



## Adaptive capacity in the multi-level management system of migratory waterbirds: a case study of participatory goose management in Sweden

Louise Eriksson, Maria Johansson, Johan Månsson, Camilla Sandström & Johan ElMBERG

**To cite this article:** Louise Eriksson, Maria Johansson, Johan Månsson, Camilla Sandström & Johan ElMBERG (2024) Adaptive capacity in the multi-level management system of migratory waterbirds: a case study of participatory goose management in Sweden, *Journal of Environmental Planning and Management*, 67:3, 522-541, DOI: [10.1080/09640568.2022.2124153](https://doi.org/10.1080/09640568.2022.2124153)

**To link to this article:** <https://doi.org/10.1080/09640568.2022.2124153>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 17 Oct 2022.



Submit your article to this journal [↗](#)



Article views: 706



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)



OPEN ACCESS



## Adaptive capacity in the multi-level management system of migratory waterbirds: a case study of participatory goose management in Sweden

Louise Eriksson<sup>a\*</sup> , Maria Johansson<sup>b</sup> , Johan Månsson<sup>c</sup> ,  
Camilla Sandström<sup>d</sup>  and Johan Elmberg<sup>e</sup> 

<sup>a</sup>Department of Geography, Umeå University, Umeå, Sweden; <sup>b</sup>Environmental Psychology, Department of Architecture and Built Environment, Lund University, Lund, Sweden; <sup>c</sup>Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences (SLU), Riddarhyttan, Sweden; <sup>d</sup>Department of Political Science, Umeå University, Umeå, Sweden; <sup>e</sup>Department of Environmental Science and Bioscience, Kristianstad University, Kristianstad, Sweden

(Received 13 December 2021; revised 2 June 2022; final version received 16 August 2022)

Adaptive management (AM) is one approach to manage migratory waterbirds, but obstacles to the implementation of AM require adaptive capacities in the management system (rules, institutions, action situations). This study aims to examine the adaptive capacity of participatory goose management in Sweden. Considering the biophysical and institutional context, we analyzed how tangible, individual, and governance assets were associated with technical and social learning. Interviews with informants in the national council for geese, swans, and cranes, and local management groups (LMGs) were conducted, and documentation reviewed. Results revealed evidence of a local preparedness in areas with an LMG. Nevertheless, the study highlighted a need to formalize the evolving system, to consider a more systematic implementation of AM (including regulations allowing for adaptive responses), and to ensure stakeholder acceptance for management tools and visions. The study illustrates the need for a broad set of assets to ensure learning in participatory management.

**Keywords:** multi-level management; technical learning; social learning; geese; wildlife

### 1. Introduction

Migratory waterbirds, such as ducks and geese, introduce challenges to management. Their flyways may cross country and even continent borders, thereby requiring coordination of management strategies at the local, national, and the international scales. In addition, the environmental conditions for many waterbirds have recently changed due to factors such as climate change, intensified agriculture, and wetland degradation (Fox and Madsen 2017). As a consequence, some waterfowl populations have been increasing rapidly while others have been declining, which is causing increased challenges to management (Nichols *et al.* 2007; Marjakangas *et al.* 2015; Fox and Madsen 2017; Stroud,

---

\*Corresponding author. Email: [louise.eriksson@umu.se](mailto:louise.eriksson@umu.se)

Madsen, and Fox 2017). Adaptive management (AM) is an approach to manage natural resources when conditions are changing and there is a high level of uncertainty. AM involves stakeholders and uses iterative steps (assess, design, implement, monitor, evaluate, and adjust) to facilitate systematic learning from management outcomes (Nyberg 1999; Williams, Szaro, and Shapiro 2009). The AM approach has long been applied to waterbirds in North America (Nichols *et al.* 2007; Anderson and Padding 2015; Johnson *et al.* 2015), and in 2015 a European Goose Management Platform (EGMP) was launched under the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). The aim of the EGMP is AM of goose populations in Europe as part of a multi-level management collaboration (Williams and Madsen 2013; Stroud, Madsen, and Fox 2017). Effective implementation of AM is frequently reduced due to obstacles, such as difficulties associated with setting goals and carrying out monitoring, lack of financial resources, insufficient collaboration, lack of buy-in within organizations, and confusion over roles (Huitema *et al.* 2009; Runge 2011; Susskind, Camacho, and Schenk 2012; Fabricius and Cundill 2014; Thaler and Levin-Keitel 2016). Given that implementation of AM is contained within a management system, capacities enabling a flexible and responsive management, i.e. adaptive capacities, are likely important to realize AM in practice (Koontz *et al.* 2015; Fidelman *et al.* 2017; Cinner *et al.* 2018). Adaptive capacity of multi-level management (MLM) systems of wildlife has been examined (Dressel *et al.* 2020) as have AM of migratory waterbirds (Johnson *et al.* 2015), but little attention has been given to the institutional conditions facilitating AM of migratory waterbirds. With a focus on one country nested within an international management system, this study aims to examine the adaptive capacity of participatory goose management in Sweden. Populations of several goose species have increased substantially and a multi-level management system is currently being formed in Sweden (Hake, Månsson, and Wiberg 2010; Månsson *et al.* 2015). The present study adds to an understanding of adaptive capacities in the management of migratory waterbirds and provides insights on how to develop collaborative goose management in Europe.

## 2. Framework for analysis

### 2.1. The IAD framework

This study uses the Institutional Analysis and Development (IAD) framework (Ostrom 2011) as a diagnostic approach to identify strengths and weaknesses in the management system. The IAD, further developed into the social-ecological system (SES) framework (Ostrom 2009), has been used extensively to analyze multi-level management systems (Sandström, Wennberg Di Gasper, and Öhman 2013; Dressel, Ericsson, and Sandström 2018). The IAD framework focuses on interactions between actors in the action situation where policy decisions are made. Exogenous variables include the biophysical context (the resource system and resource units, in our case geese in Europe), the community context (the social system), as well as already existing institutions and rules (the governance system). These variables are considered important for the action situation since they may enable, but also constrain, actions (Ostrom 2011). The interplay between exogenous variables and interactions in the action situation is believed to result in various outcomes. Certain evaluative criteria are used to assess interactions in the action situation and the related outcomes.

For analyses of a SES it is relevant to consider ecological outcomes such as harvest level or biodiversity, as well as social outcomes reflecting cooperation or

collaborative solutions (Ostrom 1990, 2009, 2011; Ratner *et al.* 2013; Sandström, Wennberg Di Gasper, and Öhman 2013). Since learning is central for adaptive responses in the management of natural resources (Pahl-Wostl 2009; Fabricius and Cundill 2014; Koontz *et al.* 2015; Gosnell *et al.* 2017), the processes of technical and social learning are useful evaluative criteria. Technical learning involves interaction with diverse experts, including specialists and researchers who can communicate research findings to involved actors (Lubell, Niles, and Hoffman 2014). Social learning results from interactions with others via networks (Pahl-Wostl 2009; Johannessen *et al.* 2019). Baird *et al.* (2014) distinguish between three types of social learning: ‘cognitive’ reflecting acquisition and restructuring of knowledge, ‘normative’ in terms of changes in values and norms, and ‘relational’ in the form of improved understanding of others’ viewpoints and trust. Social learning may also refer to a cycle of single-loop learning characterized by incremental improvements, or double-loop learning when the frames of thinking are altered and more innovative approaches are implemented. Greater shifts in terms of triple-loop learning is when the structural context such as regulatory frameworks is transformed (Pahl-Wostl 2009).

## **2.2. Adaptive capacities in participatory management**

By drawing on the adaptive capacity research, the analysis was directed toward conditions important for facilitating an adaptive management system (see e.g. Siders 2019 for a review). This study outlined three interconnected categories of assets important for building adaptive capacity in an MLM system with stakeholder participation: tangible, individual, and governance assets (Pahl-Wostl 2009; Gupta *et al.* 2010; Lockwood 2010; Lockwood *et al.* 2010; Koontz *et al.* 2015; Vedung 2016; Cinner *et al.* 2018; Koop *et al.* 2018). Tangible assets comprise financial resources, technical equipment, and different forms of knowledge. Given the focus on stakeholder participation, individual assets include, for example, engagement to participate, diverse perspectives, and coping strategies. Finally, governance assets contribute toward high-quality participatory management characterized by legitimacy and effectiveness. This approach enables an understanding of the relevance of different assets for interactions and the identification of strengths and weaknesses in the MLM system.

## **2.3. Operationalizing the IAD framework in the case of geese**

Arenas for stakeholder collaboration are significant action situations, especially in systems with higher levels of participation (i.e. collaborative governance or co-management) (Davies and White 2012). This study analyzed the adaptive capacity of the participatory goose management system in Sweden by exploring interactions in national and local arenas. Analyses focused on how exogenous variables and key adaptive assets in terms of tangible, individual, and governance were associated with outcomes considering a set of evaluative criteria (Table 1). Exogenous variables included the context (biophysical and community) and rules in use with implications for goose management. Tangible assets comprised the use of knowledge and physical assets, such as financial resources, time, and equipment. Individual assets included actors’ engagement in terms of transaction costs, and their values and beliefs about wildlife. Governance assets were examined by considering the principles for good governance proposed by Lockwood (2010): accountability (to fulfill commitments toward

Table 1. Exogenous variables, assets in the action situation (tangible, governance, and individual), outcomes (management and governance), and evaluative criteria (technical and social learning).

Variables	Definition	References
Exogenous variables		
Biophysical and community context	Biophysical and community context variables relevant for goose management	Ostrom 2011
Rules in use	Regulations and directives at different levels with implications for goose management	Ostrom 2011; Sandström, Wennberg Di Gasper, and Öhman 2013
Tangible assets		
Knowledge	Different types of knowledge (e.g. goose populations, goose behavior, effectiveness of measures) and the use of such knowledge	Sandström, Wennberg Di Gasper, and Öhman 2013; Bjärstig <i>et al.</i> 2014; Gupta <i>et al.</i> 2010; Lockwood <i>et al.</i> 2010
Physical assets	Financial, time, and equipment	Bjärstig <i>et al.</i> 2014; Cinner <i>et al.</i> 2018; Gupta <i>et al.</i> 2010; Lockwood <i>et al.</i> 2010
Individual assets		
Engagement	Actors' engagement e.g. the impact of transaction costs	Bjärstig <i>et al.</i> 2014
Diversity in value and belief systems	Different actors' values and beliefs about wildlife	Fulton, Manfredo, and Lipscomb 1996; Gupta <i>et al.</i> 2010
Governance assets		
Accountability	To fulfill commitments (responsibilities), i.e. mandate upwards (i.e. toward legislation) and downwards (i.e. toward citizens)	Lockwood 2010; Lockwood <i>et al.</i> 2010; Holmgren, Sandström, and Zachrisson 2017; Hahn 2011
Fairness	All relevant interests are considered by the authority	Lockwood 2010; Lockwood <i>et al.</i> 2010; Holmgren, Sandström, and Zachrisson 2017; Sandström, Wennberg Di Gasper, and Öhman 2013
Inclusiveness	All relevant stakeholders have been invited	Lockwood 2010; Lockwood <i>et al.</i> 2010
Transparency	Decision making is open to scrutiny (internally and externally)	Lockwood 2010; Lockwood <i>et al.</i> 2010
Connectivity	Communication and collaboration within the participatory groups (bonding), upwards (linking) and horizontally (bridging), along with alignment of plans/ goals between levels	Lockwood 2010; Lockwood <i>et al.</i> 2010; Cinner <i>et al.</i> 2018; Dressel <i>et al.</i> 2020
Flexibility	Openness and flexibility in management	Lockwood 2010; Lockwood <i>et al.</i> 2010; Cinner <i>et al.</i> 2018; Craig <i>et al.</i> 2017

(Continued)

Table 1. (Continued).

Variables	Definition	References
Outcomes		
Management (ecological)	Reduced crop damage	Baggio <i>et al.</i> 2016; Ratner <i>et al.</i> 2013, Sandström, Wennberg Di Gasper, and Öhman 2013. See also Powolny <i>et al.</i> 2018; Jensen <i>et al.</i> 2018
Governance (social)	Trust within and between groups and levels, scope for action, legitimacy, and capacity	Cinner <i>et al.</i> 2018; Koontz <i>et al.</i> 2015; Dressel <i>et al.</i> 2020; Lockwood 2010; Lockwood <i>et al.</i> 2010
Evaluative criteria		
Technical learning	Through interactions with experts, the practice of goose management is improved, e.g. via adaptive management	Lubell, Niles, and Hoffman 2014
Social learning	Change in the multi-actor setting through information transfer and group interaction (e.g. new knowledge (cognitive), group agreement and trust (relational) and commitment to shared vision (normative))	Pahl-Wostl 2009; Koontz <i>et al.</i> 2015; Baird <i>et al.</i> 2014

legislation and citizens), inclusiveness (all relevant stakeholders invited), fairness (all relevant interests are considered by the authority), transparency (decision making is open to scrutiny internally and externally), connectivity (communication and collaboration within the participatory groups i.e. bonding, upwards i.e. linking, and horizontally i.e. bridging, along with the alignment of plans/goals between levels), and flexibility (openness and flexibility in management). One ecological and one social outcome were analyzed: 1) effects of management in terms of reduced number of geese grazing on crops, and 2) effects of management in terms of trust, legitimacy, the scope for action, and capacity in the institutional system. The interactions in action situations and outcomes were evaluated to explore evidence of learning. The study covered technical learning in terms of improving management and the implementation of AM, and social learning with a focus on level and types of learning in the system. We expected that access and appropriate use of the different assets would facilitate technical and social learning and thereby increase the adaptive capacity of the system.

### 3. Materials and methods

#### 3.1. Study context

Some goose species such as the lesser white-fronted goose (*Anser erythropus*) are threatened with extinction in Europe (including Sweden), whereas the populations of graylag goose (*Anser anser*) and barnacle goose (*Branta leucopsis*) are at an historical high (Fox and Madsen 2017; Nilsson and Kampe-Persson 2020). Even though geese provide several ecosystem services, their abundance may also lead to over-grazing and

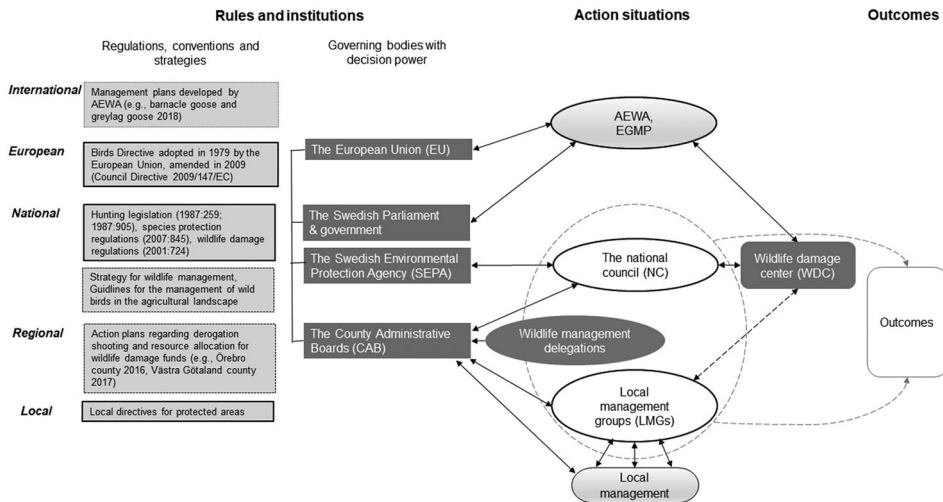


Figure 1. The multi-level management system for geese, including Rules and institutions (light grey boxes with dashed frames: conventions and strategy documents; light grey boxes with solid frames: regulations; dark grey boxes: governing bodies with decision power), Action situations (dashed grey ellipse) and the influence of the Action situations on Outcomes as defined by the IAD framework. The focus of the present study was on examining adaptive capacity in the national council and the local management groups.

degradation of natural vegetation, compromised air safety, and significant damage to agricultural crops (Green and Elmberg 2014; Buij *et al.* 2017; Bakker *et al.* 2018). Sweden's agricultural land is concentrated to the southern third of the country, where farmland close to roost sites, such as lakes and wetlands, provide some of the most important goose foraging habitat (Nilsson 2013). Crop damage through feeding and trampling is mainly caused by barnacle goose, graylag goose, bean goose (*Anser fabalis*), greater white-fronted goose (*Anser albifrons*), and Canada goose (*Branta canadensis*) (Montrás-Janer *et al.* 2019; Tombre *et al.* 2019).

Goose management in Sweden includes direct measures of damage prevention such as hunting and scaring (visual and audio), sacrificial crops (where birds are left undisturbed), economic compensation, subsidies, and collaboration (Hake, Månsson, and Wiberg 2010). The MLM system of geese includes Rules and institutions, Action situations, and Outcomes as defined by the IAD framework (see Figure 1). There are governing bodies with decision-making power at the international, national, and regional levels. Arenas for collaboration include the AEWAs and EGMPs at the international and European Union (EU) level, respectively. A National Council (NC) for large grazing birds (*Storfågelrådet*) was established in 2014 and local management groups (LMGs) (the first group initiated in 1997) operate in some sites with high densities of geese and high levels of crop damage. The NC and the LMGs comprise agency representatives, managers, and stakeholders (Hake, Månsson, and Wiberg 2010; Månsson *et al.* 2015). The national Wildlife Damage Center (WDC) at the Swedish University of Agricultural Sciences participates in the work of AEWAs, the NC, and collaborates with some of the LMGs.

Regulations, conventions and agreements set at different levels guide goose management. The Birds Directive adopted by the EU differentiates between species with the highest level of protection status (annex 1) (lesser white-fronted goose, barnacle



goose) and species that have an open hunting season (annex 2) (graylag goose, Canada goose, bean goose, and greater white-fronted goose) (Directive 2009/147/EC 2009). This international directive limits open hunting seasons and delineates rules for derogation shooting (lethal scaring) for the different goose species. International management plans for certain species such as graylag goose and barnacle goose have been adopted by AEWA (Jensen *et al.* 2018, Powolny *et al.* 2018). National regulations regarding species protection and wildlife damage regulations govern damage prevention, such as under what conditions scaring is allowed and determine when farmers are eligible for damage compensation. A national management plan for geese in Sweden had not been adopted at the time of the study, but national guidelines for implementation of preventive actions, damage compensation, and subsidies have been available since 2015 (Månsson *et al.* 2015). At the regional level, action plans regarding derogation shooting and resource allocation for damage prevention and compensation have been adopted by the wildlife management delegations in some counties. Local directives for protected areas have implications for local goose management, as it is often forbidden to disturb wildlife in reserves. Overall, AM with its focus on structured decision making and stepwise learning is advocated by the AEWA and the EGMP, endorsed in the Swedish national wildlife strategy, and in the LMGs (Hake, Månsson, and Wiberg 2010; The Swedish Environmental Protection Agency (SEPA)), 2015; Stroud, Madsen, and Fox 2017).

### 3.2. Study design

The evaluation covered analyses of interviews and documents. In the autumn of 2018, County Administrative Board (CAB) officials working on large grazing birds (geese, cranes, and swans) in the 21 counties in Sweden were contacted via e-mail and asked to provide county-specific information about geese and management. Based on information about the extent to which geese are a problem and how goose management is organized, four local areas were selected for in-depth analyses ensuring geographic disparity and variation in the duration of local participation (see Table 2). Three of the study cases (Scania Northeast, Lake Hornborga, and Lake Kvismaren) had an established LMG. In the fourth case (Lake Hjälstaviken), the LMG had been initiated more recently and was replaced by alternative forms of cooperation in 2018. In 2019, interviews were conducted with local actors in the selected study cases, as well as with national-level actors in the NC. To add a system perspective on goose management, an expert interview with a WDC representative involved in goose management at multiple levels (including the international) was conducted in 2020 (cf. Wroblewsky and Leitner 2009). Meeting minutes from the LMGs and the NC (2015-2019) and regional action plans (where available) were used as supporting documentation. Participation in interviews relied on written informed consent and the ethical guidelines for human subjects of the Helsinki Declaration were at all instances of the study followed. The study did not require permission from the Swedish Ethical Review Authority, since no sensitive personal information was handled. The WDC can be considered a stakeholder in the MLM system and one in the interdisciplinary team of authors is affiliated with the WDC. To ensure independent interpretations, the interviews were conducted and analyzed only by the authors not actively involved in management (LE, MJ, CS).



Table 2. Overview of the four local study cases with local management groups (LMGs) and the national council for geese, swans and cranes (NC).

Context	Scania Northeast	Lake Kvismaren	Lake Hornborgasjön	Lake Hjälstaviken	National council
County and local study area, including occurrence of large numbers of geese/other species (reports of > 5,000 individuals <sup>†</sup> )	Skåne county in southernmost Sweden.	Örebro county in southcentral Sweden.	Västra Götaland county in southwestern Sweden.	Uppsala county in southeastern Sweden.	–
	Kristianstad and Bromölla municipalities. Lakes and arable land, some protected land.	Lake Kvismaren (restored) and arable land around it. 732 ha protected land	Lake Hornborga (restored) and arable land around it. 4,000 ha protected land	Lake Hjälstaviken. 808 ha protected land	
	Graylag goose, barnacle goose, bean goose, Canada goose/ Common crane	Graylag goose, bean goose/ Common Crane	Graylag goose/ Common crane	Graylag goose, bean goose, barnacle goose/ Common crane	
Participation Initiated	1997	Approx. 2004	2009	2014-2017 <sup>‡</sup>	2014
Members, approx.	20	10-15	10	5-7	9 organizations (1-3 from each)
Meetings/year approx.	2	2	3-4	N/a	1-2
Attendance	11-20	5-10	5-15	N/a	7-10
Study materials					
Number of interviews (attrition)	6 (0)	4 (3)	5 (1)	4 (0)	4 (2)
Meeting minutes 2015-2019	Yes <sup>§</sup>	Yes	Yes <sup>§</sup>	No	Yes <sup>§</sup>

<sup>†</sup>Based on the Swedish Species Observation System 2015-2019 (Swedish University of Agricultural Sciences).

<sup>‡</sup>While the LMG was dissolved in 2018, cooperation between the County Administrative Boards (CAB) and ornithologists, and between the CAB and individual farmers have continued.

<sup>§</sup>Not all meeting minutes were available.

N/a = not available.

### 3.3. Interviews

Representatives for different positions and interests were contacted for individual interviews; 23 in the selected local study areas and six in the NC. In total, 19 interviews were conducted with local actors (LMG 1-19) and four with national-level actors (NC 20-23) (21 men and 2 women, largely reflecting the gender bias in the groups). Representatives of the governing agencies (SEPA, CABs), managers employed by the CAB (i.e. goose-scaring consultants assisting farmers with scaring), and participating stakeholder groups (farmers, hunters, ornithologists, and public interests) were interviewed (see Table 2). Semi-structured interviews, taking approximately 1 h (39–66 min) were conducted by telephone, recorded, and transcribed. After introductory questions about the participant (e.g. background and education), the interview included questions about goose management, including descriptions of the group's work, the different assets important for adaptive capacity, perceptions of outcomes, and learning (Ostrom 2011; Koontz *et al.* 2015; Cinner *et al.* 2018). The whole multi-level system was discussed, but the focus was on the level (local or national) at which the interviewees were active. The transcripts were analyzed in MAXQDA 11 using a deductive thematic analysis, as described by Braun and Clarke (2006). The deductive framework was based on the IAD presented in Table 1. The expert interview included questions about the WDC's role in the MLM system and the representative was given the opportunity to discuss the main results from the other interviews to validate findings from a systems perspective.

## 4. Results

The CAB engaged in diverse activities at the local level such as occasional information meetings, local networks, and the LMGs. Overall, results revealed differences between study areas with and without an established LMG. Thus, the importance of local participatory groups in MLM systems was supported by the study. To provide insights regarding assets and learning within a participatory MLM system, results focus on contexts with an established LMG but use the study case without as a reference.

### 4.1. Tangible assets

Results revealed that actors in the LMGs were relatively satisfied with the available financial and technical resources, including scaring equipment and access to knowledge. Actors in local settings, and even more so actors in national management, nevertheless highlighted that more funds are required if the aim is to strictly adhere to AM principles (including experiments, modeling, and structured decision-making) and that resource shortages may be a barrier to the development of national management plans. These points are highlighted by these quotes:

We can buy material gradually sort of, when ... yes the birds increase and they go for larger areas, then we need more material. We have been doing that the whole time and bought more and more. We cannot complain about that. LMG 7

If we had more resources, we could do even more. And what I have been thinking about that is also that what I miss around ... an adaptive management approach, is that ... we need good data sort of, to be able to follow up on things. And a good way to

extract data. A standardized way. And that is where the technical solutions re-enter. EXPERT

In addition, as shown by the comparison with the study area without a LMG, sufficient financial means, including agency personnel at the regional level, are needed for the work in LMGs to last over time. Knowledge gaps included both a lack of standardized and accessible data about geese and practical management, such as goose hunting skills. Utilization of available knowledge in practical management was sometimes perceived to be difficult due to, for instance, regulations and land ownership.

#### **4.2. Individual assets**

Results further revealed that engagement was not restricted by high transaction costs, since actors did not believe they devoted a lot of time to work in the groups. As one member of a LMG stated:

It is not so much time because it is meeting ... is it two times a year? I think that is one afternoon there, so direct work in the group is limited to that you could say. LMG 15

Heated disagreements between actors either at the local or national level were not explicit, as highlighted by the following LMG respondent:

I think about this with ornithologists and hunters, what is it that ... what is the conflict all about? I'm thinking since there is no obvious division in the LMG anyway. LMG 9

Nevertheless, different experiences, as well as different value and belief systems, were evident in the results. First, despite agreement upon short-term goals (to reduce crop damage) among the respondents, the vision for the future was more fragmented, with different emphasis among groups placed on the need for goose population targets, changed agricultural practices, and compensation to farmers. Second, problems associated with management tools, such as hunting, were highlighted. One ornithologist stated it like this:

Many of the populations are already so large that I think it is practically impossible to control them, I think that the race is over. I don't know if I think hunting is the right method always. LMG 5

Ornithologists further emphasized the need to follow ethical principles and sustainable hunting practices, such as to avoid crippling of geese and lead contamination of the environment. Hunters, farmers, governance representatives, and scaring consultants rather highlighted the need for more effective goose hunts, as illustrated by the quote below:

Because we need an increased hunting pressure ... I think that we somehow have to get an international understanding for this, concern or positive, it depends how you perceive it, but today it is actually a concern for many that we have a substantially increasing goose population and we need a consensus across countries on how to manage this. LMG 6

Several barriers for more effective hunting were noted, including regulations (the EU Birds directive), a lack of demand for goose meat, limited knowledge and collaboration, insufficient time and motivation among farmers and hunters, as well as not enough hedges and other hiding places in the agricultural landscape reflecting poor physical conditions to hunt.

### 4.3. Governance assets

The SEPA and the CAB have the responsibility and mandate to decide on the management of geese, illustrating a clear role assignment. The CABs used the LMGs for advice – a role appreciated by local level actors. Even though the NC had been initiated for co-operation, it was mainly used for information exchange. The undefined role of the NC is highlighted by the NC participant below:

Yes, no, that is where you come back to the question at issue:” what is it that the NC has the possibility to influence”, but I actually feel that they are listening to the viewpoints. NC 22

Actors at the national level suggested that the SEPA should make better use of NC, but also formalize the entire system, with clearer responsibilities and mandates. Overall, we found little evidence of collaborative governance in the sense of shared responsibilities, but the LMGs displayed more participatory practices than did the NC. The importance of having the agency (SEPA or CAB) as the unbiased leader was highlighted to ensure fair procedures. Results revealed that there may be an overrepresentation of farming interests in the LMGs, and the inclusion of broader public interests was lacking in many local groups, yet this was generally not considered to be unfair, since the farmers are those mainly affected by goose grazing damage. Notably, though, the homogeneity in the LMGs, with an over-representation of older men, may potentially prevent broad inclusiveness of ideas.

With regard to connectivity, there was strong evidence of bonding within the LMGs and the reduced level of dispute within them over time highlights the potential for local participation to mitigate local conflicts:

I think it is working amazingly well. Everybody is listening and embraces viewpoints from the different interests. No, it is really fun to take part and that it is taken seriously. We have several taking part non-profit, but leave their work and come here just because they want to ... think that the questions are important and want to push the work forward. No, so it works very well. LMG 1

Actors in LMGs shared the understanding that superabundant goose populations cause problems for agriculture and the goal to reduce agricultural damage locally, but also to facilitate good relations and reduce conflicts between different interests. This reflects a co-development of goals over time, even though the latter were not explicit. Within the NC there was evidence of bonding, but no shared view of the group's goals. The national workshop for large grazing birds held approximately every 1.5 years by WDC and the CABs for CAB representatives, scaring consultants, and stakeholders served to bridge between the different CABs. At the local level, scaring consultants were important for bridging with other consultants, individual farmers, and ornithologists. Even though the WDC did serve as a link between some of the LMGs

and higher-level management, the linking upwards was constrained and local level actors displayed uncertainty regarding national and international goose management. Shortcomings in the linking between lower and higher levels were found even when an LMG was in place.

On the other hand, when it comes to e.g., WDC it is, of course, collaboration there as well, but that is mainly through dropping off information from their side, what they are doing, their latest findings when it comes to goose populations, goose management more generally. And when it comes to yet another level above it is of course only an information flow downwards, that now this and this regulation has come. LMG 13

The work by AEWA was considered important by the expert at WDC and a more formalized process for connecting the different levels (e.g. using regional councils) was suggested to enhance connectivity in the system. Meeting minutes at the local and national levels permitted transparency, but the diffusion outside management, to media, the general public, and individual farmers and birdwatchers, was limited. Actors in areas without an LMG were more loosely connected to the overall MLM system (mainly via the local scaring consultant) and low connectedness was coupled with low inclusiveness and transparency within the system.

Flexibility was evident in the open discussions both at the national and local levels facilitating an innovative environment. The EU Birds directive was generally considered a barrier to flexible management of barnacle geese, being strictly protected despite its present superabundance as illustrated by the following quote:

I mean, this Bird directive, they say 'you cannot change that'. So there is a need to take detours and thwart. I don't understand why you cannot change the Bird directive.  
LMG 7

The less restrictive approach to derogation shooting of barnacle geese in some of the CABs (also explicit in one of the regional action plans) may be a way to test the scope of action allowed within the current framework. Additional barriers to flexible management included established working practices, insufficient resources to facilitate flexibility, and difficulties associated with implementing the tools available in a flexible manner, such as increased goose culling.

#### **4.4. Learning and outcomes**

The actions taken by some of the CABs, scaring consultants, and the WDC were important for both technical and social learning in the system. Whereas the LMGs were important for learning at the local level, the NC had a more limited role for learning processes at the national level. In addition, the recurring national workshop for the management of large grazing birds played an important role in learning processes, for areas with, as well as those without, an LMG.

From a technical learning perspective, the results suggest that scaring practices (including lethal scaring) were at the core of damage prevention, although more recently, management has also focused on diversion in the form of establishment of foraging areas ('sacrificial fields') (cf. Månsson *et al.* 2015). More specifically, technical learning in the LMGs appeared mainly in terms of 'trial and error' approaches by the local scaring consultant, sometimes in collaboration with individual farmers.

If he [the scaring consultant] has been out, he will describe the effect of what he has been doing. But I have not experienced a purely formalized evaluation, no. Then it is the landowners and the hunters, they gladly evaluate their work and share their experiences, they do. But that is not formalized either, but will be a discussion just for the moment and then there is no more after that. LMG 12

The consecutive phases of the AM cycle were, thus, not systematically implemented. Nevertheless, more formal evaluations were conducted by the WDC, often in collaboration with the LMGs.

We have been lucky to have the WDC doing trials around the lake, with extensive activities two, three years in a row, where you have been able to observe the effect of scaring. And now this year we also try to establish derogation fields in three different places around the lake and that is yet another step to find fields that can be left undisturbed completely and scare in other places. So, I think we are getting a fairly good understanding of which method works and which doesn't. LMG 6

Even though a more systematic technical learning process was lacking in the LMGs, suggesting that a key component of the AM approach was absent, the collaboration between scaring consultants and researchers at the WDC strengthened the technical learning. Data on costs for prevention and compensation for goose damage suggest that damage levels are increasing in many parts of Sweden (Montrás-Janer *et al.* 2019, Frank *et al.* 2020), but the trend in areas with an LMG cannot be assessed, since data on goose damage levels with high spatial resolution are lacking. Actors in the LMGs perceived a reduction in agricultural damage in their local area over time, even though available tools were not perceived to be sufficient to manage increasing goose populations in the future.

Social learning was evident in the LMGs, with a shared problem perception and short-term goals for the group. A gradual increase in the understanding of how crop damage can be reduced (indicating cognitive learning) as well as trust and mutual understanding (reflecting relational learning) were evident, as shown in the following quote:

And what may be the most important thing I have experienced the last year, that is the respect for each other's differences in that ... yes, want to be with the geese or use the geese, or watch the geese, or whatever you want to do with them. The respect has increased. And the understanding that people think differently about the geese. LMG 12

Reluctance to discuss changes in, for example, agricultural practices and the lack of a joint vision for the MLM system indicate limitations in normative learning. In other words, most of the learning consisted of single-loop learning, but the discontent associated with the strong focus on scaring in some of the LMGs may signal the initiation of double-loop learning. With regard to social outcomes in the MLM system, the increasing level of trust within the LMGs over time will likely enable them to respond to local conflicts and facilitate collective local management solutions. Inertia in the system including regulations (the EU Birds directive) and lack of effective measures to address the actual problems may limit the scope of action in management, eventually leading to reduced trust in the system as a whole, as shown in the following quotes:

Nine out of ten farmers are very happy with how it works and we have a good collaboration with other interests. But I feel that the work we are doing here, we are only putting out fires. We do not seriously influence management, at all. LMG 1

We have one goose species, barnacle goose, that is increasing tremendously across Europe ... It would obviously have been –... yes, get a little more ... get better hunting times on that for example. Then the trust in the top of the pyramid would increase. LMG 8

Despite individual efforts, mainly by scaring consultants in local areas without an LMG, results suggest lower levels of preparedness when local participation is lacking. Finally, results suggest that actors, particularly at higher levels in the system, may be directing more attention to other wildlife. Some of the lack in assets needed to build adaptive capacity (tangible resources) may, thus, be associated with geese not being prioritized by all involved actors.

We don't really have the energy to think about this as well, among wolves, moose, wild boar and deer and everything. By tradition, we focus on large animals in Sweden, and I think we are doing ourselves a disservice. It would be much better if we started to work hard with this now rather than wait until it is too late. NC 23

## 5. Discussion

In this study, the IAD framework allowed us to outline how adaptive capacity in an MLM system can be analyzed. In line with previous research (e.g. Fidelman *et al.* 2017), the study highlights the importance of exploring the tangible assets available and how management processes are governed within an institutional framework. Comparable to Johansson *et al.* (2020), results point toward a need to not overlook the actors and how individual processes feed into participatory AM. The present study shows that also in an MLM system, where international collaboration and coordination are important, adaptive capacities are needed at different levels in the system. For goose management in Sweden, the study suggests ways of strengthening the adaptive capacity by: 1) formalizing the system and improving communication, 2) more systematically implementing AM at all levels, and 3) ensuring stakeholder acceptance for tools and a long-term vision.

### 5.1. Formalizing the system and improving communication

Participatory processes in goose management in Sweden were formed at the local level. Increasing local problems with goose damage on agricultural crops ultimately resulted in the formation of LMGs in some local areas (Hake, Månsson, and Wiberg 2010; Tuvendal and Elmberg 2015). The widespread satisfaction among actors in the LMGs evident in this study confirms the potential of these groups to address negative emotional reactions and disagreements between actors (cf. Redpath *et al.* 2013). It is necessary to advance goose management from 'hot-spots' where extensive crop damage occurs in fields close to protected land to other areas by, for example, establishing additional LMGs and strengthening outreach to farmers and hunters. The study revealed difficulties associated with establishing a matching partnership at the national level. It was proposed by actors at the national level that work in the NC would need



to be formalized. Deliberate steps to enhance participatory processes can be taken by considering the preferred degree of collaboration and authority to make decisions (who will make decisions and how) as well as the amount of resources and time needed (Pratt Miles 2013). With regulations distinctly governing goose management, participatory processes at higher levels are important to ensure that top-down processes not only encompass restrictions but also resources and support. Overall, CABs, local scaring consultants, the WDC, and the national workshop for large grazing birds have contributed to the formation and connectivity of the system, but a disconnect between higher levels (national and international) and lower levels (regional and local) was evident. Additional efforts to ensure continuous dialogue are needed.

### **5.2. More systematically implementing AM at all levels**

AM should allow for flexibility in management while not jeopardizing the long-term viability of vulnerable populations. As illustrated by the regulations for barnacle geese, the static nature of the EU Birds directive constrains adaptive responses. There may be means to deal with this via increased derogation shooting, as shown in this study and on Islay in Scotland (McKenzie and Shaw 2017), but the judicial support is uncertain. This study shows that relational learning may be inhibited with reduced trust in the higher levels of the system if superabundant species are strictly protected. When regulations constrain the possibilities for agencies to govern there is also a risk for an over-emphasis on management issues rather than the governing of management processes. In line with earlier SES research (Ostrom 2009), this study shows that constraints on adaptive responses were also rooted in exogenous conditions. For example, problems associated with efforts to intensify hunting in a sustainable manner were rooted in the farming landscape, ownership structure, and the access to and use of different assets. Flexible management of geese requires actions at multiple levels and within different domains. A more systematic implementation of the different phases of AM may have advantages for what the LMGs can achieve locally. In addition, continuous monitoring and coordinated data collection of, for example, population size, hunting bags, and damage reports would add knowledge to the development of national and international management of waterfowl in Europe (Elmberg *et al.* 2006). Coordination between AM at different levels is important to create conditions for adaptive responses, since obstacles to AM at the local level may need to be addressed at higher levels in the system. Assessment of the feasibility of AM in this context, including sufficient resources and benefits (Rist *et al.* 2013), may aid strategic decisions regarding how to develop goose management in the future. Higher ambitions in management are likely to require that involved actors, and even the larger society (the general public and politicians), realize the urgency of managing geese relative to other wildlife.

### **5.3. Ensuring stakeholder acceptance for tools and a long-term vision**

The lack of a long-term vision and coherence reflects the extent to which this MLM system is still in its formative stages. The AEWA and the EGMP consider different outcomes, such as crop damage and viable goose populations (e.g. Powolny *et al.* 2018). In contrast, the NC and LMGs mainly focus on crop damage. Such a restricted focus makes it easier to delineate management, but a broader scope in terms of multi-species management ensures consideration of interactions between species and diverse

outcomes (Van Dyke and Lamb 2020). Management scope may have implications for stakeholder engagement, because a narrow focus may boost engagement in some stakeholder groups but not in others. Farmers may, for example, be more willing to engage in management targeting crop damage mitigation, but the opposite may be true for ornithologists. Ambiguities regarding the long-term goals may be reduced by the upcoming national management plan for geese in Sweden. The present study nevertheless suggests that underlying differences in stakeholders' value and belief systems may also surface due to the different opinions regarding, for example, population targets. Even with a long-term vision in place, continuous dialogue is necessary to ensure stakeholder acceptance of management tools and goals (Williams and Madsen 2013).

## 6. Conclusions

Insights from this study may be used to further develop participatory goose management in other European countries and at the EU level. Results demonstrate how diverse assets (tangible, individual, governance) and coordination of management at different levels (international, national, regional, local) are needed to achieve technical and social learning in the system. To facilitate learning it is also necessary for insights derived at lower levels in the system to feed into participatory processes, the development of management plans, and regulative processes. For example, focus groups with local farmers in different countries may be used to inform higher level processes. This may also help in connecting local farmers to the MLM system, given the need to ensure such bridges for legitimate and effective goose management (cf. Eriksson *et al.* 2022).

## Acknowledgements

The authors would like to thank the study participants.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This work was supported by the Swedish Environmental Protection Agency under Grants 16/72; NV-00695-17 to JE and 16/71; NV-00695-17 to JM.

## Data availability

The transcribed interviews are not publicly available because they contain information that could compromise the privacy of research participants. The documentation (e.g. meeting minutes and regional action plans) that supports the findings of this study is available on request from the corresponding author [LE].

## 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 Swedish legislation, no explicit ethical approval was required for this study.

## ORCID

Louise Eriksson  <http://orcid.org/0000-0002-6673-0079>  
 Maria Johansson  <http://orcid.org/0000-0001-7947-3297>  
 Johan Månsson  <http://orcid.org/0000-0002-5189-2091>  
 Camilla Sandström  <http://orcid.org/0000-0002-7674-6197>  
 Johan ElMBERG  <http://orcid.org/0000-0003-2337-4155>

## References

- Anderson, M. G., and P. I. Padding. 2015. "The North American Approach to Waterfowl Management: Synergy of Hunting and Habitat Conservation." *International Journal of Environmental Studies* 72 (5): 810–829. doi:10.1080/00207233.2015.1019296.
- Baggio, J. A., A. J. Barnett, I. Perez-Ibarra, U. Brady, E. Ratajczyk, N. Rollins, C. Rubiños, et al. 2016. "Explaining Success and Failure in the Commons: The Configural Nature of Ostrom's Institutional Design Principles." *International Journal of the Commons* 10 (2): 417–439. doi:10.18352/ijc.634/.
- Baird, J., R. Plummer, C. Haug, and D. Huitema. 2014. "Learning Effects of Interactive Decision-Making Processes for Climate Change Adaptation." *Global Environmental Change* 27: 51–63. doi:10.1016/j.gloenvcha.2014.04.019.
- Bakker, E. S., C. G. F. Veen, G. J. N. Ter Heerdt, N. Huig, and J. M. Sarneel. 2018. "High Grazing Pressure of Geese Threatens Conservation and Restoration of Reed Belts." *Frontiers in Plant Science* 9: 1649. doi:10.3389/fpls.2018.01649.
- Bjärstig, T., C. Sandström, S. Lindqvist, and E. Kvastegård. 2014. "Partnerships Implementing Ecosystem-Based Moose Management in Sweden." *International Journal of Biodiversity Science, Ecosystem Services & Management* 10 (3): 228–239. doi:10.1080/21513732.2014.936508.
- Braun, V., and V. Clarke. 2006. "Using Thematic Analysis in Psychology." *Qualitative Research in Psychology* 3 (2): 77–101. doi:10.1191/1478088706qp063oa.
- Buij, R., T. C. P. Melman, M. J. J. E. Loonen, and A. D. Fox. 2017. "Balancing Ecosystem Function, Services and Disservices Resulting from Expanding Goose Populations." *Ambio* 46 (Suppl. 2): 301–318. doi:10.1007/s13280-017-0902-1.
- Cinner, J. E., W. N. Adger, E. H. Allison, M. L. Barnes, K. Brown, P. J. Cohen, S. Gelcich, et al. 2018. "Building Adaptive Capacity to Climate Change in Tropical Coastal Communities." *Nature Climate Change* 8 (2): 117–123. doi:10.1038/s41558-017-0065-x.
- Craig, R. K., A. S. Garmestani, C. R. Allen, C. A. Arnold, H. Birgé, D. A. DeCaro, A. K. Fremier, H. Gosnell, and E. Schlager. 2017. "Balancing Stability and Flexibility in Adaptive Governance: An Analysis of Tools Available in U.S. environmental Law." *Ecology and Society: A Journal of Integrative Science for Resilience and Sustainability* 22 (2): 1–3. doi:10.5751/ES-08983-220203.
- Davies, A. L., and R. M. White. 2012. "Collaboration in Natural Resource Governance: Reconciling Stakeholder Expectations in Deer Management in Scotland." *Journal of Environmental Management* 112: 160–169. doi:10.1016/j.jenvman.2012.07.032.
- Directive 2009/147/EC of the European Parliament and of the council of 30 November 2009 on the conservation of wild birds (codified version). 2009. *Official Journal of the European Union*, L 20/7-20/25. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN>
- Dressel, S., G. Ericsson, and C. Sandström. 2018. "Mapping Social-Ecological Systems to Understand the Challenges Underlying Wildlife Management." *Environmental Science & Policy* 84: 105–112. doi:10.1016/j.envsci.2018.03.007.
- Dressel, S., M. Johansson, G. Ericsson, and C. Sandström. 2020. "Perceived Adaptive Capacity within a Multi-Level Governance Setting: The Role of Bonding, Bridging, and

- Linking Social Capital.” *Environmental Science & Policy* 104: 88–97. doi:10.1016/j.envsci.2019.11.011.
- Elmberg, J., P. Nummi, H. Pöysä, K. Sjöberg, G. Gunnarsson, P. Clausen, M. Guillemain, D. Rodrigues, and V-M. Väänänen. 2006. “The Scientific Basis for New and Sustainable Management of Migratory European Ducks.” *Wildlife Biology* 12 (2): 121–127. doi:10.2981/0909-6396(2006)12[121:TSBFNA]2.0.CO;2.
- Eriksson, L., M. Johansson, J. Månsson, S. Redpath, C. Sandström, and J. Elmberg. 2022. “Individuals and Multilevel Management: A Study of the Perceived Adaptive Capacity of the Goose Management System among Farmers in Sweden.” *Society & Natural Resources* 35 (1): 1–19. doi:10.1080/08941920.2021.2015497.
- Fabricius, C., and G. Cundill. 2014. “Learning in Adaptive Management: Insights from Published Practice.” *Ecology and Society* 19 (1): 29. doi:10.5751/ES-06263-190129.
- Fidelman, P., T. Van Tuyen, K. Nong, and M. Nursey-Bray. 2017. “The Institutions-Adaptive Capacity Nexus: Insights from Coastal Resources Co-Management in Cambodia and Vietnam.” *Environmental Science & Policy* 76: 103–112. doi:10.1016/j.envsci.2017.06.018.
- Fox, A. D., and J. Madsen. 2017. “Threatened Species to Super-Abundance: The Unexpected International Implications of Successful Goose Conservation.” *Ambio* 46 (Suppl. 2): 179–187. doi:10.1007/s13280-016-0878-2.
- Frank, J., J. Månsson, M. Levin, and L. Höglund. 2020. *Viltskadestatistik 2019*. [Wildlife Damage Statistics 2019]. Report, SLU Viltskadecenter 2020–2. <https://www.slu.se/globalassets/ew/org/centrb/vsc-dokument/vsc-publikationer/rapporter/viltskadestatistikrapporter/viltskadestatistik-2019.pdf>
- Fulton, D. C., M. J. Manfredo, and J. Lipscomb. 1996. “Wildlife Value Orientations: A Conceptual and Measurement Approach.” *Human Dimensions of Wildlife* 1 (2): 24–47. doi:10.1080/10871209609359060.
- Gosnell, H., B. C. Chaffin, J. B. Ruhl, C. A. Arnold, R. K. Craig, M. H. Benson, and A. Devenish. 2017. “Transforming (Perceived) Rigidity in Environmental Law through Adaptive Governance: A Case of Endangered Species Act Implementation.” *Ecology and Society* 22 (4): 42. doi:10.5751/ES-09887-220442.
- Green, A. J., and J. Elmberg. 2014. “Ecosystem Services Provided by Waterbirds.” *Biological Reviews of the Cambridge Philosophical Society* 89 (1): 105–122. doi:10.1111/brv.12045.
- Gupta, J., C. Termeer, J. Klostermann, S. Meijerink, M. van den Brink, P. Jong, S. Nooteboom, and E. Bergsma. 2010. “The Adaptive Capacity Wheel: A Method to Assess the Inherent Characteristics of Institutions to Enable the Adaptive Capacity of Society.” *Environmental Science & Policy* 13 (6): 459–471. doi:10.1016/j.envsci.2010.05.006.
- Hahn, T. 2011. “Self-Organized Governance Networks for Ecosystem Management: Who is Accountable?” *Ecology and Society* 16 (2): 18. doi:10.5751/ES-04043-160218.
- Hake, M., J. Månsson, and A. Wiberg. 2010. “A Working Model for Preventing Crop Damage Caused by Increasing Goose Populations in Sweden.” *Ornis Svecica* 20 (3–4): 225–233. doi:10.34080/os.v20.22628.
- Holmgren, L., C. Sandström, and A. Zachrisson. 2017. “Protected Area Governance in Sweden: New Modes of Governance or Business as Usual?” *Local Environment* 22 (1): 22–37. doi:10.1080/13549839.2016.1154518.
- Huitema, D., E. Mostert, W. Egas, S. Moellenkamp, C. Pahl-Wostl, and R. Yalcin. 2009. “Adaptive Water Governance: Assessing the Institutional Prescriptions of Adaptive (co-) Management from a Governance Perspective and Defining a Research Agenda.” *Ecology and Society* 14 (1): 26. doi:10.5751/ES-02827-140126.
- Jensen, G. H., J. Madsen, S. Nagy, and M. Lewis. (Compilers) 2018. *AEWA International Single Species Management Plan for the Barnacle Goose (Branta Leucopsis) - Russia/Germany & Netherlands population, East Greenland/Scotland & Ireland population, Svalbard/South-west Scotland population*. AEWA Technical Series No. 70. Bonn, Germany. [https://egmp.aewa.info/sites/default/files/download/population\\_status\\_reports/AEWA%20International%20Single%20Species%20Management%20Plan%20for%20the%20Barnacle%20Goose.pdf](https://egmp.aewa.info/sites/default/files/download/population_status_reports/AEWA%20International%20Single%20Species%20Management%20Plan%20for%20the%20Barnacle%20Goose.pdf)
- Johannessen, Å., Å. Gerger Swartling, C. Wamsler, K. Andersson, J. T. Arran, D. I. Hernández Vivas, and T. A. Stenström. 2019. “Transforming Urban Water Governance through Social (Triple-Loop) Learning.” *Environmental Policy and Governance* 29 (2): 144–154. doi:10.1002/et.1843.

- Johansson, M., S. Dressel, G. Ericsson, A. Sjölander-Lindqvist, and C. Sandström. 2020. "How Stakeholder Representatives Cope with Collaboration in the Swedish Moose Management System." *Human Dimensions of Wildlife* 25 (2): 154–170. doi:10.1080/10871209.2019.1698081.
- Johnson, F. A., G. S. Boomer, B. K. Williams, J. D. Nichols, and D. J. Case. 2015. "Multilevel Learning in the Adaptive Management of Waterfowl Harvests: 20 Years and Counting." *Wildlife Society Bulletin* 39 (1): 9–19. doi:10.1002/wsb.518.
- Koontz, T. M., D. Gupta, P. Mudliar, and P. Ranjan. 2015. "Adaptive Institutions in Social-Ecological Systems Governance: A Synthesis Framework." *Environmental Science & Policy* 53: 139–151. doi:10.1016/j.envsci.2015.01.003.
- Koop, S., F. Monteiro Gomes, L. Schoot, C. Dieperink, P. Driessen, and K. Van Leeuwen. 2018. "Assessing the Capacity to Govern Flood Risk in Cities and the Role of Contextual Factors." *Sustainability* 10 (8): 2869. doi:10.3390/su10082869.
- Lockwood, M. 2010. "Good Governance for Terrestrial Protected Areas: A Framework, Principles and Performance Outcomes." *Journal of Environmental Management* 91 (3): 754–766. doi:10.1016/j.jenvman.2009.10.005.
- Lockwood, M., J. Davidson, A. Curtis, E. Stratford, and R. Griffith. 2010. "Governance Principles for Natural Resource Management." *Society & Natural Resources* 23 (10): 986–1001. doi:10.1080/08941920802178214.
- Lubell, M., M. Niles, and M. Hoffman. 2014. "Extension 3.0: Managing Agricultural Knowledge Systems in the Network Age." *Society & Natural Resources* 27 (10): 1089–1103. doi:10.1080/08941920.2014.933496.
- Månsson, J., P. Risberg, I. Ångsteg, and U. Hagbarth. 2015. *Riktlinjer För Förvaltning av Stora Fåglar i Odlingslandskapet: Åtgärder, Ersättningar och Bidrag*. [Guidelines for the Management of Large Birds in the Agricultural Landscape: Measures, Compensation, and Subsidies]. Report from the Swedish National Protection Agency and the Wildlife Damage Centre, SLU: 2015–3. <https://www.slu.se/globalassets/ew/org/centrb/vsc/vsc-dokument/vsc-publikationer/rapporter/2015/riktlinjer-forvaltning-stora-faglar-i-odlingslandskapet-web.pdf>.
- Marjakangas, A., M. Alhainen, A.D. Fox, T. Heinicke, J. Madsen, L. Nilsson, and S. Rozenfeld. (Compilers). 2015. *International Single Species Action Plan for the Conservation of the Taiga Bean Goose (Anser Fabalis Fabalis)*. AEWa Technical Series No. 56. Bonn, Germany: AEWa. [https://www.unep-aewa.org/sites/default/files/publication/ts56\\_issap\\_tbg\\_0.pdf](https://www.unep-aewa.org/sites/default/files/publication/ts56_issap_tbg_0.pdf)
- McKenzie, R., and J. M. Shaw. 2017. "Reconciling Competing Values Placed upon Goose Populations: The Evolution of and Experiences from the Islay Sustainable Goose Management Strategy." *Ambio* 46 (Suppl 2): 198–209. doi:10.1007/s13280-016-0880-8.
- Montrás-Janer, T., J. Knape, L. Nilsson, I. Tombre, T. Pärt, and J. Månsson. 2019. "Relating National Levels of Crop Damage to the Abundance of Large Grazing Birds: Implications for Management." *Journal of Applied Ecology* 56 (10): 2286–2297. doi:10.1111/1365-2664.13457.
- Nichols, J. D., M. C. Runge, F. A. Johnson, and B. K. Williams. 2007. "Adaptive Harvest Management of North American Waterfowl Populations: A Brief History and Future Prospects." *Journal of Ornithology* 148 (S2): 343–349. doi:10.1007/s10336-007-0256-8.
- Nilsson, L. 2013. "Censuses of Autumn Staging and Wintering Goose Populations in Sweden 1977/1978–2011/2012." *Ornis Svecica* 23 (1): 3–45. doi:10.34080/os.v23.22582.
- Nilsson, L., and H. Kampe-Persson. 2020. Changes in Numbers of Staging and Wintering Geese in Sweden: 1977/78–2019/20. *Wildfowl* 70: 107–126. <https://wildfowl.wwt.org.uk/index.php/wildfowl/article/view/2722>
- Nyberg, B. 1999. *An Introductory Guide to Adaptive Management for Project Leaders and Participants*. Victoria, BC: Forest Service. <https://planet.uwc.ac.za/nisl/ESS/ESS121/Introductory-Guide-AM.pdf>.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Ostrom, E. 2009. "A General Framework for Analyzing Sustainability of Social-Ecological Systems." *Science (New York, NY)* 325 (5939): 419–422. doi:10.1126/science.1172133.
- Ostrom, E. 2011. "Background on the Institutional Analysis and Development Framework." *Policy Studies Journal* 39 (1): 7–27. doi:10.1111/j.1541-0072.2010.00394.x.
- Pahl-Wostl, C. 2009. "A Conceptual Framework for Analysing Adaptive Capacity and Multi-Level Learning Processes in Resource Governance Regimes." *Global Environmental Change* 19 (3): 354–365. doi:10.1016/j.gloenvcha.2009.06.001.

- Powolny, T., G. H. Jensen, S. Nagy, A. Czajkowski, A. D. Fox, M. Lewis, and J. Madsen (Compilers). 2018. "AEWA International Single Species Management Plan for the Graylag Goose (*Anser Anser*).” AEWA Technical Series No. 71. Bonn, Germany. [https://www.unep-aewa.org/sites/default/files/publication/ts71\\_issmp\\_greylag%20goose\\_complete.pdf](https://www.unep-aewa.org/sites/default/files/publication/ts71_issmp_greylag%20goose_complete.pdf)
- Pratt Miles, J. D. 2013. "Designing Collaborative Processes for Adaptive Management: Four Structures for Multistakeholder Collaboration." *Ecology and Society* 18 (4): 5. doi:10.5751/ES-05709-180405.
- Ratner, B. D., R. Meinzen-Dick, C. May, and E. Haglund. 2013. "Resource Conflict, Collective Action, and Resilience: An Analytical Framework." *International Journal of the Commons* 7 (1): 183–208. doi:10.18352/ijc.276/.
- Redpath, S. M., J. Young, A. Evely, W. M. Adams, W. J. Sutherland, A. Whitehouse, A. Amar, et al. 2013. "Understanding and Managing Conservation Conflicts." *Trends in Ecology & Evolution* 28 (2): 100–109. doi:10.1016/j.tree.2012.08.021.
- Rist, L., A. Felton, L. Samuelsson, C. Sandström, and O. Rosvall. 2013. "A New Paradigm for Adaptive Management." *Ecology and Society* 18 (4): 63. doi:10.5751/ES-06183-180463.
- Rist, L., B. M. Campbell, and P. Frost. 2013. "Adaptive Management: Where Are we Now?" *Environmental Conservation* 40 (1): 5–18. doi:10.1017/S0376892912000240.
- Runge, M. C. 2011. "An Introduction to Adaptive Management for Threatened and Endangered Species." *Journal of Fish and Wildlife Management* 2 (2): 220–233. doi:10.3996/082011-JFWM-045.
- Sandström, C., S. Wennberg Di Gasper, and K. Öhman. 2013. "Conflict Resolution through Ecosystem-Based Management: The Case of Swedish Moose Management." *International Journal of the Commons* 7 (2): 549–570. doi:10.18352/ijc.349/.
- Siders, A. R. 2019. "Adaptive Capacity to Climate Change: A Synthesis of Concepts, Methods, and Findings in a Fragmented Field." *WIREs Climate Change* 10 (3): e573. doi:10.1002/wcc.573.
- Stroud, D. A., J. Madsen, and A. D. Fox. 2017. "Key Actions towards the Sustainable Management of European Geese." *Ambio* 46 (Suppl 2): 328–338. doi:10.1007/s13280-017-0903-0.
- Susskind, L., A. E. Camacho, and T. Schenk. 2012. "A Critical Assessment of Collaborative Adaptive Management in Practice." *Journal of Applied Ecology* 49 (1): 47–51. doi:10.1111/j.1365-2664.2011.02070.x.
- Swedish Environmental Protection Agency (SEPA). 2015. *Strategi För Svensk Viltförvaltning*. [Strategy for Swedish Wildlife Management]. Stockholm, Sweden: SEPA.
- Thaler, T., and M. Levin-Keitel. 2016. "Multi-Level Stakeholder Engagement in Flood Risk Management—A Question of Roles and Power: Lessons from England." *Environmental Science & Policy* 55: 292–301. doi:10.1016/j.envsci.2015.04.007.
- Tombre, I. M., A. Brunner, B. D'Hondt, H. Düttmann, R. Enzerink, A. Fox, and N. Feige et al. 2019. *An Overview of the Management Measures for Geese in Range States of the European Goose Management Platform*. AEWA EGMP Technical Report No. 10. Bonn, Germany: AEWA. [https://egmp.aewa.info/sites/default/files/download/population\\_status\\_reports/EGMP\\_010\\_Management\\_measures\\_for\\_geese\\_0.pdf](https://egmp.aewa.info/sites/default/files/download/population_status_reports/EGMP_010_Management_measures_for_geese_0.pdf)
- Tuvendal, M., and J. Elmberg. 2015. "A Handshake between Markets and Hierarchies: Geese as an Example of Successful Collaborative Management of Ecosystem Services." *Sustainability* 7 (12): 15937–15954. doi:10.3390/su71215794.
- Van Dyke, F., and R. L. Lamb. 2020. "Conservation through Ecosystem Management." In: *Conservation Biology*, 359–410. Cham: Springer. doi:10.1007/978-3-030-39534-6\_9.
- Vedung, E. 2016. *Implementering i Politik Och Förvaltning*. Lund: Studentlitteratur.
- Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Washington, DC: Adaptive Management Working Group, US Department of the Interior.
- Williams, J. H., and J. Madsen. 2013. "Stakeholder Perspectives and Values When Setting Waterbird Population Targets: Implications for Flyway Management Planning in a European Context." *PloS One* 8 (11): e81836. doi:10.1371/journal.pone.0081836.
- Wroblewsky, A., and A. Leitner. 2009. "Between Scientific Standards and Claims to Efficiency: Expert Interviews in Programme Evaluation." In *Interviewing Experts*, edited by A. Bogner, B. Littig, and W. Menz, 235–251. London: Palgrave Macmillan.