringar av systemet i sin helhet. Genom att ta tillvara på den här kunskapen och etablera forum för systematiskt kunskapsutbyte mellan områden och förvaltningsnivåer skulle berörda intressen och aktörer kunna bidra till att sprida kunskap om fungerade processer, och därmed undvika att upprepa misstag.

Sammantaget visar min avhandling på behovet av ökad regional och lokal anpassning samt att samverkan mellan olika nivåer utvecklas, för att bättre matcha det social-ekologiska systemet. Länkarna mellan de olika förvaltningsnivåerna bör stärkas, eftersom goda relationer mellan nivåerna har visat sig vara avgörande för att öka aktörernas anpassningsförmåga och att nå fastställda sociala och ekologiska mål.

Acknowledgements

Jag vill först och främst tacka alla personer som på olika sätt bidragit till att göra den här avhandlingen möjlig. Stort tack till alla er som investerade tid och energi för att besvara frågeformulären, som delade med er av erfarenheter och kunskap i intervjuer eller medverkade med inspel i olika workshops. Resultaten av era insatser är kärnan i min avhandling. Jag vill också tacka Svenska Jägareförbundet, Skogsstyrelsen och alla Länsstyrelserna för datamaterialet de delade med mig. Forskningen möjliggjordes genom finansiellt stöd från Naturvårdsverkets Viltvårdsfond, Svenska Jägareförbundet, Västerbottens älgvårdsfond och regeringsuppdraget att uppdatera, utveckla och förenkla befintligt utbildningspaket i adaptiv älgförvaltning. Dessutom vill jag tacka Stiftelsen Knut och Alice Wallenbergs forskarstipendiefond via KSLA, Lennart Hjelms Fond, Wallenbergs Stiftelse och Seth M Kempes stipendiefond som gjort det möjligt för mig att delta i internationella konferenser och doktorandkurser, samt Umeå universitet och SLU för deras övergripande stöd.

The journey that led up to this thesis started in 2012, when I sent an email to Prof. Ericsson asking if there was a 'moose project' I could write my Master's thesis on …. the answer was "no". Instead, I was offered a 'human dimensions' topic, which turned out to be my real research interest and which I want to build my career on.

Göran, you gave me a chance back then, opened a door for me, and you have continued to do so during the last 8 years. You have always been supportive and encouraging. Despite all your tasks as Department Head, you made sure to set aside time for me and my questions. However, what I want to thank you most for, and what I will never forget, is that you gave me the possibility to be with my family when they needed it the most.

Camilla, you are an amazing researcher and a true role model (I have to admit I found it a bit intimidating in the beginning). You have such a broad expertise and I am grateful that you shared it with me during this journey. Your insights

and comments helped me and my thesis to grow beyond what would have been otherwise possible. Besides your scientific qualities, you are also a wonderful person. I enjoyed getting to know your great personality during our conference trips around the world and I really hope we will continue to work together in the future. Your supervision was priceless – thank you so much.

Lund might be quite far away from Umeå, but that never made a difference for the great support I got from you, Maria. Having you as a co-supervisor was a blessing. Thank you for introducing me to environmental psychology and asking all the right questions to make me think about my analyses and writing. You also made sure, that I would not forget to take care of myself and have a break in-between. Thank you for all your support.

Governance would not be complete without you, Annelie. It was great to have you by my side during my first purely qualitative work. Your experience and supervision gave me the needed tools and confidence. I hope we can collaborate again!

Besides the *Governance* project group, there are of course many other people I owe my gratitude to, as they supported me in different ways during this journey. Liza, Klara, Anita, Hussein, and Andy, you were PhD students when I started at VFM. You made Umeå quickly feel like a home for me and I could always count on you. Liza and Klara, driving me in a Ford Fiesta through the Kalahari to a conference while I was running SEM models in the backseat is just one example of our crazy endeavours. Describing everything that you two did for me would easily fill several pages. You made it not only fun to be a PhD student, but also supported me during hard times. Thank you so much for everything! Anita and Hussein you are both brilliant minds and very thoughtful persons. You always gave me great advice, whenever I had questions - private or work related. After leaving VFM (I forgive you for that), you came back and I am glad to have you again with me in Umeå. Andy, you set a high standard for moose-related theses - I forgive you for that. You are a wonderful and fun person and I hope to see you more often once your little one is ready for his Stuga holidays.

Sabine, you would also deserve several pages of acknowledgements. Sharing an office with you was a gift. Not only could we discuss moose management and databases, but we were also laughing tears quite often, which eased the stress. You have become a true friend and your support during this final stretch of my PhD thesis was invaluable. I hope to return the favour during the next year. However, I am sure you will do an amazing job with your own thesis. Anna, your art skills upgraded the appearance of this thesis, but your comments and thoughts also helped with the content. You were such a great addition to our PhD crew and I'm happy to call you a friend. Chris, you are one of the most caring

persons I know and having a chat with you always cheers me up. Thanks for being you. Emelie, Linda, Robert, Julia, and the rest of the VFM PhD group, thanks for all the delightful Fikas, lunches, and talks. Having you all around made this PhD work so much more enjoyable. Good luck with all your projects!

Besides my fellow PhDs, there were several VFM colleagues that helped by discussing my work, giving advice, sharing their insights, or just being friends at work. Joris, organizing the South Africa course with you was amazing and I want to thank you for being on my side during the big day that is coming. Jörgen, chats with you are always great and your Fika support made some days simply better. Navinder, you introduced me to Soapbox Science and more importantly to R, both of them gave me new skills – thanks so much. Fredrik, thanks for sharing your insights on Swedish hunting and wildlife management and for discussing my work. Tim, you took great care of the Human Dimensions course, which made finishing this PhD easier, thank you for that. Helena, Lotta, and Kicki, thanks for all the administrative support that took additional weight of my shoulders. VFM is a great place to do a PhD, thanks to the staff at VFM who contributes to this welcoming and inclusive work place.

Of course, there were also people outside of VFM that supported me. A big thank you to the whole Environmental Governance Group at Umeå University. You 'adopted' me even though I am not a political scientist and gave valuable feedback on my work. Ann, you were my PhD 'sibling' in this interdisciplinary journey. Thanks for our chats; it was great to have someone who was sharing the endeavour of crossing disciplines. During my PhD work, I had the opportunity to get helpful input from several researchers, Shawn Riley, Steve Redpath, Kjell Danell, and Thomas Heberlein being some of them. Thanks for taking the time!

Ohne die Unterstützung meiner Familie und Freunde wäre ich nicht so weit gekommen. Rike, du bist einer der Gründe wieso es diese Doktorarbeit gibt. Ich erinnere mich noch an das Telefonat, in dem du mich ermuntert hast die Praktikumsstelle in Schweden anzunehmen. Danke für deine Freundschaft. Meine Danksagungen können leider nicht mehr von allen gelesen werden, die sie verdienen. Mama und Papa ihr habt mir alles ermöglicht und euch stolz zu machen ist meine größte Motivation. Papa du wirst immer mein Vorbild sein. Stefan und Peter ihr habt mir vorgelebt, dass man beruflich das machen sollte was einem am meisten Spaß macht. Danke, dass ihr so liebevolle große Brüder seid. Aleks, du bist mein Fels. Deine Unterstützung und Liebe haben all dies möglich gemacht und ich freue mich auf die gemeinsame Reise die noch vor uns liegt.

Umeå, 19 April 2020

Appendix 1. Survey instrument to MMG

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

LUNDS UNIVERSITET
Lunds Tekniska Högskola

Umeå universitet

EN UNDERSÖKNING OM ÄLGFÖRVALTNING

En undersökning om älgförvaltning

Undersökningen ingår i ett forskningsprojekt som syftar till att bättre förstå hur älgförvaltningen fungerar i praktiken. Vi ber dig att läsa texten noggrant och besvara alla frågor så gott du kan. Dina erfarenheter och upplevelser är viktiga för oss. Svaren är konfidentiella och kommer inte att kunna spåras till dig. Om du har andra tankar som är viktiga i sammanhanget finns utrymme i slutet av formuläret.

Tack på förhand!

A. Frågor om din roll inom älgförvaltningen

A1. Vilken eller vilka älgförvaltningsgrupp/er sitter du i?

☐Jag sitter i en älgförvaltningsgrupp i följande län ……..…

☐Jag sitter i flera älgförvaltningsgrupper i följande län……....

……..……

A2. Vilket intresse representerar du?

☐Markägarintresset ☐Jägarintresset

A3. Är du förtroendevald eller anställd vid intresseorganisation, företag eller motsvarande?

☐Förtroendevald ☐Anställd

A4. Hur många år har du varit med i någon älgförvaltningsgrupp?
Om du sitter i flera grupper, utgå från det område du suttit i längst. Utgå från detta när du svarar på resten av frågorna.

☐Jag är ny
☐1 år
☐2 år
☐3 år
☐Jag har varit med sedan starten 2012

A5. När deltog du senast i någon utbildning inom älgförvaltningen?

☐Har ännu inte deltagit
☐Deltar just nu
☐Ca 1 år sedan
☐Ca 2 år sedan
☐3 år eller längre

A6. Ungefär hur många hektar omfattar det älgförvaltningsområde som du är verksam inom?

☐Mindre än 50 000 ha
☐50 000 – 99 000 ha
☐100 000 – 499 000 ha
☐500 000 ha eller större

A7. Vilka viltarter finns inom älgförvaltningsområdet?

Markera för varje art om viltet saknas helt, finns sporadiskt eller om det finns en etablerad och regelbunden förekomst.

	Saknas helt	Sporadiskt, enstaka djur	Regelbunden förekomst	Vet inte
Älg	☐	☐	☐	☐
Rådjur	☐	☐	☐	☐
Vildsvin	☐	☐	☐	☐
Kronhjort	☐	☐	☐	☐
Dovhjort	☐	☐	☐	☐
Mufflonfår	☐	☐	☐	☐
Björn	☐	☐	☐	☐
Lodjur	☐	☐	☐	☐
Varg	☐	☐	☐	☐
Järv	☐	☐	☐	☐
Gäss	☐	☐	☐	☐
Tranor	☐	☐	☐	☐
Änder	☐	☐	☐	☐

A8. Av de viltarter som finns inom älgförvaltningsområdet är det någon eller några viltarter som din organisation tycker det finns för lite eller för mycket av inom området?

Markera med ett kryss per art.

	Alldeles för lite	Något för lite	Lagom	Något för mycket	Alldeles för mycket
Älg	☐	☐	☐	☐	☐
Rådjur	☐	☐	☐	☐	☐
Vildsvin	☐	☐	☐	☐	☐
Kronhjort	☐	☐	☐	☐	☐
Dovhjort	☐	☐	☐	☐	☐
Mufflonfår	☐	☐	☐	☐	☐
Björn	☐	☐	☐	☐	☐
Lodjur	☐	☐	☐	☐	☐
Varg	☐	☐	☐	☐	☐
Järv	☐	☐	☐	☐	☐
Gäss	☐	☐	☐	☐	☐
Tranor	☐	☐	☐	☐	☐
Änder	☐	☐	☐	☐	☐
Annat vilt:	☐	☐	☐	☐	☐

……

A9. Finns det kronviltområde/n inom ditt älgförvaltningsområde?

☐Nej ☐Ja

B. Mål för älgförvaltningen

Enligt propositionen 2009/10:239 bör älgförvaltningen vara lokalt förankrad och ekosystembaserad. Målet är en livskraftig älgstam av hög kvalitet som är i balans med betesresurserna och en produktionsanpassad älgjakt. Älgstammens storlek ska genom lämplig avskjutning anpassas till betestillgången, de areella näringarna och trafiksäkerheten. En anpassning måste också ske till förekomsten av rovdjur för vilka älgen är bytesdjur.

B1. Jag står bakom målet med dagens älgförvaltning.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken tar avstånd eller instämmer ☐Instämmer delvis ☐Instämmer helt

B2. Jag anser att dagens mål för älgförvaltning gynnar alla intressegrupper.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken tar avstånd eller instämmer ☐Instämmer delvis ☐Instämmer helt

B3. I älgförvaltningen behövs kunskap om...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
arten älg	☐	☐	☐	☐	☐
skogsbruk	☐	☐	☐	☐	☐
jakt	☐	☐	☐	☐	☐
jordbruk	☐	☐	☐	☐	☐
inventeringsmetoder	☐	☐	☐	☐	☐
samspel med annat klövvilt	☐	☐	☐	☐	☐
samspel med rovdjur	☐	☐	☐	☐	☐
adaptiv förvaltning	☐	☐	☐	☐	☐
Annat: ……..	☐	☐	☐	☐	☐

B4. Hur ser du på din egen roll i älgförvaltningsgruppen? I min roll är jag personligen…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
intresserad av att känna till ny teknologi och nya metoder	☐	☐	☐	☐	☐
tveksam till att prova nya saker	☐	☐	☐	☐	☐
bra på att anpassa mig	☐	☐	☐	☐	☐
tveksam till att anta nya utmaningar	☐	☐	☐	☐	☐
öppen för nya idéer inom jakt	☐	☐	☐	☐	☐
öppen för nya idéer inom skogsbruk	☐	☐	☐	☐	☐
öppen för nya idéer inom jordbruk	☐	☐	☐	☐	☐

C. Inventering

Kvalitetssäkrade inventeringsmetoder är en del av adaptiv älgförvaltning. Hur ser du på behovet av kunskap inom ditt älgförvaltningsområde?

C1. Anser du utifrån din intressegrupps behov att det finns tillräcklig kunskap om…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
hur många älgar det finns	☐	☐	☐	☐	☐
kvalitet på älgpopulationen	☐	☐	☐	☐	☐
övriga klövviltarter	☐	☐	☐	☐	☐
samspel mellan olika klövviltarter	☐	☐	☐	☐	☐
betestryck på skog	☐	☐	☐	☐	☐
betestryck på gröda	☐	☐	☐	☐	☐
fodertillgång i skog	☐	☐	☐	☐	☐
foderprognoser för de närmaste 5 åren	☐	☐	☐	☐	☐
trafikolycka med klövvilt	☐	☐	☐	☐	☐
förekomst av rovdjur	☐	☐	☐	☐	☐
predation från rovdjur	☐	☐	☐	☐	☐
lokala ekologiska variationer	☐	☐	☐	☐	☐
adaptiv förvaltning	☐	☐	☐	☐	☐
Annat: ……..	☐	☐	☐	☐	☐

C2. Finns det behov av ytterligare kunskap inom ditt älgförvaltningsområde?

☐Nej ☐Ja, om……

C3. Vilka av de rekommenderade metoderna för inventering används inom ditt älgförvaltningsområde?

	Varje år	Vartannat år	Vart tredje år	Vart femte år	Inte alls
Avskjutningsstatistik	☐	☐	☐	☐	☐
Älgobservationer (älgobs)	☐	☐	☐	☐	☐
Spillningsinventering	☐	☐	☐	☐	☐
Kalvviktsinsamling	☐	☐	☐	☐	☐
Flyginventering	☐	☐	☐	☐	☐
Älgbetesinventering (ÄBIN)	☐	☐	☐	☐	☐
Foderprognoser	☐	☐	☐	☐	☐

C4. Hur bedömer du nyttan av inventeringsmetoderna i älgförvaltningen?

	Liten	Måttlig	Stor
Avskjutningsstatistik	☐	☐	☐
Älgobservationer (älgobs)	☐	☐	☐
Spillningsinventering	☐	☐	☐
Kalvviktsinsamling	☐	☐	☐
Flyginventering	☐	☐	☐
Älgbetesinventering (ÄBIN)	☐	☐	☐
Foderprognoser	☐	☐	☐

C5. Används andra inventeringsmetoder än de rekommenderade inom ditt älgförvaltningsområde?

☐Nej ☐Ja, det används också……..

……..

C6. Inventeras andra klövviltarter inom ditt älgförvaltningsområde?

☐ Nej ☐Ja, det inventeras också……..

C7. Hur arbetar ni vanligtvis inom din älgförvaltningsgrupp? I vårt arbete har vi samråd med…

	Aldrig	Ibland	Regel-bundet	Vet inte
lokala markägare	☐	☐	☐	☐
lokala jaktlag	☐	☐	☐	☐
jägarorganisationer	☐	☐	☐	☐
markägarorganisationer	☐	☐	☐	☐
rennäringen	☐	☐	☐	☐
Länsstyrelsen	☐	☐	☐	☐
konsultföretag	☐	☐	☐	☐
Skogsstyrelsen	☐	☐	☐	☐
Andra grupper: ……	☐	☐	☐	☐

D. Kommunikation och samverkan

När du tar ställning till nedanstående påståenden om kommunikation och samverkan i din älgförvaltningsgrupp ber vi dig att utgå från din personliga uppfattning.

D1. Hur väl stämmer följande påståenden på din upplevelse av kommunikationen inom din älgförvaltningsgrupp?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
I stort sett fungerar kommunikationen inom min älgförvaltningsgrupp	☐	☐	☐	☐	☐
Jag känner att jag har möjlighet att framföra mina idéer i älgförvaltningsgruppen	☐	☐	☐	☐	☐
Det känns bekvämt att framföra min åsikt i älgförvaltningsgruppen även om åsikten inte delas av alla i gruppen	☐	☐	☐	☐	☐
Kommunikationen inom älgförvaltningsgruppen påverkas på ett bra sätt av att vi har olika åsikter	☐	☐	☐	☐	☐
Kommunikationen fungerar mellan de olika nivåerna i älgförvaltningen	☐	☐	☐	☐	☐

D2. Hur ser du på din älgförvaltningsgrupps samverkan med <u>älgskötselområden</u>? Genom samverkan…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
klarar vi bättre att nå våra mål	☐	☐	☐	☐	☐
förstår jag bättre hur älgförvaltningen påverkar lokalsamhället	☐	☐	☐	☐	☐
förstår jag bättre hur olika typer av faktorer påverkar älgförvaltningen (t. ex. sociala, ekonomiska och miljömässiga)	☐	☐	☐	☐	☐

D3. Hur ser du på din älgförvaltningsgrupps samverkan med <u>lokala markägare</u>? Genom samverkan...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
klarar vi bättre att nå våra mål	☐	☐	☐	☐	☐
förstår jag bättre hur älgförvaltningen påverkar lokalsamhället	☐	☐	☐	☐	☐
förstår jag bättre hur olika typer av faktorer påverkar älgförvaltningen (t. ex. sociala, ekonomiska och miljömässiga)	☐	☐	☐	☐	☐

D4. Hur upplever du att medlemmarna inom älgförvaltningsgruppen samarbetar? I vår älgförvaltningsgrupp…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
samarbetar medlemmarna genom att dela med sig av idéer och information	☐	☐	☐	☐	☐
handlar medlemmarna så att det gynnar alla parter	☐	☐	☐	☐	☐
samarbetar medlemmarna för att lösa problem när de uppstår	☐	☐	☐	☐	☐
finns det en god samverkan mellan myndigheter, organisationer och lokal samhället	☐	☐	☐	☐	☐

E. Nu vill vi veta lite mer om hur mycket tid och resurser du lägger ned på arbetet i älgförvaltningsgruppen

Utgå från vad du gjort de senaste 12 månaderna. För dig som är medlem i flera grupper; utgå från den grupp du varit medlem i längst. Räkna med all tid och alla resurser som du totalt lagt ned på möten och kontakter, både formella som protokollförda möten och informella som telefonsamtal eller besök.

E1. Hur många timmar har du de senaste 12 månaderna lagt ned på…

	0	1 – 8	9 – 20	21 – 40	>40
din egen utbildning i älgförvaltningsfrågor	☐	☐	☐	☐	☐
att utbilda eller informera andra i älgförvaltningsfrågor	☐	☐	☐	☐	☐
att samla in information	☐	☐	☐	☐	☐
att analysera information	☐	☐	☐	☐	☐
att prata med företrädare av älgskötselområden	☐	☐	☐	☐	☐
att prata med företrädare för andra jägar- och markägar-intressen än älgskötselområden	☐	☐	☐	☐	☐
att prata med myndigheter	☐	☐	☐	☐	☐
dina egna förberedelser för älgförvaltningsmöten	☐	☐	☐	☐	☐
att delta vid älgförvaltningsmöten inklusive restid	☐	☐	☐	☐	☐
att återrapportera möten till jägar- eller markägarintressen	☐	☐	☐	☐	☐
att uppdatera älgförvaltningsplaner	☐	☐	☐	☐	☐
medling och konflikthantering	☐	☐	☐	☐	☐
samverkan med kronviltförvaltningsområden	☐	☐	☐	☐	☐
andra saker som direkt har att göra med ditt uppdrag i älgförvaltningsområdet	☐	☐	☐	☐	☐

E2. Hur många mil har du uppskattningsvis kört de senaste 12 månaderna för frågor som rör ditt arbete i en älgförvaltningsgrupp?

Antal mil: ……..

E3. Vilka förutsättningar har du för att genomföra ditt arbete i älgförvaltningsgruppen? I min roll har jag tillräckligt med…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
tid så att jag kan göra ett bra jobb	☐	☐	☐	☐	☐
resurser för att göra ett bra jobb	☐	☐	☐	☐	☐
stöd från min organisation för att göra ett bra jobb	☐	☐	☐	☐	☐

F. Representation

Nu ber vi dig att ta ställning till några påståenden om älgförvaltningen.

F1. Som medlem i en älgförvaltningsgrupp, hur tycker du att du kan tillgodose behov och önskemål från…

	Inte alls	I ganska låg grad	Varken eller	I ganska hög grad	I allra högsta grad
Älgskötselområden	☐	☐	☐	☐	☐
Allmänheten	☐	☐	☐	☐	☐
Jägare	☐	☐	☐	☐	☐
Jordbruket	☐	☐	☐	☐	☐
Länsstyrelsen	☐	☐	☐	☐	☐
Lokalsamhället	☐	☐	☐	☐	☐
Naturvårdsverket	☐	☐	☐	☐	☐
Privata markägare (mindre än 100 ha)	☐	☐	☐	☐	☐
Privata markägare (större än 100 ha)	☐	☐	☐	☐	☐
Rennäringen	☐	☐	☐	☐	☐
Riksdagen och regeringen	☐	☐	☐	☐	☐
Skogsbruket	☐	☐	☐	☐	☐
Skogsstyrelsen	☐	☐	☐	☐	☐
Trafikverket	☐	☐	☐	☐	☐
Turismnäringen	☐	☐	☐	☐	☐
Viltförvaltningsdelegationen	☐	☐	☐	☐	☐
Andra grupper: ……..	☐	☐	☐	☐	☐

F2. I vilken utsträckning anser du att berörda intressen har likvärdiga förutsättningar inom älgförvaltningen?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Alla intressen behandlas lika i dagens älgförvaltning	☐	☐	☐	☐	☐
Dagens älgförvaltning gynnar vissa intressen mer än andra	☐	☐	☐	☐	☐
Alla intressen beaktas på ett likvärdigt sätt i älgförvaltningens beslutsprocesser	☐	☐	☐	☐	☐
Hur besluten tas i dagens älgförvaltning är orättvist	☐	☐	☐	☐	☐

G. Din upplevelse av andras sätt att verka i älgförvaltningen

G1. Jag upplever att representanter för andra intressegrupper i älgförvaltningsgruppen…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G2. Jag känner tillit till att representanterna från andra intressegrupper i älgförvaltnings-gruppen tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G3. Jag upplever att företrädare för älgskötselområdena...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G4. Jag känner tillit till att företrädare för älgskötselområdena tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G5. Jag upplever att viltförvaltningsdelegationerna...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G6. Jag känner tillit till att viltförvaltningsdelegationerna tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G7. Jag upplever att Länsstyrelsen...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G8. Jag känner tillit till att Länsstyrelsen tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

H. Din koppling till älgförvaltningsområdet

Om du sitter i flera grupper, utgå från den grupp du suttit i längst. Utgå från det när du svarar på resten av frågorna.

H1. Ungefär hur långt har du från din bostad till älgförvaltningsområdet? Jag bor…

☐i älgförvaltnings-området ☐högst en mil bort från området ☐1-5 mil från området ☐5-10 mil från området ☐mer än 10 mil från området

H2. Hur ofta befinner du dig inom älgförvaltningsområdet?

☐I princip aldrig ☐Några gånger per år ☐Varje månad ☐Varje vecka ☐Dagligen

H3. Hur känner du inför älgförvaltningsområdet och människorna där?

Var vänlig ta ställning till vart och ett av påståendena nedan.

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Jag känner ingen speciell relation till området	☐	☐	☐	☐	☐
Jag skulle hellre vilja vara engagerad i ett annat område	☐	☐	☐	☐	☐
Jag känner att jag hör hemma i området	☐	☐	☐	☐	☐
Jag identifierar mig med de värden och traditioner som finns inom området	☐	☐	☐	☐	☐
Jag vill personligen bidra till att området fungerar	☐	☐	☐	☐	☐
Jag är beredd att göra personliga uppoffringar för att området utvecklas	☐	☐	☐	☐	☐

H4. Hur skulle du i det stora hela vilja beskriva din relation till älgförvaltningsområdet?

☐Mycket negativ ☐Negativ ☐Neutral ☐Positiv ☐Mycket positiv

I. Personlig uppfattning om älgförvaltningen.

I1. Hur tycker du att älgförvaltningen tillgodoser dina behov?

☐Mycket dåligt ☐Dåligt ☐Varken eller ☐Bra ☐Mycket bra

I2. I vilka situationer tycker du att älgförvaltningen fungerar bäst?

I3. I vilka situationer tycker du att älgförvaltningen fungerar sämst?

I4. Vad har du gjort i situationer där du upplevt att älgförvaltningen fungerat dåligt?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Jag har låtit det vara	☐	☐	☐	☐	☐
Jag har känt ilska och frustration	☐	☐	☐	☐	☐
Jag har aktivt försökt förändra saker	☐	☐	☐	☐	☐

Om du försökt förändra något, vad gjorde du då?

I5. I allmänhet anser jag att dagens älgförvaltning…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
kan hantera framtidens utmaningar	☐	☐	☐	☐	☐
är redo att hantera olika situationer	☐	☐	☐	☐	☐
kan anpassa sig till nya omständigheter	☐	☐	☐	☐	☐

J. Livskvalitet

Livskvalitet kan handla om många olika saker som är viktiga för olika människor under olika perioder i livet. Livskvalitet relateras allt oftare till var människor bor och deras möjlighet att vistas i naturen.

J1. Vi ber dig markera hur viktiga följande aspekter är för dig som ditt liv ser ut för närvarande.

Markera med ett kryss hur viktig du tycker att var och en av följande aspekter är.

	Inte alls	Lite	Ganska	Mycket	Extremt mycket
Njuta av natur- och kulturlandskapets skönhet	☐	☐	☐	☐	☐
Ha en god hälsa	☐	☐	☐	☐	☐
Ha tillgång till ren luft, rent vatten och giftfri mark	☐	☐	☐	☐	☐
Leva ett liv med positiva upplevelser och utmaningar	☐	☐	☐	☐	☐
Känna dig trygg i ditt hem och ditt bostadsområde	☐	☐	☐	☐	☐
Ha lika möjligheter och rättigheter som andra	☐	☐	☐	☐	☐
Ha vackra saker omkring dig	☐	☐	☐	☐	☐
Upprätthålla goda relationer med vänner, kollegor och grannar	☐	☐	☐	☐	☐
Ha en enkel och bekväm vardag	☐	☐	☐	☐	☐
Ha tillgång till naturmiljöer med en mångfald av växter och djur	☐	☐	☐	☐	☐
Ha ett tillfredsställande arbete	☐	☐	☐	☐	☐
	Inte alls	Lite	Ganska	Mycket	Extremt mycket
Ha ett varierat liv fyllt med olika upplevelser	☐	☐	☐	☐	☐
Ha tillgång till en avskild och rofylld plats	☐	☐	☐	☐	☐
Ha möjlighet att utveckla dina kunskaper	☐	☐	☐	☐	☐
Känna kontroll över ditt liv, själv kunna bestämma vad du ska göra, när och hur	☐	☐	☐	☐	☐
Känna självrespekt och möjlighet att utveckla din egen identitet	☐	☐	☐	☐	☐
Kunna köpa både sådant som är nödvändigt och trevligt	☐	☐	☐	☐	☐
Upprätthålla ett stabilt familjeliv och goda familjerelationer	☐	☐	☐	☐	☐
Känna att människor i din närhet bryr sig om dig	☐	☐	☐	☐	☐
Ge dig möjlighet att utöva religion enligt din egen övertygelse	☐	☐	☐	☐	☐
Bli uppskattad och respekterad av andra	☐	☐	☐	☐	☐

J2. Upplever du att älgförvaltningen påverkar dina möjligheter att…

Markera med ett kryss hur du tycker att älgförvaltningen påverkar följande aspekter.

	Inte alls	Lite	Ganska	Mycket	Extremt mycket
njuta av natur- och kulturlandskapets skönhet.	☐	☐	☐	☐	☐
ha en god hälsa.	☐	☐	☐	☐	☐
ha tillgång till ren luft, rent vatten och giftfri mark.	☐	☐	☐	☐	☐
leva ett liv med positiva upplevelser och utmaningar.	☐	☐	☐	☐	☐
känna dig trygg i ditt hem och ditt bostadsområde.	☐	☐	☐	☐	☐
ha lika möjligheter och rättigheter som andra.	☐	☐	☐	☐	☐
ha vackra saker omkring dig.	☐	☐	☐	☐	☐
upprätthålla goda relationer med vänner, kollegor och grannar.	☐	☐	☐	☐	☐
ha en enkel och bekväm vardag.	☐	☐	☐	☐	☐
ha tillgång till naturmiljöer med en mångfald av växter och djur.	☐	☐	☐	☐	☐
ha ett tillfredsställande arbete.	☐	☐	☐	☐	☐
	Inte alls	Lite	Ganska	Mycket	Extremt mycket
ha ett varierat liv fyllt med olika upplevelser.	☐	☐	☐	☐	☐
ha tillgång till en avskild och rofylld plats.	☐	☐	☐	☐	☐
ha möjlighet att utveckla dina kunskaper.	☐	☐	☐	☐	☐
känna kontroll över ditt liv, själv kunna bestämma vad du ska göra, när och hur.	☐	☐	☐	☐	☐
känna självrespekt och möjlighet att utveckla din egen identitet.	☐	☐	☐	☐	☐
kunna köpa både sådant som är nödvändigt och trevligt.	☐	☐	☐	☐	☐
upprätthålla ett stabilt familjeliv och goda familjerelationer.	☐	☐	☐	☐	☐
känna att människor i din närhet bryr sig om dig.	☐	☐	☐	☐	☐
ge dig möjlighet att utöva religion enligt din egen övertygelse.	☐	☐	☐	☐	☐
bli uppskattad och respekterad av andra.	☐	☐	☐	☐	☐

K. Bakgrundsinformation

K1. Är du markägare?
Du kan sätta mer än ett kryss.

☐Nej ☐Ja, jag äger mark inom älgförvaltningsområdet ☐Ja, jag äger mark utanför älgförvaltningsområdet

K2. Är du jägare?
Du kan sätta mer än ett kryss.

☐Nej ☐Ja, jag jagar inom älgförvaltningsområdet ☐Ja, jag jagar utanför älgförvaltningsområdet

K3. Är du yrkesverksam inom någon av följande areella näringar?
Du kan sätta mer än ett kryss.

☐Skogsbruk ☐Jordbruk ☐Annat: ……
(t.ex. rennäring, jaktturism)

K4. Var bor du?

☐På landsbygden, eller ort med färre än 200 invånare
☐Ort med färre än 2 000 invånare
☐Ort med 2 000 – 10 000 invånare
☐Ort med 10 001 – 200 000 invånare
☐Stockholm, Göteborg eller Malmö

K5. Är du man eller kvinna?

☐Man ☐Kvinna

K6. Vilket år är du född?

Jag är född 19..... (Ange år)

K7. Vilken är din högsta avslutade utbildning?
Sätt ett kryss i rutan framför det alternativ du anser stämma bäst in på dig.

☐Obligatorisk skola (t.ex. grundskola, folkskola)
☐Yrkesutbildning (yrkesskola, fackskola, institut av olika slag)
☐Gymnasieutbildning (även realexamen, folkhögskola)
☐Universitet eller högskoleutbildning

ETT VARMT TACK FÖR DIN MEDVERKAN

Vi är medvetna om att det har tagit tid för dig att svara på våra frågor. Du har kanske också tyckt att några av dem har varit besvärliga att svara på. Vi är tacksamma för dina synpunkter.

Kontakt:

Institutionen för vilt, fisk och miljö
901 83 Umeå
Tel. 090-786 85 26. Fax. 090-786 81 62
E-post: survey@slu.se

Appendix 2. Survey instrument to MMU

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

LUNDS UNIVERSITET
Lunds Tekniska Högskola

Umeå universitet

EN UNDERSÖKNING OM ÄLGFÖRVALTNING

En undersökning om älgförvaltning

Undersökningen ingår i ett forskningsprojekt som syftar till att bättre förstå hur älgförvaltningen fungerar i praktiken. Vi ber dig att läsa texten noggrant och besvara alla frågor så gott du kan. Dina erfarenheter och upplevelser är viktiga för oss. Svaren är konfidentiella och kommer inte att kunna spåras till dig. Om du har andra tankar som är viktiga i sammanhanget finns utrymme i slutet av formuläret.

Tack på förhand!

A. Frågor om din roll inom älgförvaltningen

A1. Vilket eller vilka älgskötselområde/n sitter du i?

☐Jag sitter i ett älgskötselområde i följande län: ……..……

☐Jag sitter i flera älgskötselområden i följande län:…….....

……..

A2. Vilken eller vilka roller har du?

☐Jag är enbart jägare

☐Jag är både jägare och markägare → Jag äger _____ ha mark

☐Jag är enbart markägare → Jag äger _____ ha mark

A3. Anser du dig representera något eller flera av följande intressen?

☐Markägarintresset

☐Jägarintresset

☐Rennäring

☐Endast mig själv

☐Annat:……..

A4. Hur många år har du varit med i styrelsen i något älgskötselområde?
Om du sitter i flera områden, utgå från det område du suttit i längst när du besvarar resten av frågorna.

☐Mindre än 1 år
☐1-2 år
☐2-3 år
☐4-5 år
☐Fler än 5 år

A5. Hur styrs älgskötselområdet?

☐ **Genom en förening med stadgar, styrelse och beslutande årsmöte.**
Hur blev du föreslagen till styrelsen?
☐Gemensam valberedning för både markägare och jägare
☐Valberedning endast för markägare
☐Valberedning endast för jägare
☐Årsmöte utan valberedning

☐**Genom en styrgrupp, bestående av lika många jägare som markägare.**
Hur blev du föreslagen till styrgruppen?
☐Utsedd av både markägare och jägare
☐Utsedd av endast markägare
☐Utsedd av endast jägare
☐Utsedd av jaktlag

☐**Genom en styrgrupp med företrädare för de jaktlag som ingår i älgskötselområdet.**

☐**Annat, vänligen beskriv hur:**……..……
……

A6. Hur stor andel av älgskötselområdets areal ägs av skogsbolag?

☐Ingen ☐1-25% ☐26-50% ☐51-75% ☐76-100%

A7. Hur många jaktlag ingår i älgskötselområdet? Antal jaktlag: ……

A8. Finns det kronhjortsskötselområden (KSO) som är en del av älgskötselområdet?

☐Nej ☐Ja

A9. Har du deltagit i någon utbildning inom älgförvaltningen?

☐Nej ☐Ja, anordnad av……..……...

A10. Vilka viltarter finns inom älgskötselområdet?

Markera för varje art om viltet saknas helt, finns sporadiskt eller om det finns en etablerad och regelbunden förekomst.

	Saknas helt	Sporadiskt, enstaka djur	Regelbunden förekomst	Vet inte
Älg	☐	☐	☐	☐
Rådjur	☐	☐	☐	☐
Vildsvin	☐	☐	☐	☐
Kronhjort	☐	☐	☐	☐
Dovhjort	☐	☐	☐	☐
Mufflonfår	☐	☐	☐	☐
Björn	☐	☐	☐	☐
Lodjur	☐	☐	☐	☐
Varg	☐	☐	☐	☐
Järv	☐	☐	☐	☐
Gäss	☐	☐	☐	☐
Tranor	☐	☐	☐	☐
Änder	☐	☐	☐	☐

A11. Av de viltarter <u>som finns</u> inom älgskötselområdet är det någon eller några viltarter som det intresse som du representerar tycker det finns för lite eller för mycket av inom området? *Markera med ett kryss per art.*

	Alldeles för lite	Något för lite	Lagom	Något för mycket	Alldeles för mycket
Älg	☐	☐	☐	☐	☐
Rådjur	☐	☐	☐	☐	☐
Vildsvin	☐	☐	☐	☐	☐
Kronhjort	☐	☐	☐	☐	☐
Dovhjort	☐	☐	☐	☐	☐
Mufflonfår	☐	☐	☐	☐	☐
Björn	☐	☐	☐	☐	☐
Lodjur	☐	☐	☐	☐	☐
Varg	☐	☐	☐	☐	☐
Järv	☐	☐	☐	☐	☐
Gäss	☐	☐	☐	☐	☐
Tranor	☐	☐	☐	☐	☐
Änder	☐	☐	☐	☐	☐
Annat vilt: ……..	☐	☐	☐	☐	☐

B. Mål för älgförvaltningen

Enligt propositionen 2009/10:239 bör älgförvaltningen vara lokalt förankrad och ekosystembaserad. Målet är en livskraftig älgstam av hög kvalitet som är i balans med betesresurserna och en produktionsanpassad älgjakt. Älgstammens storlek ska genom lämplig avskjutning anpassas till betestillgången, de areella näringarna och trafiksäkerheten. En anpassning måste också ske till förekomsten av rovdjur för vilka älgen är bytesdjur.

B1. Jag står bakom målet med dagens älgförvaltning.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken tar avstånd eller instämmer ☐Instämmer delvis ☐Instämmer helt

B2. Jag anser att det viktigaste i den nya älgförvaltningen är: ……..

……..

……..

B3. Jag anser att dagens mål för älgförvaltning gynnar alla intressegrupper.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken tar avstånd eller instämmer ☐Instämmer delvis ☐Instämmer helt

B4. I älgförvaltningen behövs kunskap om...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
arten älg	☐	☐	☐	☐	☐
skogsbruk	☐	☐	☐	☐	☐
jakt	☐	☐	☐	☐	☐
jordbruk	☐	☐	☐	☐	☐
renskötsel	☐	☐	☐	☐	☐
inventeringsmetoder	☐	☐	☐	☐	☐
samspel med annat klövvilt	☐	☐	☐	☐	☐
samspel med rovdjur	☐	☐	☐	☐	☐
adaptiv förvaltning	☐	☐	☐	☐	☐
Annat: ……..	☐	☐	☐	☐	☐

B5. Hur ser du på din egen roll i älgförvaltningen? I min roll är jag <u>personligen</u>…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
intresserad av att känna till ny teknologi och nya metoder	☐	☐	☐	☐	☐
tveksam till att prova nya saker	☐	☐	☐	☐	☐
bra på att anpassa mig	☐	☐	☐	☐	☐
tveksam till att anta nya utmaningar	☐	☐	☐	☐	☐
öppen för nya idéer inom jakt	☐	☐	☐	☐	☐
öppen för nya idéer inom skogsbruk	☐	☐	☐	☐	☐
öppen för nya idéer inom jordbruk	☐	☐	☐	☐	☐

C. Inventering

Kvalitetssäkrade inventeringsmetoder är en del av adaptiv älgförvaltning. Hur ser du på behovet av kunskap inom ditt älgskötselsområde?

C1. Anser du att det finns tillräcklig kunskap om…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
hur många älgar det finns	☐	☐	☐	☐	☐
kvalitet i älgpopulationen	☐	☐	☐	☐	☐
övriga klövviltarter	☐	☐	☐	☐	☐
samspel mellan olika klövviltarter	☐	☐	☐	☐	☐
betestryck på skog	☐	☐	☐	☐	☐
betestryck på gröda	☐	☐	☐	☐	☐
fodertillgång i skog	☐	☐	☐	☐	☐
foderprognoser för de närmaste 5 åren	☐	☐	☐	☐	☐
trafikolyckor med klövvilt	☐	☐	☐	☐	☐
förekomst av rovdjur	☐	☐	☐	☐	☐
predation från rovdjur	☐	☐	☐	☐	☐
lokala ekologiska variationer	☐	☐	☐	☐	☐
adaptiv förvaltning	☐	☐	☐	☐	☐
Annat: ……..	☐	☐	☐	☐	☐

C2. Finns det behov av ytterligare kunskap inom ditt älgskötselområde?

☐Nej ☐Ja, om……

C3. Vilka av de rekommenderade metoderna för inventering används inom ditt älgskötselområde?

	Varje år	Vartannat år	Vart tredje år	Vart femte år	Inte alls
Avskjutningsstatistik	☐	☐	☐	☐	☐
Älgobservationer (älgobs)	☐	☐	☐	☐	☐
Spillningsinventering	☐	☐	☐	☐	☐
Kalvviktsinsamling	☐	☐	☐	☐	☐
Flyginventering	☐	☐	☐	☐	☐
Älgbetesinventering (ÄBIN)	☐	☐	☐	☐	☐
Foderprognoser	☐	☐	☐	☐	☐

C4. Hur bedömer du nyttan av inventeringsmetoderna i älgförvaltningen?

	Liten	Måttlig	Stor
Avskjutningsstatistik	☐	☐	☐
Älgobservationer (älgobs)	☐	☐	☐
Spillningsinventering	☐	☐	☐
Kalvviktsinsamling	☐	☐	☐
Flyginventering	☐	☐	☐
Älgbetesinventering (ÄBIN)	☐	☐	☐
Foderprognoser	☐	☐	☐

C5. Används andra inventeringsmetoder än de rekommenderade inom ditt älgskötselområde?

☐Nej ☐Ja, vi använder också……..

……..

C6. Inventeras andra klövviltarter inom ditt älgskötselområde?

☐ Nej ☐Ja, vi inventerar också……

C7. Hur arbetar ni vanligtvis inom ditt älgskötselområde? I vårt arbete har vi samråd med…

	Aldrig	Ibland	Regel-bundet	Vet inte
lokala markägare	☐	☐	☐	☐
lokala jaktlag	☐	☐	☐	☐
angränsande älgskötselområden	☐	☐	☐	☐
angränsande licensområden	☐	☐	☐	☐
älgförvaltningsgrupper	☐	☐	☐	☐
jägarorganisationer	☐	☐	☐	☐
markägarorganisationer	☐	☐	☐	☐
rennäringen	☐	☐	☐	☐
länsstyrelsen	☐	☐	☐	☐
Skogsstyrelsen	☐	☐	☐	☐
Andra: ……	☐	☐	☐	☐

D. Kommunikation och samverkan

När du tar ställning till nedanstående påståenden om kommunikation och samverkan i ditt älgskötselområde (ÄSO) ber vi dig att utgå från din personliga uppfattning.

D1. Hur väl stämmer följande påståenden på din upplevelse av kommunikationen inom ditt älgskötselområde (ÄSO)?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
I stort sett fungerar kommunikationen inom mitt ÄSO	☐	☐	☐	☐	☐
Jag känner att jag har möjlighet att framföra mina idéer inom mitt ÄSO	☐	☐	☐	☐	☐
Det känns bekvämt att framföra min åsikt i mitt ÄSO även om åsikten inte delas av alla i gruppen	☐	☐	☐	☐	☐
Kommunikationen inom mitt ÄSO påverkas på ett bra sätt av att vi har olika åsikter	☐	☐	☐	☐	☐

D2. Hur upplever du att kommunikationen fungerar i älgförvaltningen?

	Mycket dåligt	Ganska dåligt	Varken eller	Ganska bra	Mycket bra
Kommunikationen mellan styrelse/styrgrupp och jaktledare inom mitt ÄSO fungerar…	☐	☐	☐	☐	☐
Kommunikationen mellan jaktlag inom mitt ÄSO fungerar…	☐	☐	☐	☐	☐
Kommunikationen mellan mitt ÄSO och angränsande älgskötselområden /licensområden fungerar…	☐	☐	☐	☐	☐
Kommunikationen mellan mitt ÄSO och älgförvaltningsgruppen fungerar …	☐	☐	☐	☐	☐
Kommunikationen mellan mitt ÄSO och Länsstyrelsen fungerar…	☐	☐	☐	☐	☐
I det stora hela fungerar kommunikationen mellan de olika nivåerna i älgförvaltningen…	☐	☐	☐	☐	☐

D3. Hur ser du på ditt ÄSOs samverkan med <u>jaktlagen som ingår i älgskötselområdet</u>? Genom samverkan…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
klarar vi bättre att nå våra mål	☐	☐	☐	☐	☐
förstår jag bättre hur älgförvaltningen påverkar lokalsamhället	☐	☐	☐	☐	☐
förstår jag bättre hur olika typer av faktorer påverkar älgförvaltningen	☐	☐	☐	☐	☐

D4. Hur ser du på ditt ÄSOs samverkan med <u>berörda markägare inom älgskötselområdet</u>? Genom samverkan...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
klarar vi bättre att nå våra mål	☐	☐	☐	☐	☐
förstår jag bättre hur älgförvaltningen påverkar lokalsamhället	☐	☐	☐	☐	☐
förstår jag bättre hur olika typer av faktorer påverkar älgförvaltningen	☐	☐	☐	☐	☐

D5. Hur upplever du att ledamöterna inom ditt ÄSO samarbetar? I vårt älgskötselområde samarbetar vi…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
genom att dela med sig av idéer och information	☐	☐	☐	☐	☐
så att det gynnar alla parter	☐	☐	☐	☐	☐
för att lösa problem när de uppstår	☐	☐	☐	☐	☐

D6. Hur upplever du att ditt ÄSO samarbetar med älgförvaltningsgruppen? Vi samarbetar…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
genom att dela med oss av idéer och information	☐	☐	☐	☐	☐
så att det gynnar alla parter	☐	☐	☐	☐	☐
för att lösa problem när de uppstår	☐	☐	☐	☐	☐

D7. Hur upplever du att ni inom ÄSO samarbetar kring förvaltningsmål?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Vi sätter gemensamt upp tydliga mål	☐	☐	☐	☐	☐
Vi har svårt att gemensamt nå de uppsatta målen	☐	☐	☐	☐	☐
Alla ledamöter i vårt ÄSO accepterar de uppsatta målen	☐	☐	☐	☐	☐
Ledamöter som representerar olika intressen inom vårt ÄSO arbetar i praktiken efter olika mål	☐	☐	☐	☐	☐
Det finns en stark vilja att samarbeta mellan oss	☐	☐	☐	☐	☐
Det råder stora meningsskiljaktigheter mellan oss	☐	☐	☐	☐	☐
Vi brukar efter diskussion nå samförstånd	☐	☐	☐	☐	☐
Diskussioner domineras oftast av en eller ett par ledamöters intressen	☐	☐	☐	☐	☐
Vi visar stor respekt för varandras åsikter	☐	☐	☐	☐	☐
Vår diskussion styrs av egenintressen	☐	☐	☐	☐	☐

D8. Din upplevelse av din sociala situation i älgskötselområdet.

Människan befinner sig alltid i någon slags social situation som kan upplevas vara mer eller mindre trivsam, avspänd, auktoritär eller kylig. Nedan finns ett antal skattningsskalor. Markera hur du vanligtvis upplever den sociala situationen ***på era ordinarie möten i älgskötselområdet****. Markera din upplevelse genom att sätta kryss i* ***en*** *ruta. Skalan har 7 steg. Rutan längst till vänster innebär litet och rutan längst till höger mycket av egenskapen.*

				INTENSIV				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				TRYGG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				ANNORLUNDA				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				TORFTIG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				MÅLINRIKTAD				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				VÄNLIG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				OMVÄXLANDE				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				NERVÖS				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				VARDAGLIG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				VÄNLIG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				MENINGSLÖS				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				KORREKT				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				BEKVÄM				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				INTRESSANT				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				KONFLIKTFYLLD				
lite	☐	☐	☐	☐	☐	☐	☐	mycket

***Forts* D8. Din upplevelse av din sociala situation i älgskötselområdet.**

				TRADITIONELL				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				DÄMPAD				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				FORMELL				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				STRESSAD				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				OVAN				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				AKTIVERANDE				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				PLANERAD				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				RESPEKTABEL				
lite	☐	☐	☐	☐	☐	☐	☐	mycket

D9. Hur uppfattar du att styrelsen eller styrgruppen leder arbetet inom älgskötselområdet?

*Markera hur du **vanligtvis** upplever styrelsens eller styrgruppens arbetsform. Markera din upplevelse genom att sätta kryss i **en** ruta.*

				DEMOKRATISK				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				FRIVILLIG				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				RÄTTVIS				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				ÖPPEN				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				EFFEKTIV				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				INKLUDERANDE				
lite	☐	☐	☐	☐	☐	☐	☐	mycket
				ANSVARSFULL				
lite	☐	☐	☐	☐	☐	☐	☐	mycket

E. Nu vill vi veta lite mer om hur mycket tid och resurser du lägger ned på arbetet inom älgskötselområdet

Utgå från vad du gjort de senaste 12 månaderna. För dig som sitter i flera områden, utgå från det område du suttit i längst. Räkna med all tid och alla resurser som du totalt lagt ned på möten och kontakter, både formella som protokollförda möten och informella som telefonsamtal eller besök.

E1. Hur många timmar har du de senaste 12 månaderna lagt ned på…

	0	1 – 8	9 – 20	21 – 40	>40
din egen utbildning i älgförvaltningsfrågor	☐	☐	☐	☐	☐
att utbilda eller informera andra i älgförvaltningsfrågor	☐	☐	☐	☐	☐
att samla in information från inventeringar och andra källor	☐	☐	☐	☐	☐
att analysera information	☐	☐	☐	☐	☐
att prata med andra älgskötselområden	☐	☐	☐	☐	☐
att prata med älgförvaltningsgruppen	☐	☐	☐	☐	☐
att prata med myndigheter	☐	☐	☐	☐	☐
dina egna förberedelser för älgförvaltningsmöten	☐	☐	☐	☐	☐
att delta vid älgförvaltningsmöten inklusive restid	☐	☐	☐	☐	☐
att återrapportera möten till jaktlaget och/eller markägare	☐	☐	☐	☐	☐
att uppdatera älgskötselplaner	☐	☐	☐	☐	☐
medling och konflikthantering	☐	☐	☐	☐	☐
samverkan med kronhjortsskötselområden	☐	☐	☐	☐	☐
andra saker som direkt har att göra med ditt uppdrag i älgskötselområdet	☐	☐	☐	☐	☐

E2. Hur många mil har du uppskattningsvis kört de senaste 12 månaderna för frågor som rör ditt arbete i ett älgskötselområde?

Antal mil: ……

E3. Vilka förutsättningar har du för att genomföra ditt arbete i älgskötselområdet? I min roll har jag tillräckligt med…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
tid så att jag kan göra ett bra jobb	☐	☐	☐	☐	☐
resurser för att göra ett bra jobb	☐	☐	☐	☐	☐
stöd från det intresse jag representerar för att göra ett bra jobb	☐	☐	☐	☐	☐

F. Representation

Nu ber vi dig att ta ställning till några påståenden om älgförvaltningen.

F1. Hur upplever du att ledamöterna inom älgförvaltningsgruppen kan tillgodose behov och önskemål från…

	Inte alls	I ganska låg grad	Varken eller	I ganska hög grad	I allra högsta grad
Älgskötselområden	☐	☐	☐	☐	☐
Allmänheten	☐	☐	☐	☐	☐
Jägare	☐	☐	☐	☐	☐
Jordbruket	☐	☐	☐	☐	☐
Länsstyrelsen	☐	☐	☐	☐	☐
Lokalsamhället	☐	☐	☐	☐	☐
Naturvårdsverket	☐	☐	☐	☐	☐
Privata markägare (mindre än 100 ha)	☐	☐	☐	☐	☐
Privata markägare (större än 100 ha)	☐	☐	☐	☐	☐
Rennäringen	☐	☐	☐	☐	☐
Riksdagen och regeringen	☐	☐	☐	☐	☐
Skogsbruket	☐	☐	☐	☐	☐
Skogsstyrelsen	☐	☐	☐	☐	☐
Trafikverket	☐	☐	☐	☐	☐
Turismnäringen	☐	☐	☐	☐	☐
Viltförvaltningsdelegationen	☐	☐	☐	☐	☐
Andra grupper: ……..	☐	☐	☐	☐	☐

F2. I vilken utsträckning anser du att berörda intressen har likvärdiga förutsättningar inom älgförvaltningen?

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Alla intressen behandlas lika i dagens älgförvaltning.	☐	☐	☐	☐	☐
Dagens älgförvaltning gynnar vissa intressen mer än andra.	☐	☐	☐	☐	☐
Alla intressen beaktas på ett likvärdigt sätt i älgförvaltningens beslutsprocesser.	☐	☐	☐	☐	☐
Hur besluten tas i dagens älgförvaltning är orättvist.	☐	☐	☐	☐	☐
Älgförvaltningen styrs i praktiken alltför mycket av ekonomiska intressen.	☐	☐	☐	☐	☐
Älgförvaltningen styrs i praktiken alltför mycket av rekreationsintressen.	☐	☐	☐	☐	☐

Om du anser att något/några intressen särskilt gynnas, vilket/vilka är de? ……

……..

F3. På vilken nivå anser du att avskjutningsmålen för förvaltningen bör fastställas?

☐Jaktlag ☐Älgskötselområde ☐Älgförvaltningsgrupp
☐Länsstyrelse ☐Viltförvaltningsdelegation

G. Din upplevelse av andras sätt att verka i älgförvaltningen

G1. Jag upplever att jaktlag i mitt ÄSO…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G2. Jag känner tillit till att jaktlag i mitt ÄSO tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G3. Jag upplever att de andra ledamöterna i mitt ÄSO…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G4. Jag känner tillit till att de andra ledamöterna i mitt ÄSO tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G5. Jag upplever att ledamöterna i älgförvaltningsgruppen...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G6. Jag känner tillit till att ledamöterna i älgförvaltningsgruppen tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G7. Jag upplever att viltförvaltningsdelegationerna...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G8. Jag känner tillit till att viltförvaltningsdelegationerna tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

G9. Jag upplever att länsstyrelsen...

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
har helt andra värderingar om älgförvaltningen än jag	☐	☐	☐	☐	☐
stödjer mina åsikter om älgförvaltningen	☐	☐	☐	☐	☐
tänker annorlunda än vad jag gör kring hur olika frågor ska skötas av älgförvaltningen	☐	☐	☐	☐	☐

G10. Jag känner tillit till att länsstyrelsen tar hänsyn till människor som omfattas av älgförvaltningen.

☐Tar helt avstånd ☐Tar delvis avstånd ☐Varken eller ☐Instämmer delvis ☐Instämmer helt

H. Din koppling till älgskötselområdet

Om du sitter i flera områden, utgå från det område du suttit i längst när du svarar på resten av frågorna.

H1. Hur ofta befinner du dig inom älgskötselområdet?

☐I princip aldrig ☐Några gånger per år ☐Varje månad ☐Varje vecka ☐Dagligen

H2. Hur känner du inför älgskötselområdet och människorna där?

Var vänlig ta ställning till vart och ett av påståendena nedan.

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
Jag känner att jag hör hemma i området	☐	☐	☐	☐	☐
Jag identifierar mig med de värden och traditioner som finns inom området	☐	☐	☐	☐	☐
Jag vill personligen bidra till att området fungerar	☐	☐	☐	☐	☐
Jag är beredd att göra personliga uppoffringar för att området utvecklas	☐	☐	☐	☐	☐

I. Personlig uppfattning om älgförvaltningen

I1. Hur tycker du att älgförvaltningen tillgodoser dina behov?

☐Mycket dåligt ☐Dåligt ☐Varken eller ☐Bra ☐Mycket bra

I2. Vad har du gjort i situationer där du upplevt att älgförvaltningen fungerat dåligt? Jag har…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
låtit det vara	☐	☐	☐	☐	☐
känt frustration	☐	☐	☐	☐	☐
bedrivit lobbying för min åsikt	☐	☐	☐	☐	☐
tagit fram relevanta faktaunderlag	☐	☐	☐	☐	☐
strävat efter kompromisser	☐	☐	☐	☐	☐
blivit upprörd och skarpt sagt ifrån	☐	☐	☐	☐	☐
undvikit att delta i möten	☐	☐	☐	☐	☐
känt hopplöshet	☐	☐	☐	☐	☐
reserverat mig i beslut	☐	☐	☐	☐	☐
försökt samtala med olika parter	☐	☐	☐	☐	☐
framfört kunskapsbaserade argument	☐	☐	☐	☐	☐
tagit hårda diskussioner för att jag blivit arg	☐	☐	☐	☐	☐
tagit på mig uppgifter för att driva arbetet i en viss riktning	☐	☐	☐	☐	☐
Annat: ……..	☐	☐	☐	☐	☐

I3. I allmänhet anser jag att dagens älgförvaltning…

	Tar helt avstånd	Tar delvis avstånd	Varken eller	Instämmer delvis	Instämmer helt
kan hantera framtidens utmaningar	☐	☐	☐	☐	☐
är redo att hantera olika situationer	☐	☐	☐	☐	☐
kan anpassa sig till nya omständigheter	☐	☐	☐	☐	☐

J. Livskvalitet

Livskvalitet kan handla om många olika saker såsom fysisk och psykisk hälsa, relationer till andra människor, tillgång till natur och materiella ting. Saker som är viktiga för olika människor under olika perioder i livet. Livskvalitet relateras allt oftare till var människor bor och deras möjlighet att vistas i naturen. På så sätt kan också älgförvaltningen tänkas inverka på livskvaliteten.

J1. Hur upplever du att älgförvaltningen påverkar din livskvalitet genom att ge möjligheter att…

Markera hur du tycker att älgförvaltningen påverkar var och en av följande aspekter.

	Extremt negativt	Negativt	Varken eller	Positivt	Extremt positivt
njuta av natur- och kulturlandskapets skönhet.	☐	☐	☐	☐	☐
ha en god hälsa.	☐	☐	☐	☐	☐
ha tillgång till ren luft, rent vatten och giftfri mark.	☐	☐	☐	☐	☐
leva ett liv med positiva upplevelser och utmaningar.	☐	☐	☐	☐	☐
känna dig trygg i ditt hem och ditt bostadsområde.	☐	☐	☐	☐	☐
ha lika möjligheter och rättigheter som andra.	☐	☐	☐	☐	☐
ha vackra saker omkring dig.	☐	☐	☐	☐	☐
upprätthålla goda relationer med vänner, kollegor och grannar.	☐	☐	☐	☐	☐
ha en enkel och bekväm vardag.	☐	☐	☐	☐	☐
ha tillgång till naturmiljöer med en mångfald av växter och djur.	☐	☐	☐	☐	☐
ha ett tillfredsställande arbete.	☐	☐	☐	☐	☐
ha ett varierat liv fyllt med olika upplevelser.	☐	☐	☐	☐	☐
ha tillgång till en avskild och rofylld plats.	☐	☐	☐	☐	☐
ha möjlighet att utveckla dina kunskaper.	☐	☐	☐	☐	☐
känna kontroll över ditt liv, själv kunna bestämma vad du ska göra, när och hur.	☐	☐	☐	☐	☐
känna självrespekt och möjlighet att utveckla din egen identitet.	☐	☐	☐	☐	☐

***Forts* J1. Hur upplever du att älgförvaltningen påverkar din livskvalitet genom att ge möjligheter att…**

kunna köpa både sådant som är nödvändigt och trevligt.	☐	☐	☐	☐	☐
upprätthålla ett stabilt familjeliv och goda familjerelationer.	☐	☐	☐	☐	☐
känna att människor i din närhet bryr sig om dig.	☐	☐	☐	☐	☐
utöva religion enligt din egen övertygelse.	☐	☐	☐	☐	☐
bli uppskattad och respekterad av andra.	☐	☐	☐	☐	☐
ha en god kvalitet på din fritid och kunna göra sådant som du själv tycker om.	☐	☐	☐	☐	☐

J2. Berätta gärna mer om hur du upplever att älgförvaltningen påverkar din livskvalitet

……

……

……

K. Bakgrundsinformation

K1. Är du yrkesverksam inom någon av följande areella näringar?
Du kan sätta mer än ett kryss.

☐Skogsbruk ☐Jordbruk ☐Annat: …….
(t.ex. rennäring, jaktturism)

K2. Vilka av följande organisationer är du medlem i?

☐Friluftsfrämjandet
☐Jägarnas Riksförbund - JRF
☐Lantbrukarnas riksförbund - LRF
☐Renägarförbundet
☐Skogsägareförening (Södra, Mellanskog, Norrskog, eller Norra skogsägarna)
☐Svenska Jägareförbundet
☐Svenska Naturskyddsföreningen - SNF
☐Svenska Samernas Riksförbund - SSR
☐Sveriges Jordägareförbund
☐Världsnaturfonden – WWF
☐Jag är inte medlem i någon av dessa organisationer
☐Annan:……..

K3. Var bor du?

☐På landsbygden, eller ort med färre än 200 invånare
☐Ort med färre än 2 000 invånare
☐Ort med 2 000 – 10 000 invånare
☐Ort med 10 001 – 200 000 invånare
☐Stockholm, Göteborg eller Malmö

K4. Är du man eller kvinna?

☐Man ☐Kvinna

K5. Vilket år är du född?

Jag är född 19..... (Ange år)

K6. Vilken är din högsta avslutade utbildning?
Sätt ett kryss i rutan framför det alternativ du anser stämma bäst in på dig.

☐Obligatorisk skola (t.ex. grundskola, folkskola)
☐Yrkesutbildning (yrkesskola, fackskola, institut av olika slag)
☐Gymnasieutbildning (även realexamen, folkhögskola)
☐Universitet eller högskoleutbildning

ETT VARMT TACK FÖR DIN MEDVERKAN

Vi är medvetna om att det har tagit tid för dig att svara på våra frågor. Du har kanske också tyckt att några av dem har varit besvärliga att svara på. Vi är tacksamma för dina synpunkter.

Appendix 3. Q-method

Hej!
Vi behöver din hjälp! Vi ber dig som anmält dig till årets konferens att medverka i en kort undersökning om viltförvaltning med fokus på älg. Undersökningen är en del av NV:s forskningsprogram ”*Governance - utmaningar för framtidens viltförvaltning*” och resultaten kommer att presenteras den 15:e november på viltförvaltarkonferensen. Vi är övertygade om att du har värdefull kunskap om de utmaningar som finns inom viltförvaltningen. Även om du huvudsakligen arbetar med andra frågor än älgförvaltning önskar vi att du deltar och delar med dig av din kunskap.
Vi är medvetna om att det kan finnas stora skillnader i hur olika län organiserar viltförvaltningen. Vad som är viktiga frågor i en del av landet behöver inte vara det i en annan del. Det är därför viktigt att du besvarar frågorna utifrån hur det ser ut just i det län eller den region där du är verksam. Påståendena som du har att ta ställning till har kommit upp under intervjuer med personer som är involverade i älgförvaltningen eller som kommentarer till den undersökning som vi skickat till älgförvaltningsgrupperna. Det vi är intresserade av är att förstå om det finns mönster i de påstående som framkommit eller om det finns variationer mellan olika län.
Länken till undersökningen finns nedan. När du klickar på länken öppnas ett webbaserat program - Q-sort. Undersökningen startar så snart du klickar på den runda knappen i det övre vänstra hörnet. Q-sort syftar till att underlätta att sortera en mängd olika påståenden i förhållande till varandra. Vi ber dig att sortera de 25 påståenden som presenteras utifrån din åsikt om dem. Du gör det genom att dra och släppa olika påståenden i den kategori där du helst vill placera dem. Sorteringen görs i två påföljande steg och kommer att ta cirka 10-15 minuter.

<u>Viktiga anvisningar:</u>
• Undersökningen måste fyllas i på en dator. Det går inte att använda mobiltelefon eller surfplatta.
• Det är nödvändigt att besvara de inledande frågorna för att komma vidare till sorteringsuppgifterna.
• Alla påståenden måste sorteras för att kunna påbörja steg två.
• När du sorterar påståendena en andra gång finns det en begränsning av hur många påståenden som kan användas i varje kategori (angivet i varje ruta). Du kan endast gå vidare när alla rutor är ifyllda med antalet påståenden som finns angivet inom parantes.

• I slutet av undersökningen ombeds du att ange din e-postadress. Om du vill fylla i undersökningen anonymt kan du ange en påhittad adress - men då måste den följa formatet för en e-postadress, t.ex. namn@abc.se.

För att delta, klicka på länken här:
http://application.qsortware.net/user/SLUGovernance/

1. Arbetar du med älgförvaltning?

- ☐ ja, huvudsakligen
- ☐ ja, delvis
- ☐ nej

2. I vilket län är du verksam?

- ☐ Blekinge
- ☐ Dalarna
- ☐ Gotland
- ☐ Gävleborg
- ☐ Halland
- ☐ Jämtland
- ☐ Jönköping
- ☐ Kalmar
- ☐ Kronoberg
- ☐ Norrbotten
- ☐ Skåne
- ☐ Stockholm
- ☐ Södermanland
- ☐ Uppsala
- ☐ Värmland
- ☐ Västerbotten
- ☐ Västernorrland
- ☐ Västmanland
- ☐ Västra Götaland
- ☐ Örebro
- ☐ Östergötland

3. Vad anser du utgör en utmaning i älgförvaltningen?

Sortera påståenden nedan efter i vilken utsträckning du upplever att de försvårar älgförvaltningen i ditt län. I tidigare intervjuer med människor som på olika sätt är involverade i älgförvaltningen har vi identifierat ett antal faktorer som upplevs försvåra förvaltningen. Nu undrar vi vilka erfarenheter du har från det län där du är verksam.

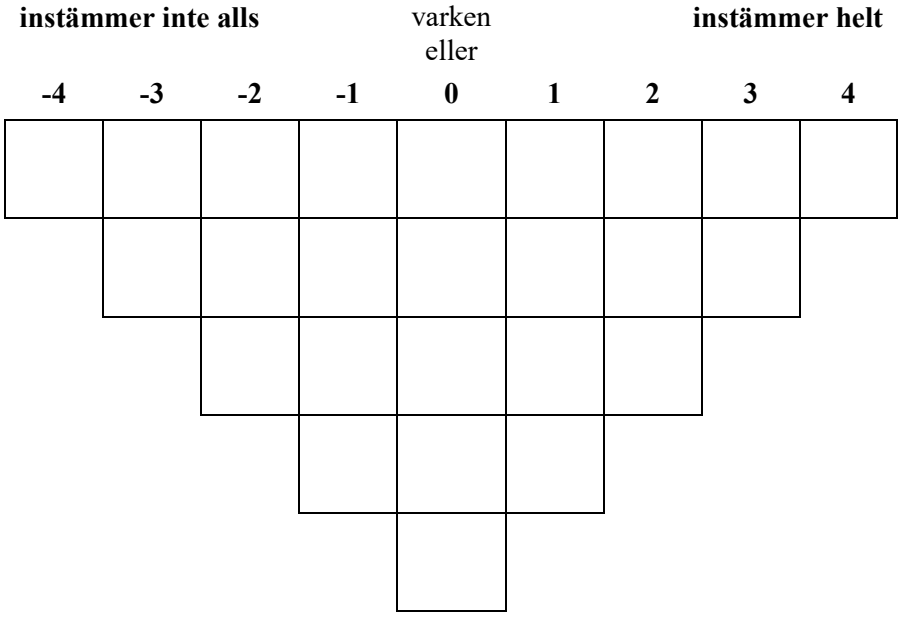
Steg 1: Dra följande påstående till en av rutorna nedan

instämmer inte	varken eller	instämmer

1	*Det går inte att föryngra lövträd*
2	*Antalet trafikolyckor ökar*
3	*Det finns både stora och små markägare inom samma område*
4	*Det är för mycket skador på jordbruksgrödor*
5	*Kunskapen om lokala variationer på fodertillgång och älgtäthet är otillräcklig*
6	*Indelningen i älgförvaltningsområden tar inte hänsyn till hur viltet är fördelat i landskapet*
7	*Det finns andra klövviltarter*
8	*Det finns för få påtryckningsmedel*
9	*Älgen vandrar mellan sommar och vinterområden*
10	*Det saknas medel för en fullt ut fungerande älgförvaltning*
11	*Det är för få älgskötselområden (ÄSO)*
12	*Det råder brist på samarbetsvilja mellan olika aktörer*
13	*Det finns för lite foder i jordbrukslandskapet*
14	*Det förekommer brister i samarbetet mellan de olika nivåerna inom älgförvaltningen*
15	*De sammanhängande områdena för vilda djur blir färre*
16	*Många markägare undviker att plantera tall på grund av betesskador*
17	*Nya arter påverkar älgen*
18	*Det genomförs för lite samråd inom älgförvaltningsområdena (ÄFO)*
19	*Det är svårt att balansera foder med antalet älg mellan olika år*
20	*Det råder stor oenighet mellan olika aktörer*
21	*Det är för många licensområden*
22	*Det finns stora rovdjur*
23	*Det blir olika grad av ekonomisk påverkan av älgförekomst för olika aktörer*
24	*Tätheten av älg*
25	*Betesskadorna på skog är för stora*

Steg 2: Dra påståendena till en av rutorna nedan

OBS! Antalet påståenden som kan sorteras in under varje kategori är begränsat. Om du ändrar dig kan du flytta påståendena mellan de olika kategorierna. Det spelar ingen roll i vilken ordning de ligger inom en kategori.



Ett varmt tack för din medverkan!

Appendix 4. Survey instrument to CAB

A. Mål och målformuleringsprocessen

1. **Beskriv övergripande hur processen ser ut för att fastställa målen för älgförvaltningen i ditt län**?
   Till exempel i vilken ordning antas målen ÄSO-ÄFG-VFD/LST eller VFD/LST-ÄFG-ÄSO?

2. **Finns en strukturerad dialog för hur målen ska tas fram?**
   Om ja, beskriv hur processen ser ut och vilka aktörer som är involverade? Om nej, hur fastställs målen i huvudsak?

3. **Hur stor vikt läggs vid kvantitativa respektive kvalitativa målsättningarna?**

4. **Om det råder oenighet mellan de olika nivåerna vilken roll spelar länsstyrelsen för att hantera oenigheten?**
   Om oenighet mellan LST/VFD och ÄFG? Om oenighet mellan ÄFG och ÄSO?

5. **Spelar Naturvårdsverket någon specifik roll vid eventuell oenighet mellan de olika nivåerna?**

B. Rutiner för granskning av planer

1. **Beskriv övergripande vilka aspekter ni utgår ifrån när ni granskar älgförvaltningsplaner:**

2. **Beskriv övergripande vilka aspekter ni utgår ifrån när ni granskar älgskötselplaner:**

3. **Har ni utarbetat någon rutin för att garantera/säkra att planer på olika nivåer (ÄSO, ÄFO, län) harmonierar?**

4. **Använder ni Älgfrode?**
   - Ja
   - Nej

C. Rutiner för uppföljning och anpassning

1. **Vilken roll spelar älgförvaltningsplanerna?**
   - Treårsplanerna ligger fast om inget oförutsett händer
   - Planerna revideras årligen
   - Planerna är levande dokument som uppdateras kontinuerligt
   - Det varierar mellan älgförvaltningsgrupperna

2. **Hur ofta följs planerna upp på respektive nivå?**

3. **Beskriv övergripande vilka aspekter ni utgår ifrån när ni följer upp älgförvaltningsplaner:**

4. **Beskriv övergripande vilka aspekter ni utgår ifrån när ni följer upp älgskötselplaner:**

5. **I vilken utsträckning får en plan avvika från målen?**

6. **Vilka åtgärder vidtas om avvikelsen från målen är omfattande?**

7. **Beskriv särskilt vilka rutiner som finns för att följa upp de kvalitativa målen i planerna:**

8. **Vad anser ni vara ett rimligt mål?**

D. <u>Utmaningar</u>

1. **Vad anser du utgör en utmaning i dagens älgförvaltning i ditt län?**

2. **Beskriv i vilken utsträckning som älg samförvaltas med klöv- respektive rovvilt i ditt län:**

3. **Mot bakgrund av ovanstående, vilka aspekter/metoder/verktyg behöver utvecklas för att nå målen i älgförvaltningen?**

E. <u>Utbildningsmaterial och goda exempel</u>

I SLUs uppdraget ingår en revision av befintligt utbildningsmaterial för älgförvaltning med fokus att uppdatera, utveckla och förenkla den.

1. **Har du några synpunkter på hur utbildningspaketet kan förbättras?**

2. **Kan vi be dig att ange exempel på ÄFO och ÄSO där du anser att det fungerar väl både i termer av måluppfyllelse och god samverkan:**

Ett varmt tack för din medverkan!

Appendix 5. Interview guide for ‘good examples’

[Inledning: Information om
- GDPR & inspelning
- Forskningsprojekt & regeringsuppdraget
- Urvalsprocess för goda exempel]

Tema 1: Bakgrund och information om ÄFO & ÄFG

Beskriv kort hur ert område ser ut idag t.ex.

- markägarstruktur/ hur stor andel av områdets areal ägs av skogsbolag?

- markanvändning (skogsbruk, jordbruk etc.)

- älgtäthet / betestryck / fodertillgång

Hur ser utvecklingen ut över tid? Stora förändringar i antalet ÄSO & licensområden?

Hur länge har den nuvarande ÄFG varit med? (om förändringar i bemanningen fanns sedan 2012, varför?)

Varför blev du utsedd som ledamot?

Vilken typ av utbildning fick du/ni?

Hur ofta träffas ni?

Tema 2: Ta fram ÄFO plan

Beskriv hur processen ser ut för att fastställa målen för älgförvaltningen i ert område?

Vilka underlag använder ni för att fastställa målen? Vilka (inventerings)metoder är dessa underlag baserade på?

Hur tycker du det är att arbeta med utgångspunkt från det underlag som samlas in från inventeringarna?

Om det råder oenighet inom ÄFG, hur löser ni den situationen? Hur brukar ordförande agera i situationer där det råder oenighet? Minns du någon specifik situation? Berätta.

Tema 3: Samråd med ÄSO & licensområden

Hur ser kommunikationen/samråd med ÄSO ut? Vilka rutiner finns? Hur ofta möter ni ÄFO? Vem är med? När? Presenterar ni en preliminär förvaltningsplan?

Hur jobbar ni för att säkerställa att ÄSO-planerna och er ÄFO-plan harmonierar?

Hur tar ni hänsyn till synpunkter från ÄSOn?

Vad gör ni om vissa ÄSO inte accepterar de uppsatta målen?

Hur hanteras det om ni avstyrker älgskötselplanen?

Vilka råd och vilken vägledning ger ni till ÄSOna i ÄFO planerna?

Hur hanterar ni avlysningsjakt? (automatisk alltid eller anpassad efter måluppfyllelse under jaktperioden?)

Hur ser kommunikationen med licensområden ut?

Hur tar ni fram tilldelning av älgar för licensområden?

Tema 4: Måluppfyllelse

Hur jobbar ni för att nå målet? (Rent praktisk under jakttiden, Hur lyckas man med ett stort område och många licensområden?)

Vilken typ av uppföljning med ÄSO gör ni under jaktperioden?

Vad gör ni om jaktresultatet avviker kraftigt från älgförvaltningens mål?

Tema 5: Redovisning av planer och relationer till Länsstyrelsen, jägare- respektive markägarorganisationer

- ***Redovisning av planer***

Hur ofta och på vilket sätt redovisar ni älgförvaltningsplanen?

Saknar ni någon typ av kunskap eller information?

Vilka aspekter/metoder/verktyg behöver utvecklas för att göra det lättare att nå målen i älgförvaltningen?

Relationen till Länsstyrelsen och till VFD? Finns en övergripande plan som styr?

- ***Återrapportering till jägar-eller markägarintressen***

Hur återrapporterar ni till era respektive intressen?

Pratar ni med företrädare för andra jägar-eller markägarintressen än ÄSO?

Tema 6: Utbildning & framtida utmaningar

Har ni några synpunkter på hur utbildningspaketet kan förbättras?

Vad anser ni utgör en utmaning i dagens älgförvaltning?

Är det någonting mer som du/ni vill tillägga?

[Berätta om planerad återkoppling. Tack!]

Acta Universitatis Agriculturae Sueciae

Doctoral Thesis No. 2020:30

Natural resources such as wildlife are part of social-ecological systems. This requires governance approaches that can handle complexity and uncertainty, and adapt to changes. Despite extensive research efforts, central questions about 'what works where, and why' remain. This thesis helps bridge this knowledge gap with insights from Swedish moose *(Alces alces)* management, since it analyses the effects of context and institutional design on the social-ecological performance of the governance regime.

Sabrina Dressel received her PhD education at the Department of Wildlife, Fish and Environmental Studies, SLU, Umeå. She obtained her MSc in Wildlife Ecology & Wildlife Management from the University of Natural Resources and Life Sciences, Vienna, Austria, and her BSc in International Forest Ecosystem Management from Eberswalde University for Sustainable Development, Germany.

Acta Universitatis Agriculturae Sueciae presents doctoral theses from the Swedish University of Agricultural Sciences (SLU).

SLU generates knowledge for the sustainable use of biological natural resources. Research, education, extension, as well as environmental monitoring and assessment are used to achieve this goal.

Online publication of thesis summary: http://pub.epsilon.slu.se/

ISSN 1652-6880
ISBN (print version) 978-91-7760-578-2
ISBN (electronic version) 978-91-7760-579-9