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# How to balance forestry and biodiversity conservation

A view across Europe



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# Integrative wildlife management based on the adaptive, collaborative management of social-ecological systems

# B7

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## Introduction

Challenges in forest and wildlife management are increasing in Europe as a result of growing tensions between forest production, forest adaptation to climate change, biodiversity conservation, as well as other goals such as hunting, recreation, and tourism. These tensions also extend to issues concerning the provision of habitat for wildlife and damage caused to forest stands by specific species (in Europe mainly by even-toed ungulates) (Niemi *et al.* 2005; Kolström *et al.* 2011; Redpath *et al.* 2013). Forest and wildlife management and biodiversity conservation are also linked to developments of land use, human demographics and livelihoods, wildlife populations, habitats, as well as climate on a global scale (Distefano 2005). Consequently, the activities of various stakeholders directly or indirectly influence wild animals and their habitats, as well as the tasks and actions of other stakeholders. Reconciling different demands often leads to conflicts between the various stakeholders and the various activities such as forestry, farming, hunting, tourism, and conservation (Redpath *et al.* 2015). These conflicts often have significant economic, social, and ecological impacts on both biodiversity and humans and their livelihoods (Young *et al.* 2010; Harich *et al.* 2013).

Adaptive collaborative management (ACM) of social-ecological systems (SES) has been promoted as a promising approach to address these challenges (see e.g., Allen and Garmestani 2015). It can also serve as a basis for the development of a working wildlife management concept (Butler *et al.* 2015). An analysis using the SES framework helps to gain a better understanding of processes in a wildlife management case (Williams and Tai 2016) and ACM helps to develop natural resource management strategies in light of the complexity, uncertainty, and change arising from the challenges mentioned above (Armitage *et al.* 2009). Political and social factors should be considered and combined with ecological aspects (Bennett *et al.* 2017).

An integration of knowledge by linking various fields of science (and practice as well) is crucial for the understanding of interlinked SES and the development of sustainable management solutions (Johansson *et al.* 2016). Such integrative wildlife management covers all areas of activity and measures affecting the occurrence, behaviour, and population development of wild animals and their habitats as well as the relationships and actions of stakeholders (Redpath *et al.* 2015). A comprehensive approach is needed in which all stakeholders are involved in the identification and implementation of solutions to the above-mentioned conflicts and to create pathways for shared responsibility and cooperation. In this regard, participation is a key element in the process, but there is no universal panacea. Instead, approaches must be tailored to deal with the complexity of the relevant SES, focusing both on the process and the outcome of participation (Reed 2008).

< Fig. B7.1. While big predators are widely absent in Europe, the management of wildlife, in particular of ungulates, is an important part of managing forests and habitats. The sustainable provision of important forest goods and services directly depends on the availability of targeted tree regeneration which can be highly impacted by excessive populations of e.g. red deer, sika deer roe deer and mountain goat (picture) (Photo: Ulrich Wasem).

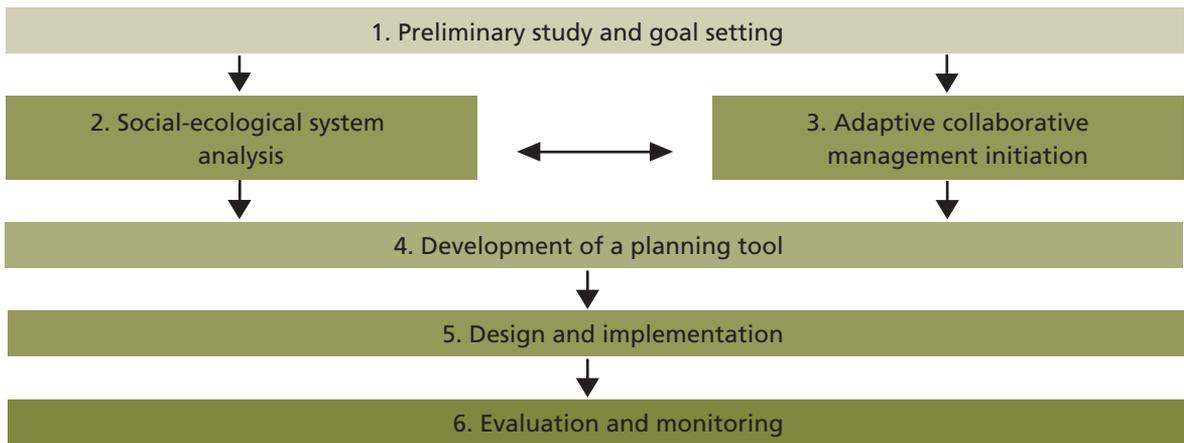


Fig. B7.2. Approach for the development of an integrative wildlife management concept.

In the remainder of this chapter, we present an approach for the development of an integrative wildlife management concept that aims to improve the balance between biodiversity conservation and other forest management goals. It is based on the ACM of SES as well as on existing frameworks and success criteria of integrative wildlife management; the approach consists of six steps (fig. B7.2).

We illustrate the approach with a case example concerning red deer (*Cervus elaphus*) management in the Northern Black Forest in Germany, and then discuss general insights that may be transferable to other contexts.

## Case example

In the German federal state Baden-Württemberg, red deer populations have been restricted to five legally defined 'red deer areas' since 1958. These areas were implemented because of extensive damage caused by red deer, the risk of traffic accidents, and stakeholder demands. Inside red deer areas, red deer is controlled by an annual game harvest plan. Outside red deer areas, all red deer shall be shot. There is some exchange between populations of different areas, but adjacent residence, industry, agriculture, and traffic are barriers for animal movement. The largest red deer area is located in the Northern Black Forest (NBF, covering 105 000 ha). Owing to the high proportion of dense forest

stands with little understorey vegetation and lack of alternative food sources in the NBF, red deer often browse on new shoots of trees and peel off the bark from larger trees. These impacts have led to discussions about forest management and biodiversity conservation, both in managed forests and in protected forests. Because of red deer's extended spatial use and complex social behaviour, its management is best coordinated across large areas. However, this has proven to be difficult because of the diverse landowner structure, the small size of hunting districts, the differing management strategies of the various stakeholders involved, and an increase of recreational activities in the NBF. In addition, the living conditions of red deer have changed as a result of large-scale windthrows and red deer population growth. Also, the Black Forest National Park was established in 2014 in the NBF, covering 10 062 ha of the NBF red deer area. The establishment of the national park has changed the conversational atmosphere, leading to tensions between stakeholders regarding wildlife and forest management, as well as associated questions of wood production, hunting, and biodiversity conservation. Therefore, an independent, interdisciplinary research team (including the authors of this chapter) has been assigned to develop a sustainable management concept for red deer management in the NBF<sup>1</sup>. The research team was responsible for the scientific studies, as well as the initiation and implementation of moderation and planning processes.

<sup>1</sup> Promoters of the project were the Ministry of Rural Affairs and Consumer Protection Baden-Württemberg and the Black Forest National Park.

## Development of an integrative wildlife management concept

### 1. Preliminary study and goal setting

There are no clear boundaries around SES, and so the definition of a specific SES in a preliminary study is a necessary starting point to enable any planning process. This can be achieved with the support of the SES framework (Ostrom 2007, 2009; Ostrom and Cox 2010; McGinnis and Ostrom 2014) to analyse and structure natural resource management cases (Cox *et al.* 2010). The distinction of an SES is determined by social and ecological divides, such as management objectives, the distribution area for a species, or a protected area and its environment. In the NBF, the SES was predetermined by the boundaries of the red deer area. In a preliminary examination, basic SES elements were analysed by collecting data on forest structures and habitat characteristics, red deer population and distribution, land use, wildlife impacts on tree regeneration and vegetation, governance structures, and stakeholders. It is also important to define goals for the integrative wildlife management concept to be

developed; these have to be coordinated between stakeholders, reconciling different forest and habitat functions, such as forest production and biodiversity conservation (Palomo *et al.* 2011). Therefore, preliminary conversations were conducted with stakeholders in the NBF, such as governmental and administrative actors, municipal and private landowners, foresters, hunters, national park administration, representatives of the tourism sector, and conservation organisations. Together with these stakeholders, the following goals were defined as desired outcomes of an integrative red deer management concept:

1. Restriction of wildlife damage caused by red deer damage to an extent that can be tolerated by landowners;
2. Continued provision of suitable habitat for a minimum viable population of red deer;
3. Locally differentiated adaptation (increase or reduction) of the red deer population following goals (1) and (2);
4. Creation of attractive hunting opportunities and hunting value;

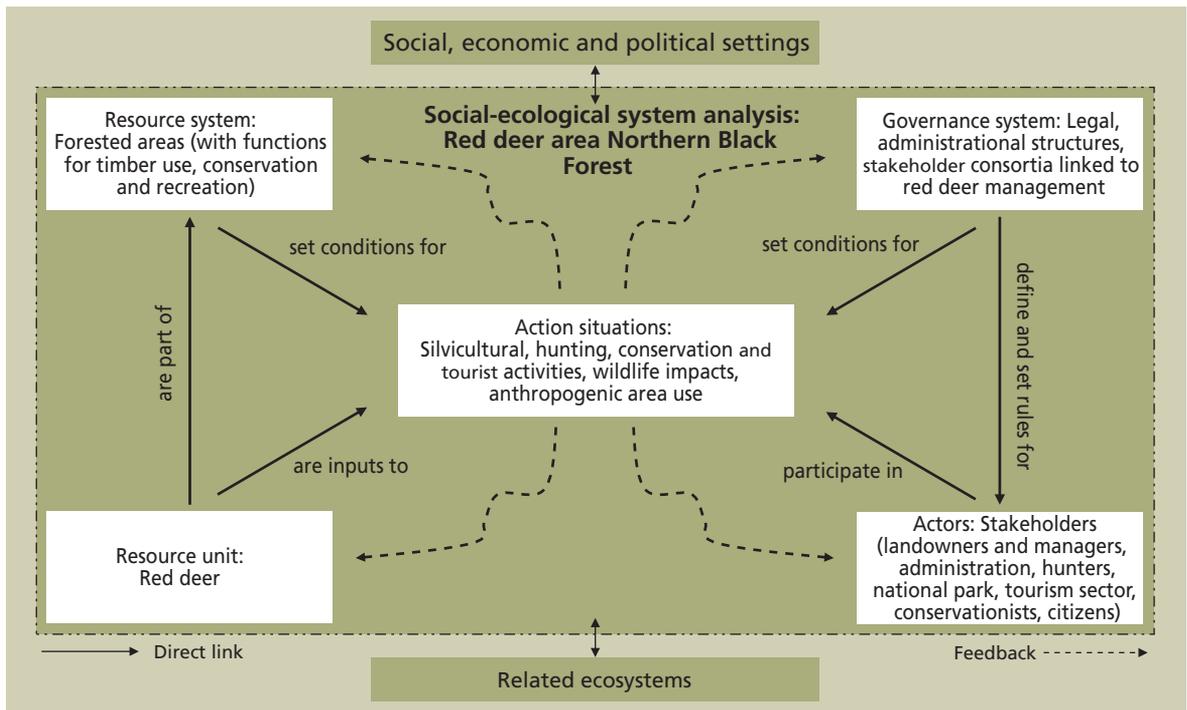


Fig. B7.3. Social-ecological system framework of the red deer area in the Northern Black Forest (modified from McGinnis and Ostrom 2014).

5. Creation of a planning instrument for tourist development;
6. Establishment of permanent management structures;
7. Coordination of red deer management in the national park with the rest of the NBF.

## 2. Social-ecological system analysis

An SES encompasses four elements: resource systems, resource units, governance systems, and actors. These elements interact with each other in 'action situations'. In turn, these lead to different outcomes, which often provide feedback and lead to alteration of the elements (McGinnis and Ostrom 2014) (fig. B.7.3).

In the NBF, the resource system mainly consisted of forested areas with simultaneous management objectives of timber production, conservation, and recreation. These areas were analysed through an examination of forest types and tree composition as well as an assessment of how suitable the habitat is for red deer. Red deer was the resource unit in question. Composition, distribution, and behaviour of the red deer population in the NBF were surveyed by telemetry, genetic studies, and monitoring with camera traps. The relevant governance systems included legal and administrative structures as well as stakeholder consortia linked to red deer management. These were examined through discussion rounds and accompanying observation. Municipal and private landowners (including mayors and councillors), land managers (foresters, hunters), administrative stakeholders (e.g. state forest, administration, national park administration), hunting tenants, representatives of the tourism sector, conservation organisations, as well as citizens were identified as actors. Their frames were examined by in-depth interviews and their value orientations and attitudes were measured by surveys. Interactions between SES elements were examined through: (i) an inquiry of ownership distribution and management goals (silvicultural, hunting, conservation, and tourist); (ii) a standardised monitoring of wildlife impacts on tree regeneration and vegetation; (iii) an analysis of hunting quotas; and (iv) an examination of use of the area by the various stakeholders. Finally, important issues and actions were discussed in focus groups with stakeholders.

## 3. Adaptive, collaborative management initiation

There are 13 characteristics of successful ACM processes, which can be summed up under three categories: (i) political and legal context and rules, (ii) cooperative management and collaboration, and (iii) cooperative management and collaboration.

Box B.7.1. Characteristics of successful adaptive, collaborative management processes (summarised following Ehrhart and Schraml 2018)

- Political and legal context and rules
  - Well-defined user and resource context
  - Provision of auxiliaries and support
  - Reasonably clear appropriation and provision rules
  - Legitimacy
  - Accountability and responsibilities
  - Conflict resolution mechanisms and sanctions
- Cooperative management and collaboration
  - Bridging knowledge and transparency
  - Inclusiveness and fairness
  - Participation, interactions, and institutionalised cooperation
  - Management plans and measures
  - Coordination by key leaders or bridging organisations
- Adaptability
  - Adaptiveness, flexibility and learning
  - Assessment and collaborative monitoring

The development of an integrative wildlife management concept can be supported by an adaptation of these characteristics to the specific SES. For that purpose, an ACM process can be initiated (Ehrhart and Schraml 2018). ACM is a process in which networks and knowledge are examined and revised in a successive, dynamic, and self-organised way of learning through practice and science. Links between stakeholders are established with a focus on social learning. The process helps to increase trust and resolve conflicts. ACM has proved to be a suitable approach for the development of a resource management system, which is tailored to a specific SES and which is supported by, and works in conjunction with, various organisations (Armitage *et al.* 2007; Berkes 2009). In the NBF, an ACM process was initiated by the research team in two local forums, which were open for all citizens. In these forums, participants were randomly distributed in moderated groups which discussed and collected issues and questions regarding: communica-

tion and organisation, forestry, hunting, tourism, and conservation. On this basis, five topical working groups were established; the groups were open for anyone to participate. Individuals from all relevant stakeholders volunteered for participation in each of the working groups. A topical working group on communication and organisation acted as a panel that accompanied the ACM process, adjusted the 13 ACM characteristics to the NBF's conditions, and developed concepts for communication and governance (fig. B7.4). Finally, regular meetings and workshops with and between stakeholders were established.

#### 4. Development of a planning tool

Based on the information provided by the scientific results of SES analysis and the consideration of ACM characteristics, a planning tool can be developed. In order for the process to be successful, the stakeholders should take an active, responsible role (Palomo *et al.* 2011). This can be achieved through citizen task forces, where stakeholders identify and discuss important issues and develop solution

approaches (Chase *et al.* 2000). For integrative wildlife management, it is important to consider different practical management dimensions such as forestry, hunting, conservation, and recreation, as well as communication. Based on this, it is possible to develop a planning tool, where goals and measures are defined on a local scale. These can then be aligned to superordinate processes and institutions, such as governance structures or monitoring systems. In the NBF, the other four topical working groups, which emerged through the ACM initiation, focused on forestry, hunting, tourism, and conservation. These groups used the information provided by the previous steps of the approach to develop a planning tool that included guidance for management actions and a zoning strategy. The planning tool included: (1) distribution zones of red deer, (2) core distribution zones of red deer, (3) zones for recreational and forest adventure activities, and (4) resting zones for wildlife. For each of these zones various priorities, criteria, and guidance for forestry, hunting, conservation, and tourism were defined (fig. B7.5).

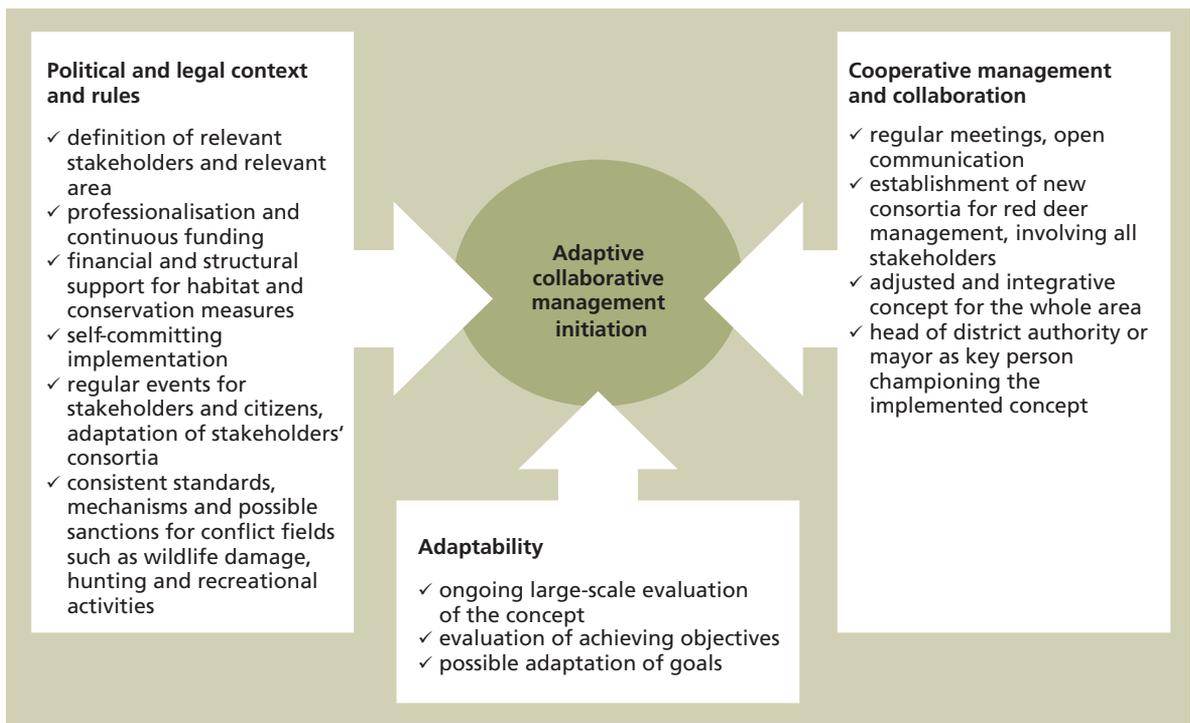


Fig. B7.4. Adaptive collaborative management characteristics, adjusted to the red deer area in the Northern Black Forest by a topical working group of local stakeholders on communication and organisation.

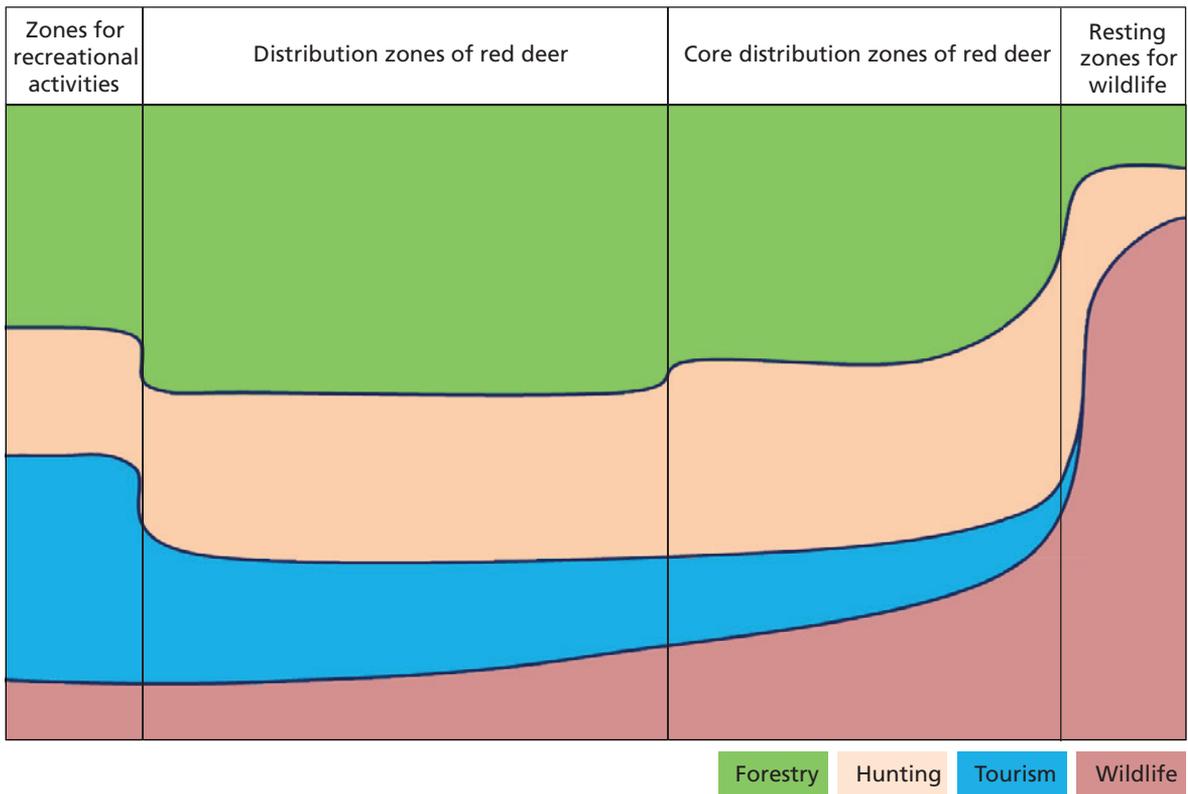


Fig. B7.5. Zoning strategy for the red deer area in the Northern Black Forest, developed by four topical working groups of local stakeholders on forestry, hunting, tourism, and conservation.

### 5. Design and implementation

Through collaboration between stakeholders the planning tool can be used to design a locally adapted, specific management concept. The cooperation of science and practice is important to connect local knowledge and scientific insights of SES analysis (Clark and Slocombe 2011); this is possible if ACM characteristics are considered and if trust and cooperation have been established (Zurba *et al.* 2012). The challenge in the design and implementation phase is to reconcile the originally defined goals of the process and the results of the SES analysis with stakeholder demands. Thus, moderation and transfer of information about the SES are important to support development of trust and a common standard of knowledge. In the NBF, local stakeholders were asked if they were interested in participating in local task forces to establish local design processes. Initially, only landowners and the owners of the hunting rights (or the representatives of these groups) were included because of

their importance with respect to this issue. After establishing communication, further relevant stakeholders were involved, such as foresters, hunting tenants, representatives from the tourism sector, and conservationists. Initially, it was difficult to get individual stakeholders to participate in the design process. Subsequently, the planning tool developed by the topical working groups was used as an instrument for the zoning of the areas (fig. B7.6).

The results should now be implemented by local decision makers. Finally, the various local planning concepts should be merged into one overarching integrative wildlife management concept, again in cooperation with the project team and local stakeholders. Following the recommendations developed by the topical and local task forces, strategies for governance, forestry, hunting, conservation, tourism, and monitoring should also be adjusted.

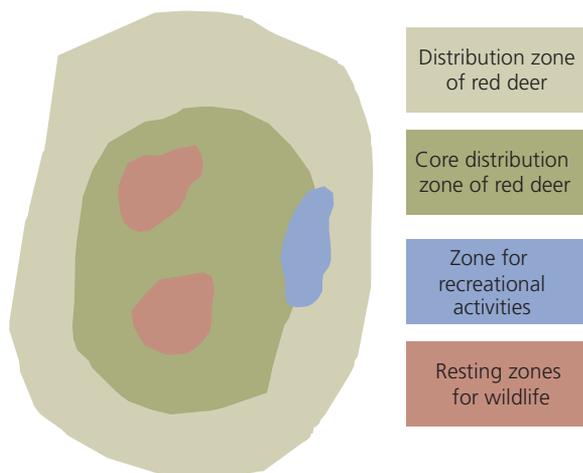


Fig. B 7.6. Illustration of a hypothetical zoned local area in the red deer area in the Northern Black Forest (in reality, zonings are much more complex and more detailed than shown here).

## 6. Evaluation and monitoring

Any SES is subject to change, and so evaluation and monitoring is an important part of any ACM process (Cundill and Fabricius 2010). To adapt the developed and implemented wildlife management concept over time, a participatory and scientific monitoring and evaluation of the SES elements and the management process itself should be implemented (Chapman *et al.* 2016). Thereby, the outcomes of the management process can be evaluated, and the concept can be adapted to new goals and changing conditions (Haydn *et al.* 2018). In the NBF, following the examination of SES elements, recommendations for long-term monitoring and evaluation were developed, such as approaches for regular monitoring of wildlife impacts, development of habitat and vegetation, red deer populations, and stakeholder opinions. Some of these monitoring measures should be executed through cooperation between practitioners and scientists.

## Discussion

The presented approach proved helpful for the initiation of the development of an integrative wildlife management concept to improve the balance between the promotion of biodiversity and other forest management goals in light of the initially

mentioned challenges in the NBF example. It helped to develop locally adapted management concepts in several areas inside the NBF with the cooperation of stakeholders. Currently, discussions with stakeholders are being conducted to adapt their management actions with regards to the goals and zones, which are part of the locally adapted management concepts. Initial results show that the system has had positive effects on both ecology and societal acceptance. However, as several stakeholders refrained from participation (such as some mayors or councilpersons of a municipality, or owners of a large privately-owned forest), and as there are no long-term monitoring data available at the moment, the long-term success of the process remains to be seen. Up to now, the whole research and planning process has taken five years; it is not finished yet.

A key point for the concept development was the willingness of stakeholders to participate throughout the process, from the original definition of ACM characteristics to the development of a planning tool through to designing local management concepts. Individual key stakeholders also played important roles by championing the process and providing a connection to other stakeholders. A successful implementation and continuation of the process depends on the dedication and participation of stakeholders (Sterling *et al.* 2017). Most steps and appointments had to be initiated by the responsible research team, which functioned as SES researchers and also as moderators during the process. Taking limited resources into account, this dual function will possibly apply to many other cases. Limited resources or limiting circumstances also require a compromise between an in-depth SES analysis and a pragmatic limitation of the scope of the SES to select and measure only the most important elements. Time is a resource needed in the process, with regards to research, administrative processes, and establishment of communication and trust with stakeholders. Hence, the development of a successful concept may take up to five to ten years (Butler *et al.* 2016a).

During this period, uncertainty and change of the SES and contextual factors often alter conditions of ACM (Clark and Slocombe 2011; Cundill and Fabricius 2010; Smedstad and Gosnell 2013); this could also be the case in the NBF example. In the NBF case, a single European grey wolf (*Canis lupus*) has moved into the area; this has resulted in

tensions and conflicts among stakeholders because of different beliefs and attitudes towards and issues with this species. As a consequence, controversies between stakeholders increase (e.g. between forest owners, who are also farmers, hunters, and conservationists), which can also have negative impacts on their discussion about red deer management. Additionally, forest management has been confronted with increasing problems caused by the European spruce bark beetle (*Ips typographus*), resulting in additional pressure for forestry related to damage caused by wildlife. Likewise, disputes regarding the Black Forest National Park increased because of various political and administrative decisions. Furthermore, forest administration in Baden-Württemberg was reformed and restructured, which led to new responsibilities. As a consequence, there are new goals, individuals, and administrative structures which have to be considered.

These unforeseen obstacles and challenges show that the development of an integrative wildlife management concept is seldom a frictionless and straightforward process. It is important to understand the close linkage between forest management, biodiversity conservation, and wildlife, and incorporate these aspects into an integrative wildlife management concept. Also, adaptability has to be an inherent part of the planning process, based on monitoring and evaluation of both the SES and the ACM processes (Plummer *et al.* 2017). Political and legal circumstances have to be considered too. Regardless of how well thought out a regional concept may be, these circumstances are often crucial for failure or success and should be considered in the process (Butler *et al.* 2016b; Cosens *et al.* 2017). Despite the importance of participation and collaboration, top-down management decisions are still important, for example, with regards to existing hierarchies inside institutions, such as the forest administration.

Consequently, a functioning process must not be confused with a durable implementation of its outcome (Smedstad and Gosnell 2013). Comparable monitoring procedures in various SES can be used to observe change processes and to simplify the transfer and the development of integrative wildlife management concepts.

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