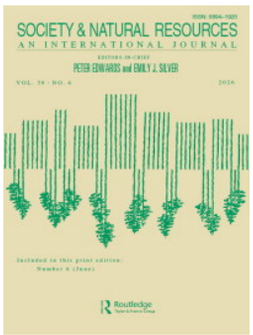

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Social Influence in Forest Management Transitions: A Study of Private Forest Owners in Sweden

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ABSTRACT

A transition toward climate adapted forest management requires an understanding of change processes. To uncover social influence in forest owners' networks, this study examined the acquisition of information about alternative management methods (e.g., no clear-cuts) alongside how social interactions and beliefs are associated with subjective knowledge, normative beliefs, and willingness to adopt these methods. A survey was conducted in a random sample of Swedish private forest owners ($n = 1763$). Results revealed that the owners received little information about these methods. Receiving more information from personal, external and some professional forestry sources was associated with higher subjective knowledge. Whereas receiving more information from private companies was negatively associated with in particular normative beliefs, more information from, for example the government and external sources, was positively correlated with normative beliefs and willingness. The study recognizes the role of informational and normative influence, but also the owners' beliefs, for a management transition.

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Information acquisition; informational influence; normative influence; social interactions; sources of information

Introduction

Forests are facing an increased risk of disturbances due to climate change, with potentially detrimental impacts on forests' ecosystem services (Jandl et al. 2019; Lindner et al. 2014). Management can be adapted proactively to climate change through for example diversifying tree species and the structural composition of stands to increase the stability of the ecosystem. Diversification may involve intensive forestry for production (e.g., artificial regeneration with improved reproductive material) or close-to-nature forestry (e.g., no clear-cuts) (Roitsch et al. 2023).

Forest management is implemented as part of a social-ecological system incorporating climate and soil conditions, but also regulations, policy, and the market, with key actors such as forest owners, forest companies, and the government (Blanco et al. 2017). In countries with a lot of forest land owned by individual private forest owners (also labeled family forest owners) (e.g., in the United States of America (US), Finland, and Sweden), the owner, but also the decision support system, consisting of professional

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advice, outreach and support, are important for the implementation of changes in management (Lawrence et al. 2020). Decision support may be provided on behalf of the government to sustain diverse policy objectives, or by organizations with diverse drivers, including forest owner associations, large forest companies, small forest businesses, and networks with different objectives (Hamunen et al. 2015; Larasatie, Karisch-Gierer, and Ludvig 2022; Lawrence et al. 2020). The owners' social network also comprises personal contacts (e.g., neighbors, family members and friends) (Ruseva, Evans, and Fischer 2014). Following public debates around forest management, sources external to the forest sector (e.g., media, such as TV and newspapers) may also convey management information (André et al. 2017). In Europe, there is an increasingly pressing need to diversify the forest by using alternative methods, not relying solely on monocultures and even aged stand management (Felton et al. 2024). However, in several countries, institutional factors, including the logics dominant in forestry, decision support, and the social networks of the owners, may prevent change toward less production-oriented climate adapted management (Andersson and Keskitalo 2018; Bouriaud et al. 2015; Kiisel and Remm 2022; Takala et al. 2023). Previous studies have confirmed the importance of owners' social networks for management decisions (Ruseva, Evans, and Fischer 2014). However, there is scarce knowledge of the mechanisms for social influence relating to practices that are not the norm today. This study examines Swedish private forest owners' acquisition of information about alternative management methods and how interactions with personal, professional forestry (public and private), and external sources are associated with owners' knowledge, norms, and interest for these methods. The study adds to a conceptual understanding of social influence mechanisms endorsing or preventing change in management.

Forest Owners' Social Networks and Forest Management

The social networks of owners vary in *size*, with the majority (67%) of the owners in one study stating three or fewer contacts (André et al. 2017; see also Sagor and Becker 2014). The *composition* of the networks differs, potentially including professional contacts, such as advisors and planners at owner organizations, forest companies, contractors, forest networks (e.g., for women), non-governmental organizations, and government agencies, but also peers, such as other owners, family, and friends (Huff et al. 2015; Larasatie, Karisch-Gierer, and Ludvig 2022; Sagor and Becker 2014; Stoettner and Ní Dhubháin 2019). While some owners have more interactions with forestry professionals and less with peers and family (Rickenbach 2009), other owners show the opposite pattern (Sagor and Becker 2014). Yet, owners have been found to prefer a combination of advice from peers and professionals (Kueper, Sagor, and Becker 2013). There are also varying levels of *diversity* in the networks, reflecting the number of contacts as a proportion of possible contacts (Sagor and Becker 2014; Stoettner and Ní Dhubháin 2019). Trust is a well-researched relationship *quality* (Huff et al. 2015; Hujala and Tikkanen 2008; Stoettner and Ní Dhubháin 2019) with more frequent interactions and high trust labeled strong ties (Prell, Hubacek, and Reed 2009). Yet, trusting relationships can also be characterized by infrequent interactions, for example among members in owner organizations (Rickenbach 2009). Moreover, relationships may exhibit expert to non-expert qualities or be more mutually respectful (Gootee

et al. 2010). One key *function* of the owner networks (linked to *content*) is learning about management and issues associated with running forest operations as well as technical service and equipment (Ruseva, Evans, and Fischer 2014). Another function of networks is social support (Crona and Bodin 2006). Different *means for communication* include face-to-face and digital means (Hujala and Tikkanen 2008).

Social networks are key for information sharing (Crona and Bodin 2006) and play a role for management decisions (Huff et al. 2015; Ruseva, Evans, and Fischer 2014). More social ties and diverse networks have been found to be associated with more timber harvesting, enrollment in forestry incentive programs, but also for example best management practices for water quality (Knoot and Rickenbach 2011; Ruseva, Evans, and Fischer 2014; Stoettner and Ní Dhubháin 2019). Larger networks and network diversity have been found among owners with more forest, those with a forest management plan (FMP), and owners who frequently visit their land (Bashir, Sjølie, and Solberg 2024; Sagor and Becker 2014). The importance of networks for interest in alternative management methods has also been confirmed (Kiisel and Remm 2022). More specifically, Joa and Schraml (2020) revealed significant (yet minor) effects of diverse knowledge sources on conservation practices (e.g., retention of dead wood) among owners in Germany. In Sweden, André et al. (2017) showed that a larger network size and diversity is weakly correlated with higher climate risk perceptions, and owners with contacts at the national government and among researchers displayed a somewhat higher perceived adaptive capacity. Furthermore, the owners stated that they mainly received climate change information from the media (i.e., non-forestry sources). However, studies have given little attention to the processes that may be operating in this context, indicating a need for research on social influence in management transitions.

Social Influence Theory Connects Social Interactions with Psychological Outcomes

Departing from a transactional view of communication and theory of social influence, mechanisms for social influence affecting forest owners can be outlined. Communication processes involve sender and receiver (or communicators), message, channels/means, but also context, noise, and feedback loops. Commonly, distinctions are made between linear communication models depicting a one-way flow of ideas (Berlo 1960), interactional models emphasizing a two-way flow (Schram 1954) and transactional models where the ideas are created during communication (Barnlund 1970). In transactional models, the role of the context in terms of its social, cultural, and relational dimensions is emphasized. Forest owners' acquisition of information, and subsequent management decisions, may be considered through the lens of a transactional communication process where such decisions are the outcome of interactions with their social network. However, since the owner can also be considered an active agent seeking interactions that fulfill his or her needs, the owners' values, beliefs, emotions, and attitudes are also important.

In this study, a theory on social influence (Deutsch and Gerard 1955) depicting either a normative or informational route, is drawn upon to unpack influences in the owners' social networks and connect these to psychological outcomes.

Informational influence occurs because of an individual's desire to make accurate judgements about reality, while normative influence is due to the individual conforming to the expectations of others to avoid social disapproval. Normative influence may operate through processes of compliance due to pressures from others or identification because of a desire to act in accordance with an important other (i.e., externally regulated), or through internalization owing to a desire to act in congruence with own values (i.e., internally regulated) (Kelman 1958, 2006). The social influence mechanisms may be observed indirectly by exploring how social interactions are associated with psychological outcomes. Informational influences have the potential to increase knowledge levels and the relevance of subjective knowledge for management has been confirmed (Eriksson and Fries 2020). In contrast, normative influences may strengthen normative beliefs, and perceived social and personal norms, reflecting what is believed to be the right thing to do according to external and internal standards, respectively. Studies have found that also normative factors influence management decision-making (Johansson, Rahm, and Gyllin 2013). Nevertheless, knowledge and normative beliefs are often considered indirect predictors of behaviors, while intention to act, i.e., a motivation (willingness) to act, is more important (Ajzen 1991; Bamberg 2013). Thus, how social interactions are associated with willingness to act reflects the level of integration into behavioral decision-making.

The conceptual framework for this study is based on a transactional view of communication and theory of social influence adapted to the forest owner context by the author (Figure 1). Different sources of information and in relation to professional forestry, different means of interactions, may through social influence mechanisms (informational and normative) affect forest owners' information acquisition and psychological outcomes relevant for management decisions. The transactional perspective further suggests that individual variables are likely to, together with interactional variables, play a role for management decisions.

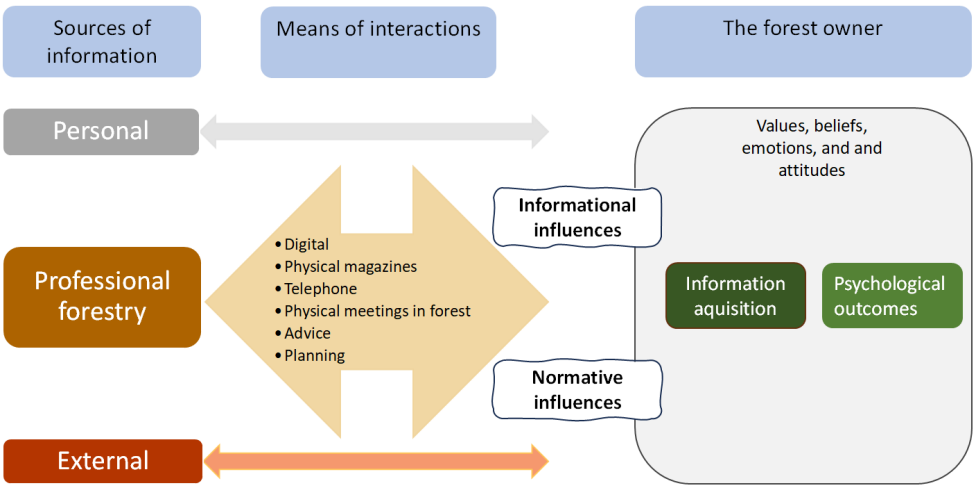

Figure 1. Transactional framework for the role of social interactions for forest owners' acquisition of information and psychological outcomes, incorporating normative and informational influences.

This study has three objectives. First, the extent to which the owners receive information about alternative management methods via different sources is examined, including personal, forestry professionals, and external sources. Patterns of information flows are examined to determine whether receiving information from one source is associated with also receiving information from another source.

Second, with a focus on professional forestry, the importance of interactional variables for the amount of information about alternative management methods the owners receive is analyzed. The importance of frequency as well as evaluations of the means for interactions (e.g., digitally) and sources of information (e.g., owner collective) are examined. If alternative management is discussed in professional forestry in Sweden, more frequent interactions and positive evaluations of the means and sources of information can be expected to be associated with receiving more information about alternative management. Aligned with this reasoning, being in contact with a professional advisor, having a FMP, as well as certification, may also be associated with more information about alternative management. To further explore this, who brings up the topic of alternative management and evaluations of advice about these methods is also analyzed among owners who had received advice.

Third, the association between interactions with different sources (via information and advice) and three different psychological outcomes, while also considering the owners' beliefs about ecosystem services (ES), is examined. Subjective knowledge and normative beliefs of alternative management methods are analyzed to explore evidence of informational and normative influence, respectively. In addition, the willingness to adopt alternative management is analyzed to close in on behavioral decision-making. Beliefs in the importance of different ES (e.g., economic) are used to reflect individual variables given that these have been found to be relevant for management decisions (Eriksson and Fries 2020; Westin et al. 2023). Since the interests of different organizations vary, with the government aiming to promote forest policy goals and a timber buyer furthering the production of pulp or timber (Lawrence et al. 2020), the content and therefore also the outcome of the interactions may differ depending on the sources the owners interact with. This suggests that whereas diverse social interactions may increase the knowledge of alternative management, only interactions where these methods are positively framed are likely to strengthen the willingness of the owners to adopt these methods.

Methods

Study Area

Almost 70% of the land in Sweden is covered by forests, with the large majority (84%) being productive forests. The productive forest pre-dominantly comprise of conifers (82%), mainly Norway Spruce (*Picea abies*) and Scots Pine (*Pinus sylvestris*) with broadleaved forest and mixtures making up 8% and 7%, respectively (Swedish University of Agricultural Sciences 2023). Almost half of the forest (48%) is owned by around 310 000 individual private forest owners (Swedish Forest Agency (SFA) 2024). The production and environmental goals have since the forest policy was revised in 1993 been considered equally important, but the forest sector has production focus (Andersson

and Keskitalo 2018). The owners have a large degree of freedom to make management decisions, and information and advice are the most important policy instruments (Johansson and Keskitalo 2014). The use of digital means for communicating with owners is increasing. Whereas advice from the government is diminishing, advice from private actors, including timber buyers and advisors at owner organizations and private companies, is increasing. Forest owner associations are key actors by providing comprehensive forestry services and advice to the owners, but in contrast to some other European countries such as the UK, non-governmental organizations are not important forest advisors (Lawrence et al. 2020).

Study Design and Respondents

A randomly selected sample of individual private forest owners in Sweden owning more than 5 ha of forest land (20–80 years) was conducted in 2024 ($n = 5000$, net sample = 4976). A commercial survey company (Kvalitetsindikator AB) carried out data collection following the ethical guidelines stipulated in the 1964 Declaration of Helsinki. Before consenting to participate the owners were informed about the purpose of the study, how personal information was handled, and that participation is voluntary. Before analyses, data was pseudonymized. No ethical approval was required for this study since no sensitive personal information as defined in Swedish legislation (the Ethics Review Act 2003:460) was collected.

After five contacts (invitation by post, paper questionnaire, text reminder, and two reminders by post), the response rate was 36% ($n = 1763$). The respondents had a mean age of 71 years (SD = 12), 35% were women and 44% had a university degree. Respondents were fairly evenly distributed across the country and about one third lived on their forest property. The average size of the forest property was 108 ha (SD = 365) (5–20 ha: 32%, 21–50 ha: 25%, 51–200 ha: 33%, >201 ha: 11%). The sample was older than the population of forest owners, a slightly larger share was men, and fewer owned a small estate (Population statistics for 2023: Mean age 61 years, 38% women, 5–20 ha: 44%, 21–50 ha: 29%, 51–200 ha: 23%, >200: 4%) (Swedish Forest Agency 2024). Hence, data was weighted on gender, age, and size of forest land ($n = 1686$). Unweighted and weighed data descriptives are available in (Supplementary material Table S1).

Measures

The questionnaire was developed among an interdisciplinary team of researchers, practitioners, and government representatives in the research project Co-Creator (https://www.slu.se/en/research/research-catalogue/projekt/c/co-creator/). Alternative management methods were described as management less common on productive forest land, including no clear-cut methods, such as gap cutting, selective felling, and shelterwood as well as increase in the share of broadleaved forest (Felton et al. 2024). Information about the size of the forest property and region was taken from the property register. The questionnaire contained questions on gender, age, education, and residency. In addition, the following variables were measured: 1) Professional forestry interactions (means and sources frequency and evaluations, as well as advice), FMP, and certification, 2) Individual variables reflecting beliefs about the importance of ES, and 3)

Alternative management methods variables including the amount of information about alternative management methods received from different sources, advice about these methods, and psychological outcome variables. Before creating index variables, the "don't know" answers were removed. A description of the concepts, questions used to assess each concept, and descriptive data is available in Table 1.

Analyses

Analyses were conducted using SPSS version 29. The first objective was addressed using a repeated measure ANOVA with the amount of information about alternative management methods received from different sources (i.e., personal, owner collective, private companies, businesses/networks, government, and external) as factor (pairwise comparisons with Bonferroni correction and Huynh-Feldt correction). In addition, a psychological network analysis of information flow from the different sources was carried out by calculating partial correlations, thus controlling for correlations with the other variables (Manson, Chua, and Lukaszewski 2020).

The second objective was addressed using a regression analysis with amount of information about alternative management methods received from professional forestry as dependent variable (index) and frequency of means, evaluations of means, frequency of sources, evaluation of sources, contact with an advisor (dummy), having a FMP (dummy), and certification (FSC and PEFC, dummies) as independent variables. This model with covariates (gender, age, education) was also tested. In addition, owners having met with an advisor in the last 5 years ($n = 786$, 45%) was analyzed regarding: 1) who had more frequently raised the topic of alternative management (themselves or the advisor), using a paired samples t-test, and 2) evaluations of advice about alternative management among owners that had been in contact with different advisors, using a univariate ANOVA with group as factor (Inspector Collective Advice $n = 214$, Timber buyer Advice $n = 266$, Other Private Advice $n = 74$, different advisors (private and government) $n = 232$) and positive evaluation as dependent variable.

To address the third objective of how interactions and individual variables are associated with psychological outcomes, hierarchical regression analyses were conducted in two steps. The interactional variables were included in the first step and comprised of information received about alternative management methods from six sources (continuous variables), having been in contact with four types of advisors (dummies), having a FMP (dummy), and certification (FSC and PEFC, dummies). In the second step, individual variables, that is, beliefs about the importance of ecological social and economic production ES, were added. These models also including covariates (gender, age, education) were also assessed.

Results

Information about Alternative Management from Different Sources

In relation to the first objective, results revealed that the owners received little information about alternative management methods (INFO Alt) but the amount differed between the sources ($F(4.59, 7154.14) = 43.40$, $p = .001$, Partial eta$^2 = .03$) (Figure

Table 1. Concepts, measures, and descriptive statistics.

Professional forestry interactions		
Means for interactions		
• Frequency	How often do you receive information or advice via the following channels?	Reversed scale:
	Digital channels (e.g., e-mail, knowledge portal)	1.87 (1.16)
	Physical newspapers (e.g., Skogsaktuellt)	2.60 (1.00)
	Contact via telephone	1.52 (1.10)
	Physical meetings such as forest courses and personal meetings in the forest	1.60 (1.02)
	Scale: 1–5 (Every week, Several times a month, Several times per year, Yearly, More seldom or never)	α = .76, 1.93 (0.84)
• Evaluation	How good or bad do you believe the following channels are regarding forest management advice?	
	Digital channels (e.g., e-mail, knowledge portal)	2.98 (0.93)
	Physical newspapers (e.g., Skogsaktuellt)	3.46 (0.86)
	Contact via telephone	2.67 (1.06)
	Physical meetings such as forest courses and personal meetings in the forest	3.23 (1.11)
	Scale: 1–5 (Very bad, Neither bad nor good, Very good)	α = .64, 3.11 (0.72)
Sources for interactions		
• Frequency	How often do you receive information or advice about forest management from the following?	Reversed scale:
	Forest owner associations	2.00 (1.09)
	Forest companies	2.04 (1.07)
	Smaller forest businesses/forest networks for advice	1.73 (1.16)
	The Swedish Forest Agency	1.96 (1.10)
	Scale: 1–5 (Every week, Several times a month, Several times per year, Yearly, More seldom or never)	α = .85, 1.96 (0.91)
• Evaluation	How much trust do you have in the following with regards to forest issues, e.g., forest management?	
	Forest owner associations	3.39 (1.13)
	Forest companies	2.94 (1.14)
	Smaller forest businesses/forest networks for advice	3.12 (1.09)
	The Swedish Forest Agency	3.39 (1.14)
	Scale: 1–5 (No trust at all, A lot of trust), NA/"don't know"	α = .80, 3.29 (0.94)
• Advice	Contact with an advisor/inspector/timber buyer to discuss forest management in the last five years (multiple answers possible)	
	An inspector working for a forest owner association [Inspector Collective Advice]	21%
	A timber buyer working for a forest company [Timber buyer Advice]	26%
	Another forest advisor working for a private business in the forest sector [Other private Advice]	9%
	An employee at the SFA [Government Advice]	7%
	No	(Any contact: 47%)
Forest management plan (FMP)		
	An FMP that was created/updated 0–5 years ago	28%
	An FMP that was created/updated 6–10 years ago	16%
	An FMP that was created/updated more than 10 years ago	16%
	No FMP	40%
Certification FSC	Certified according to Forest Stewardship Council	12%
Certification PEFC	Certified according to Programme for the Endorsement of Forest Certification	13%

(*Continued*)

Table 1. Continued.

Individual variables		
	How important is it for you that your forest contributes to the following?	
• Ecological Social beliefs	Diversity of species (e.g., plants, insects and birds), Preservation of red listed species, Carbon storage, Beautiful nature, Possibilities to pick berries and mushroom for all.	α = .80, 3.57 (0.89)
• Economic Production beliefs	Production of timber, Production of pulp, Biomass for energy or renewable materials (e.g., textiles, biochar), Economic yield for you	α = .87, 2.89 (1.09)
	Scale: 1–5 (Not at all important, Very important).	
Alternative management methods variables		
Information about alternative management methods from different sources (INFO Alt)	To what extent do you receive information or advice about alternative management methods from the following?	
	Others within the household, co-owners, other forest owners [Personal Info]	2.26 (1.30)
	Forest owner associations [Owner Collective Info]	2.19 (1.16)
	Forest companies [Private Companies Info]	2.05 (1.08)
	Smaller forest businesses/forest networks for advice [Businesses/Networks Info]	1.90 (1.05)
	The Swedish Forest Agency [Government Info]	2.35 (1.18)
	Mass media (e.g., TV, daily newspapers) [External Info]	2.05 (1.03)
	Scale: 1–5 (Not at all, To a great extent).	
	Only forestry professionals (4 items)	4 α = .74, 2.14 (0.86)
Advice about alternative management methods	Only owners who had received advice in the last five years ($n = 786$):	
• Initiative	Think about the latest advice you received and indicate the extent to which alternative forest management methods have been discussed during this consultation?	
	On your initiative	2.63 (1.36)
	On the advisor's initiative	2.36 (1.23)
	Response scale: 1–5 (Not at all, To a great extent)	
• Positive evaluation	To what extent do you believe that the following corresponds to you and the advisor you had at the latest consultation?	
	I am satisfied with how often we discuss alternative management methods.	3.28 (1.15)
	I trust the advisors' advice regarding alternative management methods.	3.48 (1.13)
	The advisor has the same opinion as I do regarding alternative management methods.	3.37 (1.07)
	The advisor has good knowledge about alternative management methods.	3.66 (1.06)
	The advisor advocates alternative management methods.	2.72 (1.20)
	Scale: 1–5 (Not at all, To a great extent), Don't know	α = .89, 3.27 (1.00)
Subjective knowledge about alternative management methods (Subjective knowledge)	How much knowledge do you believe you have about the following?	2.41 (1.08)
	Continuous cover forestry (e.g., gap cutting, selective felling, shelterwood)	2.84 (1.07)
	Mixed forest with conifer and broadleaves	1.84 (0.99)
	Valuable broadleaf forest	2.58 (1.09)
	Broadleaved forest with trivial broadleaves such as birch	1.82 (0.91)
	Fast growing broadleaved trees such as improved birch, hybrid aspen, aspen	
	Scale: 1–5 (No knowledge at all, Little knowledge, Some knowledge, Quite a lot of knowledge, Extensive knowledge).	α = .87, 2.30 (0.84)
Normative beliefs about alternative management methods (Normative beliefs	To what extent do you agree or disagree with the following statements about forest management in Sweden?	
	Alternative management methods (e.g., continuous cover forestry) should be used on a larger share of the forest land, Forest management should be more diversified by increased use of other tree species than Norway spruce and Scots pine, The pace of the transition toward more diversified forest management in Sweden should increase	
	Scale: 1–5 (Totally disagree, Totally agree)	α = .82, 3.46 (0.98)
Willingness to adopt alternative management methods (Willingness to adopt)	To what extent do you agree or disagree with the following statements about forest management in your forest?	
	I would like to change my forest management, I am interested in using alternative management methods in my forest	
	Scale: 1–5 (Totally disagree, Totally agree)	α = .68, 2.65 (1.10)

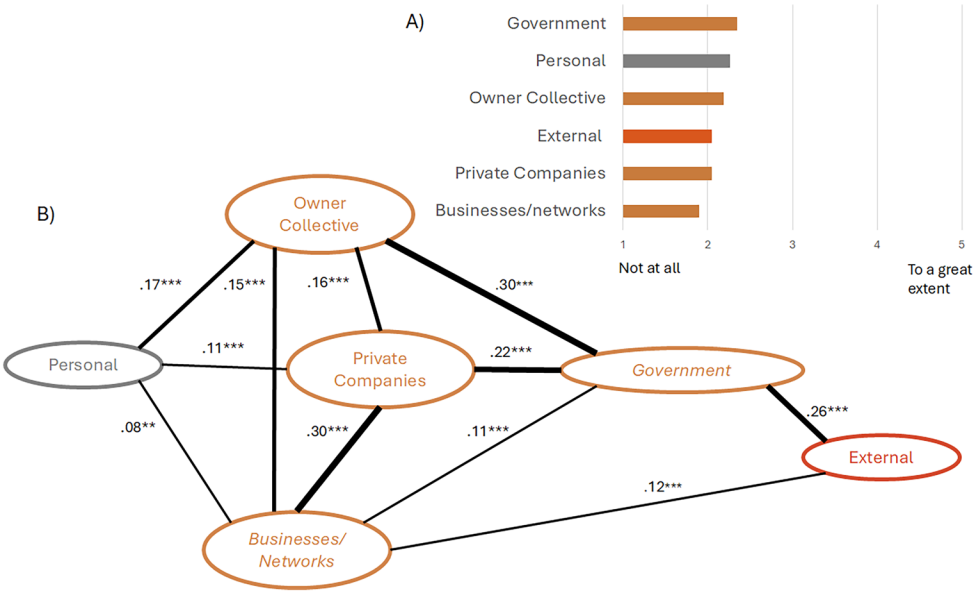

Figure 2. Acquisition of information about alternative management methods. A) Mean values of the extent to which the owners receive such information from different sources (personal, professional forestry, and external). B) Associations in the information flow from different sources (significant partial correlations, ** p <.01, *** p <.001). Stronger partial correlations are represented by thicker lines and weaker ones by thinner lines.

2). More information was received from the government compared to the other sources, including personal sources, the owner collective, external sources (mass media) and private companies (p < .05). The least information was received from businesses/networks for advice (p < .05). The psychological network analysis showed the strongest connections between the professional forestry sources, but with linkages to, on the one hand, personal sources and, on the other, external sources. The strongest linkages were found between the government and the owner collective, as well as between private companies and businesses/networks for advice. Only businesses/networks were connected to all the other sources of information. The results suggest that owners receiving more information about alternative management from personal sources also receive more information from professional forestry, but not necessarily the government. In contrast, those receiving more information from external sources also receive more information from the government and businesses/networks, but not other professional forestry or personal sources.

Professional Forestry Interactions and Information about Alternative Management

In relation to the second objective, results showed that a higher frequency of interacting with different sources, a more positive evaluation of these sources, as well as a positive evaluation of different means for communication were predictors of the amount of information about alternative management methods received by owners (Table 2). The frequency of interacting through different means was not a significant predictor even though the bivariate correlation was significant (r = .30). Furthermore,

Table 2. Linear regression analysis of social interactions as predictors of information about alternative management methods (INFO Alt) received from professional forestry.

	B(SE)	β	*P* value
Constant	.27(0.11)		.015
Means frequency	−.02(0.03)	−.02	.515
Means evaluation	.22(0.03)	.19	**.001**
Sources frequency	.26(0.03)	.28	**.001**
Sources evaluation	.18(0.02)	.20	**.001**
Sources Advice (*D*)	.25(0.05)	.15	**.001**
FMP (*D*)	.10(0.05)	.06	**.044**
Certification FSC (*D*)	−.03(0.07)	−.01	.682
Certification PEFC (*D*)	.05(0.07)	.02	.519
Adj R^2		**.25**	**.001**

D = Dummy. FMP = Forest management plan. *n* = 1251.

having been in contact with an advisor and having a FMP, but not any of the certifications, were associated with receiving more information. There was no evidence of collinearity in the model (no VIF value above 1.80). The pattern of results generally remained when including covariates. See Supplementary materials for bivariate correlations (Table S2) and the model with covariates (Table S3).

The largest share of those that had met with an advisor in the last 5 years had met a timber buyer at a forest company (26%) followed by an advisor at the owner collective (21%) (Table 1). The owners that had been in contact with an advisor stated that they more often took the initiative to discuss alternative management than the advisor did ($t(719) = 6.11$, $p = .001$, Cohen's $D = .22$). In addition, those that had met an advisor at other businesses (i.e., Other private Advice) displayed a more positive evaluation of the advice regarding alternative management compared to the other three groups ($F(3,734) = 4.58$, $p = .003$, Partial $eta^2 = .02$).

The Role of Interactions and Individual Variables for Psychological Outcomes

Results relating to the third objective revealed that receiving information about alternative management methods from personal sources was associated with higher subjective knowledge, but not normative beliefs or willingness to adopt (Table 3). Moreover, receiving information from the owner collective or being in contact with an inspector at such organizations were not associated with any of the dependent variables. Receiving more information from private companies was not significantly associated with subjective knowledge but negatively associated with normative beliefs and willingness. Yet, contact with a timber buyer was positively correlated with subjective knowledge, but negatively correlated with willingness. In contrast, information from businesses/networks for advice was positively associated with subjective knowledge and willingness. Whereas having a FMP was positively associated with subjective knowledge and willingness, it was negatively associated with normative beliefs. FSC was not associated with the outcome variables, but PEFC displayed a positive correlation with subjective knowledge and a negative correlation with willingness. Finally, receiving more information from the government and external sources was positively associated with all outcome variables, but contact with government advisors was only positively associated with willingness.

In the second step, the results from the first step generally remained,[1] and a stronger emphasis on all ES was associated with higher subjective knowledge. However, whereas

Table 3. Hierarchical linear regression analyses of social interactions (Step 1) and individual variables (Step 2) as predictors of outcomes associated with alternative management methods, including subjective knowledge, normative beliefs, and willingness to adopt.

	Subjective knowledge $n = 1398$			Normative beliefs $n = 1379$			Willingness to adopt $n = 1385$		
	B(SE)	β	*P* value	B(SE)	β	*P* value	B(SE)	β	*P* value
Step 1									
Constant	1.49(0.06)		.001	3.31(0.08)		.001	1.99(0.09)		.001
Personal Info	.08(0.02)	.13	**.001**	.04(0.02)	.05	.066	.00(0.02)	−.01	.867
Owner Collective Info	−.02(0.02)	−.02	.524	.02(0.03)	.03	.447	.03(0.03)	.03	.378
Private companies Info	−.01(0.03)	−.01	.680	−.14(0.03)	−.16	**.001**	−.08(0.04)	−.08	**.028**
Businesses /networks Info	.07(0.02)	.09	**.002**	.04(0.03)	.04	.196	.17(0.03)	.16	**.001**
Government Info	.08(0.02)	.11	**.001**	.07(0.03)	.09	**.009**	.07(0.03)	.08	**.017**
External Info	.05(0.02)	.06	**.015**	.14(0.03)	.14	**.001**	.13(0.03)	.12	**.001**
Inspector Collective Advice (*D*)	.04(0.06)	.02	.580	−.01(0.08)	.00	.941	.02(0.08)	.01	.817
Timber buyer Advice (*D*)	.16(0.05)	.09	**.002**	−.08(0.06)	−.04	.216	−.19(0.07)	−.08	**.008**
Other Private Advice (*D*)	.06(0.07)	.02	.394	.06(0.09)	.02	.486	.02(0.10)	.01	.859
Government Advice (*D*)	.10(0.08)	.03	.221	.15(0.10)	.04	.143	.33(.0.11)	.08	**.003**
FMP (*D*)	.25(0.05)	.15	**.001**	−.30(0.06)	−.15	**.001**	.10(0.07)	.04	.152
Certification FSC (*D*)	.11(0.08)	.05	.138	−.06(0.10)	−.02	.538	.01(0.11)	.00	.938
Certification PEFC (*D*)	.28(0.07)	.12	**.001**	−.13(0.09)	−.05	.161	−.26(0.10)	−.08	**.013**
Adj R^2		**.18**	**.001**		**.07**	**.001**		**.08**	**.001**
Step 2									
Constant	1.18(0.11)		.001	1.86(0.12)		.001	.89(0.15)		.001
Personal Info	.08(0.02)	.12	**.001**	.03(0.02)	.03	.153	−.02(0.02)	−.02	.501
Owner Collective Info	−.02(0.02)	−.02	.465	.03(0.03)	.03	.317	.03(0.03)	.03	.355
Private Companies Info	−.01(0.03)	−.01	.670	−.09(0.03)	−.10	**.001**	−.05(0.03)	−.05	.172
Businesses/networks Info	.07(0.07)	.08	**.006**	.03(0.03)	.03	.247	.16(0.03)	.15	**.001**
Government Info	.08(0.02)	.11	**.001**	.08(0.02)	.10	**.001**	.08(0.03)	.08	**.009**
External Info	.05(0.02)	.06	**.026**	.09(0.02)	.10	**.001**	.10(0.03)	.10	**.001**
Inspector Collective Advice (*D*)	.02(0.06)	.01	.780	.01(0.07)	.01	.839	.02(0.08)	.01	.856
Timber buyer Advice (*D*)	.13(0.05)	.07	**.009**	.01(0.05)	.00	.893	−.15(0.07)	−.06	**.025**
Other Private Advice (*D*)	.04(0.07)	.01	.606	.11(0.08)	.03	.143	.03(0.10)	.01	.750
Government Advice (*D*)	.09(0.08)	.03	.279	.02(0.09)	.01	.821	.25(0.11)	.06	**.022**
FMP (*D*)	.22(0.05)	.13	**.001**	−.11(0.05)	−.06	**.033**	.19(0.07)	.08	**.004**
Certification FSC (*D*)	.09(0.08)	.04	.222	.00(0.08)	.00	.983	.03(0.10)	.01	.785
Certification PEFC (*D*)	.27(0.07)	.11	**.001**	−.11(0.08)	−.04	.159	−.25(0.11)	−.08	**.010**
Ecological Social beliefs	.05(0.02)	.06	**.019**	.53(0.03)	.48	**.001**	.36(0.03)	.29	**.001**
Production Economic beliefs	.07(0.02)	.09	**.001**	−.20(0.02)	−.22	**.001**	−.07(0.03)	−.07	**.018**
ΔR		**.01**	**.001**		**.25**	**.001**		**.08**	**.001**
Adj R^2		**.19**	**.001**		**.32**	**.001**		**.16**	**.001**

D = Dummy. FMP = Forest management plan.

emphasis on ecological social ES was positively associated with normative beliefs and willingness, production economic ES was negatively associated with these variables. The individual variables were particularly important for explaining normative beliefs and willingness, but less important for subjective knowledge. There was no evidence of collinearity in the models (no VIF value above 1.86). Adding covariates did not change results substantially, but timber buyer advice was not a significant predictor of subjective knowledge in the second step and of willingness in both steps.[2] See the Supplementary material for the bivariate correlations (Table S4) and the models with covariates (Table S5).

Discussion

A transition to climate adapted forest management requires an understanding of the barriers and opportunities in the current system (Bouriaud et al. 2015; Hertog, Brogaard, and Krause 2022). This study adds to the understanding of how information about alternative ways of managing the forest is conveyed as part of forest owners' social network and how different interactions have implications for management decisions. Focusing on Sweden where forest production based on conifers and even-aged management is central, but with an urgent need to diversify the forest, the study provides insights on social influence mechanisms for a transition toward climate adapted forestry.

In this study, the focus on alternative management in the information flow to the owners was found to be limited. The owners received slightly more information from the government than from personal and professional forestry sources. Overall, though, since more interactions with forestry sources were associated with receiving more information about methods that are currently not the norm, results nevertheless suggest that the forestry sector is addressing this topic. Moreover, results suggest that the owners received information about these methods from diverse forestry sources, including both the owner collective and the government. Yet, receiving information from personal sources was not associated with receiving this type of information from external sources. Since social interactions have implications for psychological outcomes, results suggest that this pattern of information flow has implications for the owners' management decisions.

This study elaborates on how the social networks of forest owners may play a role for change in forest management, by revealing informational and normative influences in these interactions. Receiving more information from personal, external and some professional forestry sources (businesses/networks for advice and the government) were associated with higher subjective knowledge, in support of an informational influence. Nevertheless, receiving information from the owner collective and private companies did not have an impact, and among the different advisors only advice from timber buyers contributed to increased subjective knowledge. In addition, in line with previous studies (cf. Eriksson and Fries 2021), having a FMP and PEFC were associated with higher subjective knowledge. Fewer significant effects were found in relation to normative beliefs. Nonetheless, receiving information from the government and external sources exhibited a positive normative influence, and receiving information from private companies and having a FMP displayed the opposite normative impact. Results for willingness to adopt were similar to results for normative beliefs, but with a few exceptions. First, while PEFC was not significantly associated with normative beliefs

it was related to a weaker willingness. Second, contact with government advisors, more interaction with businesses/networks for advice, and having a FMP were all associated with a stronger willingness to use alternative management methods.

Overall, the results suggest that advisory services are lacking a normative influence. Yet, the results also showed that, for example government advisors seem to encourage these methods, but with no clear evidence for neither a normative nor an informational influence. Whereas advice from timber buyers was associated with higher subjective knowledge and lower willingness, these effects were no longer significant when considering individual variables and covariates. Results indicate that a transition to less production-oriented climate adapted forestry may be facilitated by interactions with the government and external sources and there is some evidence that the forest industry may dampen such changes. This aligns with Bouriaud et al. (2015) asserting the importance of external stakeholders for transitions. However, results also revealed a positive informational influence among some private forestry actors. Businesses/networks for advice incorporate both small businesses offering advice to owners and nonprofit networks. While they are not a key information source for most owners, the advice about alternative management provided by these was positively evaluated by the few owners who had been in contact with them. Thus, these businesses/networks may support the initiation of change by contributing to the development of new niches where change can be supported (Hertog, Brogaard, and Krause 2022). In contrast, one important source, that is, the owner collective, considering both the high frequency of interactions as well as high trust (Table 1), may play a minor role in changing forest management given the lack of correlations with the outcome variables, thus neither facilitating nor preventing change.

Individual variables, here examined in terms of beliefs, were found to be associated with subjective knowledge, but even more strongly with normative beliefs and willingness to adopt alternative management methods. This result is in line with behavioral models (e.g., Bamberg 2013) since these beliefs may guide the information seeking of the owners and thereby contribute to increased knowledge levels but have an even more important role in forming normative beliefs and willingness to adopt management. Also, the individual variables displayed diverse relationships with the psychological outcomes, with an emphasis on different ES being associated with higher subjective knowledge, but a stronger emphasis on ecological social ES and a weaker emphasis on production economic ES being associated with stronger normative beliefs and willingness. Since beliefs have been formed based on personal values (Eriksson and Fries 2020), but potentially also in interaction with diverse sources of information within and outside the forest sector, they are likely to play a key role for understanding change in forest management practices.

There are some limitations to consider when interpreting results. The response rate was comparable or even higher than other recent studies of forest owners (Fischer and Denny 2024; Westin et al. 2023). However, the sample deviated slightly from the population of owners and to control for this, the data was weighed on gender, age, and size of forest. There is nevertheless a need to be cautious regarding the extent to which particularly the descriptive results reflect the population of forest owners. Moreover, the study cannot confirm causal links. While the conceptual framework depicts a transactional relationship between the social network and the owners, only effects of interactions on outcomes were tested empirically. Future studies could further

explore the underlying motivations for seeking information and advice to learn about the owners as active agents in their social network. In addition, this study does not feature all types of forestry practices (e.g., the use of improved plant material). The results mainly relate to less production-oriented climate adapted management. Yet, the transactional framework and social influence concepts are potentially valid for examining influence in management transitions more generally.

This study provides practical implications for how to encourage a transition. Despite demands for a certain share of broadleaves in certification schemes in Sweden (currently 10% in FSC and 5% in PEFC), this study does not suggest that certification directly encourage alternative management, and even the opposite may be true for PEFC. Yet, the FMP is a more promising instrument, but it is uncertain whether the positive effects depend on the tool itself, the context (e.g., connected to advice and forest planning), or self-selection among the owners. Increasing knowledge levels are important in the initial stages of a transition and highlighting diverse perspectives enables learning about the challenges and possibilities with a change (Bodin, Crona, and Ernstson 2006). Given that major private forestry actors (until now) do not appear to encourage alternative management, the initiation of change is likely to require support from the government, an independent and trusted actor (Eriksson 2017). As a minimum this requires dialogue, targeting owners but also forestry sector actors. Physical newspapers were in this study found to be important as a means for communication and this needs to be considered as digital means is increasingly used in advisory services (Lawrence et al. 2020). Overall, this study highlights the importance of interactions in the owners' network, but also the owner him or herself, if we are to understand the potential for transitions in management and to develop appropriate policy and decision support.

Notes

1. However, for Willingness, Private Companies Info was no longer significant, and FMP became significant, in the second step.
2. This pattern of results could not be derived from any of the covariates individually indicating that reduced statistical power may have caused the result.

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Conflict of Interest

The authors report there are no competing interests to declare.

Data Availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

Ethics

The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki. Participation was voluntary and based on written informed consent. Since no sensitive personal information was collected as defined in the Swedish legislation, no explicit ethical approval was required for this study.

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References

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50 (2): 179–211. https://doi.org/10.1016/0749-5978(91)90020-T.

Andersson, E., and C. Keskitalo. 2018. Adaptation to climate change? Why business-as-usual remains the logical choice in Swedish forestry. *Global Environmental Change* 48: 76–85. https://doi.org/10.1016/j.gloenvcha.2017.11.004.

André, K., J. Baird, Å. Gerger Swartling, G. Vulturius, and R. Plummer. 2017. Analysis of Swedish forest owners' information and knowledge-sharing networks for decision-making: Insights for climate change communication and adaptation. *Environmental Management* 59 (6): 885–897. https://doi.org/10.1007/s00267-017-0844-1.

Bamberg, S. 2013. Changing environmentally harmful behaviors: A stage model of self regulated behavioral change. *Journal of Environmental Psychology* 34: 151–159. https://doi.org/10.1016/j.jenvp.2013.01.002.

Barnlund, D. C. 1970. A transactional model of communication. In J. Akin, A. Goldberg, G. Myers and J. Stewart (Eds.) *Language behavior: a book of readings in communication. For Elwood Murray on the occasion of his retirement*. Berlin, Boston: De Gruyter Mouton, pp. 43–61. https://doi.org/10.1515/9783110878752.43.

Bashir, A., H. K. Sjølie, and B. Solberg. 2024. Forest management plan pathways for non-industrial private forest owners in Norway: from acquisition to implementation. *European Journal of Forest Research* 143 (5): 1461–1475. https://doi.org/10.1007/s10342-024-01705-w.

Berlo, D. K. 1960. *The process of communication: an introduction to theory and practice*. New York: Holt, Rinehart and Winston.

Blanco, V., C. Brown, S. Holzhauer, G. Vulturius, and M. D. A. Rounsevell. 2017. The importance of socio-ecological system dynamics in understanding adaptation to global change in the forestry sector. *Journal of Environmental Management* 196: 36–47. https://doi.org/10.1016/j.jenvman.2017.02.066.

Bodin, Ö., B. Crona, and H. Ernstson. 2006. Social networks in natural resource management: What is there to learn from a structural perspective? *Ecology and Society* 11 (2):r2. https://doi.org/10.5751/ES-01808-1102r02.

Bouriaud, L., M. Marzano, M. Lexer, L. Nichiforel, C. Reyer, C. Temperli, H. Peltola, et al. 2015. Institutional factors and opportunities for adapting European forest management to climate change. *Regional Environmental Change* 15 (8): 1595–1609. https://doi.org/10.1007/s10113-015-0852-8.

Crona, B., and Ö. Bodin. 2006. What you know is who you know? Communication patterns among resource users as a prerequisite for co-management. *Ecology and Society* 11 (2): 7. https://doi.org/10.5751/ES-01793-110207.

Deutsch, M., and H. Gerard. 1955. A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology* 51 (3): 629–636. https://doi.org/10.1037/h0046408.

Eriksson, L. 2017. Components and drivers of long-term risk communication: Exploring the within- communicator, relational, and content dimensions in the Swedish forest context. *Organization & Environment* 30 (2): 162–179. https://doi.org/10.1177/1086026616649647.

Eriksson, L., and C. Fries. 2020. The knowledge and value basis of private forest management in Sweden: Actual knowledge, confidence, and value priorities. *Environmental Management* 66 (4): 549–563. https://doi.org/10.1007/s00267-020-01328-y.

Eriksson, L., and C. Fries. 2021. Relations between structural characteristics, forest involvement, and forest knowledge among private forest owners in Sweden. *European Journal of Forest Research* 140 (1): 51–63. https://doi.org/10.1007/s10342-020-01314-3.

Felton, A., R. Seidl, D. B. Lindenmayer, C. Messier, M. Löf, J. H. C. de Koning, T. Ranius, et al. 2024. The choice of path to resilience is crucial to the future of production forests. *Nature Ecology & Evolution* 8 (9): 1561–1563. https://doi.org/10.1038/s41559-024-02473-x.

Fischer, A. P., and R. C. H. Denny. 2024. Evaluating behavioral responses to climate change in terms of coping and adaptation: an index approach. *Global Environmental Change* 86: 102837. https://doi.org/10.1016/j.gloenvcha.2024.102837.

Gootee, R. S., K. A. Blatner, D. M. Baumgartner, M. S. Carroll, and E. P. Weber. 2010. Choosing what to believe about forests: Differences between professional and non-professional evaluative criteria. *Small-Scale Forestry* 9 (2): 137–152. https://doi.org/10.1007/s11842-010-9113-3.

Hamunen, K., O. Virkkula, T. Hujala, J. Hiedanpää, and M. Kurttila. 2015. Enhancing informal interaction and knowledge co-construction among forest owners. *Silva Fennica* 49 (1): 1214. https://doi.org/10.14214/sf.1214.

Hertog, I. M., S. Brogaard, and T. Krause. 2022. Barriers to expanding continuous cover forestry in Sweden for delivering multiple ecosystem services. *Ecosystem Services* 53: 101392. https://doi.org/10.1016/j.ecoser.2021.101392.

Huff, E. S., J. E. Leahy, D. Hiebeler, A. R. Weiskittel, and C. L. Noblet. 2015. An agent-based model of private woodland owner management behavior using social interactions, information flow, and peer-to-peer networks. *PloS One* 10 (11): e0142453. https://doi.org/10.1371/journal.pone.0142453.

Hujala, T., and J. Tikkanen. 2008. Boosters of and barriers to smooth communication in family forest owners' decision making. *Scandinavian Journal of Forest Research* 23 (5): 466–477. https://doi.org/10.1080/02827580802334209.

Jandl, R., P. Spathelf, A. Bolte, and C. E. Prescott. 2019. Forest adaptation to climate change–is non-management an option? *Annuals of Forest Science* 76: 48. https://doi.org/10.1007/s13595-019-0827-x.

Joa, B., and U. Schraml. 2020. Conservation practiced by private forest owners in Southwest Germany – The role of values, perceptions and local forest knowledge. *Forest Policy and Economics* 115: 102141. https://doi.org/10.1016/j.forpol.2020.102141.

Johansson, J., and E. C. H. Keskitalo. 2014. Coordinating and implementing multiple systems for forest management: implications of the regulatory framework for sustainable forestry in Sweden. *Journal of Natural Resources Policy Research* 6 (2-3): 117–133. https://doi.org/10.1080/19390459.2014.913363.

Johansson, M., J. Rahm, and M. Gyllin. 2013. Landowners' participation in biodiversity conservation examined through the value-belief-norm theory. *Landscape Research* 38 (3): 295–311. https://doi.org/10.1080/01426397.2012.673576.

Kelman, H. C. 1958. Compliance, identification and internationalization: Three processes of attitude change. *Journal of Conflict Resolution* 2 (1): 51–60. https://doi.org/10.1177/002200275800200106.

Kelman, H. C. 2006. Interests, relationships, identities: Three central issues for individuals and groups in negotiating their social environment. *Annual Review of Psychology* 57 (1): 1–26. https://doi.org/10.1146/annurev.psych.57.102904.190156.

Kiisel, M., and L. Remm. 2022. Continuous cover forestry practitioners in a clear-cutting-oriented system: Assessing the potential to foster the practice. *Small-Scale Forestry* 21 (2): 325–348. https://doi.org/10.1007/s11842-022-09501-3.

Knoot, T. G., and M. Rickenbach. 2011. Best management practices and timber harvesting: the role of social networks in shaping landowner decisions. *Scandinavian Journal of Forest Research* 26 (2): 171–182. https://doi.org/10.1080/02827581.2010.545827.

Kueper, A. M., E. S. Sagor, and D. R. Becker. 2013. Learning from landowners: Examining the role of peer exchange in private landowner outreach through landowner networks. *Society & Natural Resources* 26 (8): 912–930. https://doi.org/10.1080/08941920.2012.722748.

Larasatie, P., D. Karisch-Gierer, and A. Ludvig. 2022. Women's Woodland owner network: A comparative case study of Oregon (the United States) and Austria. *Land* 11 (10): 1653. https://doi.org/10.3390/land11101653.

Lawrence, A., P. Deuffic, T. Hujala, L. Nichiforel, D. Feliciano, K. Jodlowski, T. Lind, et al. 2020. Extension, advice and knowledge systems for private forestry: Understanding diversity and change across Europe. *Land Use Policy* 94: 104522. https://doi.org/10.1016/j.landusepol.2020.104522.

Lindner, M., J. B. Fitzgerald, N. E. Zimmermann, C. Reyer, S. Delzon, E. van der Maaten, M-J. Schelhaas, et al. 2014. Climate change and european forests: What do we know, what are the uncertainties, and what are the implications for forest management? *Journal of Environmental Management* 146: 69–83. https://doi.org/10.1016/j.jenvman.2014.07.030.

Manson, J. H., K. J. Chua, and A. W. Lukaszewski. 2020. The structure of the mini-K and K-SF-42. A psychological network approach. *Human Nature* 31 (3): 322–340. https://doi.org/10.1007/s12110-020-09373-6.

Prell, C., K. Hubacek, and M. Reed. 2009. Stakeholder analysis and social network analysis in natural resource management. *Society & Natural Resources* 22 (6): 501–518. https://doi.org/10.1080/08941920802199202.

Rickenbach, M. 2009. Serving members and reaching others: The performance and social networks of a landowner cooperative. *Forest Policy and Economics* 11 (8): 593–599. https://doi.org/10.1016/j.forpol.2009.08.006.

Roitsch, D., S. Abruscato, M. Lovrić, M. Lindner, C. Orazio, and G. Winkel. 2023. Close-to-nature forestry and intensive forestry – Two response patterns of forestry professionals towards climate change adaptation. *Forest Policy and Economics* 154: 103035. https://doi.org/10.1016/j.forpol.2023.103035.

Ruseva, T. B., T. P. Evans, and B. C. Fischer. 2014. Variations in the social networks of forest owners: The effect of management activity, resource professionals, and ownership size. *Small-Scale Forestry* 13 (3): 377–395. https://doi.org/10.1007/s11842-014-9260-z.

Sagor, E. S., and D. R. Becker. 2014. Personal networks and private forestry in Minnesota. *Journal of Environmental Management* 132: 145–154. https://doi.org/10.1016/j.jenvman.2013.11.001.

Schram, W. (Ed.) 1954. *The process and effects of mass communication*. Champaign: University of Illinois Press.

Stoettner, E. M., and Á. Ní Dhubháin. 2019. The social networks of Irish private forest owners: An exploratory study. *Forest Policy and Economics* 99: 68–76. https://doi.org/10.1016/j.forpol.2017.09.008.

Swedish Forest Agency. 2024. *Fastighets och ägarstatistik i skogsbruket*. [Property and ownership statistics in forestry.] Retrieved 17 June 2024. https://www.skogsstyrelsen.se/statistik/fastighets–och-agarstruktur/

Swedish University of Agricultural Sciences. 2023. Skogsdata 2023. [Forest Statistics 2023]. Retrieved 17 June 2024. https://internt.slu.se/globalassets/ew/org/centrb/rt/dokument/skogsdata/skogsdata_2023_webb.pdf

Takala, T., M. Tanskanen, M. Brockhaus, T. Kanniainen, J. Tikkanen, A. Lehtinen, T. Hujala, and A. Toppinen. 2023. Is a sustainability transition possible within the decision-support services

provided to Finnish forest owners? *Forest Policy and Economics* 150: 102940. https://doi.org/10.1016/j.forpol.2023.102940.

Westin, K., A. Bolte, E. Haeler, E. Haltia, R. Jandl, A. Juutinen, K. Kuhlmey, et al. 2023. Forest values and application of different management activities among small-scale forest owners in five EU countries. *Forest Policy and Economics* 146: 102881. https://doi.org/10.1016/j.forpol.2022.102881.