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Embedding Evidence on Conservation Interventions Within a Context of Multilevel Governance

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Abstract

We outline a conceptual strategy for implementing conservation interventions in a multiscale, multiactor, and multilevel governance world. Using farmland as an example, we argue that conservation interventions should be implemented within a multiscale framework of guiding ecological principles. In this context, findings from multilevel governance research can inform a nuanced understanding of the role of evidence in conservation governance and decision-making. We propose that principles of evidence-based conservation can be used to refine guiding ecological principles across scales, thereby creating a comprehensive evidence base that underpins decision-making. This evolving evidence base, in turn, should be operationalized by considering the fit of ecologically relevant scales to governance levels, paying explicit attention to issues such as democratic legitimacy and interplay with existing governance structures. We outline two specific steps for meeting this challenge. Drawing on a strategic combination of conservation interventions, guiding ecological principles, and insights from multilevel governance research promises to improve both the effectiveness and legitimacy of conservation action.

Introduction

Evidence-based conservation is rapidly gaining currency in both scientific and policy circles. It arose from the notion that much conservation effort was not based on solid facts but instead on beliefs or even myths (Pullin & Knight 2001). The origins of the evidence-based conservation approach can be traced back to medicine, where the Cochrane collaboration was established in 1993 to systematically review the evidence for different medical interventions (Bero & Rennie 1995). Seeing the value in a similar approach for biodiversity conservation, evidence-based conservation was first suggested in the early 2000s (Sutherland *et al.* 2004). Since then, efforts to facilitate evidence-based conservation via systematic reviews, systematic mapping, and conservation evidence synopses have increased substantially.

Despite its success in the academic community, evidence-based conservation has also been met with criticism (Adams & Sandbrook 2013, but see Haddaway & Pullin 2013), including its ability to link to policy-making (Greenhalgh & Russell 2009). A major issue is that existing evidence on conservation is heavily biased toward small-scale interventions (Fazey *et al.* 2005). As a result, several small-scale conservation interventions have been promoted by conservationists and implemented by landowners, but it remains unclear how these multiple small-scale interventions fit together, and how they intersect with other considerations, to create effective conservation governance (Pelosi *et al.* 2010). Within the field of evidence-based conservation, better integrating evidence into decision support systems has recently been identified as a key challenge (Dicks, Walsh *et al.* 2014). However, greater attention also needs to be paid to the process of decision-making. This is because real-world conservation cannot follow a linear logic of knowledge transfer, but instead takes place within complex and sometimes messy social contexts, where issues of vested interests,

power and democratic considerations influence conservation decisions (Adams & Sandbrook 2013). Such issues play out over governance systems comprising multiple jurisdictional levels that involve a variety of actors, their preferences and powers (Bache & Flinders 2004). Notably, governance issues are beginning to be considered in evidence-based conservation (Macura *et al.* 2013), but multilevel governance (especially as it applies to conservation in farmland) has not been addressed in this context to date.

In this article, we argue that applying evidence-based conservation interventions will be most effective by: (1) embedding such interventions within a multiscale guiding framework of ecological principles and (2) drawing on concepts and understandings from multilevel governance research to be more cognisant of the governance context in which conservation ultimately takes place. We focus primarily on European farmland because here, conservation interventions are particularly dominated by data collected at small scales (Kleijn *et al.* 2011). However, many of the issues raised will be equally relevant in other contexts. We first discuss the existing evidence base for farmland conservation interventions, and reflect on the challenges posed by most evidence pertaining to small spatial scales. The subsequent two sections highlight how these challenges could be overcome by explicitly embedding local-scale interventions within a broader multiscale context, including an appreciation of relevant institutions and actors, as well as their (power) relationships. Our goal is to guide scientists who wish to have a policy impact toward more nuanced thinking on the complex sociopolitical context influencing conservation decisions. This, in turn, may help to overcome some difficulties in implementing effective conservation interventions in farmland.

Generating a systematic understanding of conservation interventions

Evidence-based conservation heavily relies on systematic reviews of existing research (Dicks, Walsh *et al.* 2014). Following the identification of a sufficiently specific question of relevance to stakeholders, a review protocol is developed, and evidence is collected, assessed for its quality, and formally evaluated (Pullin & Stewart 2006). A key objective of systematic reviews is to avoid intentional or unintentional bias in the evaluation of evidence, which may easily enter more qualitative evaluations (Roberts *et al.* 2006). A less formal approach is to summarize evidence in the form of systematic mapping, which seeks to gather an unbiased database of research within an area, without the goal of answering a specific question. Finally, evidence can be gathered in comprehensive synopses (Dicks, Hodge *et al.* 2014). In contrast to systematic reviews, which focus on specific questions, synopses address broad topics such as farmland conservation interventions in general. While they differ in the level of detail they address, all of these comparisons allow for evaluating whether potential conservation interventions actually benefit biodiversity.

Despite clear benefits of systematically collating an evidence base, some factors limit our understanding of how individual pieces of evidence scale up into a comprehensive approach to conservation. This is particularly problematic in situations where most of the existing research has focused on local, small-scale interventions (e.g., in European farmland). First, although systematic reviews actively address context-dependent effects of various interventions, the necessary evidence for transferring an intervention to a new context may be lacking. For example, interventions designed from an understanding of Western European farming systems may be detrimental to promoting biodiversity in an Eastern European context (Sutcliffe *et al.* 2013). More critically, many researchers appear to assume that generating a stronger evidence base is a primary need to drive better conservation outcomes, thereby (often inadvertently) framing governance as a technocratic process. However, evidence about specific conservation interventions per se will constitute only one factor influencing policy decisions. How policy responds to evidence is shaped by the politics of policy-making, power, and the nature of the evidence itself (Juntti *et al.* 2009). Moreover, different institutional arrangements facilitate the integration of forms of knowledge in different ways, and offer variable opportunities for mediating actors' conflicting views on conservation. Importantly, integration of knowledge rarely happens at just the national or EU level, meaning that politics and polity influence the integration of knowledge at numerous points throughout a governance system (Leventon & Antypas 2012).

None of these challenges fundamentally undermines the general value of using the best available evidence for any given intervention, that is, the general notion of evidence-based conservation is without doubt better than haphazard approaches to conservation. However, the practical value of small-scale interventions could be greatly improved if they were more explicitly embedded within an understanding of regional ecological contexts, including explicit recognition of key principles of multilevel governance.

Embedding local interventions within a multiscale ecological context

One of the criticisms of evidence-based conservation has been that it may be overly reductionist (Adams & Sandbrook 2013, but see Pullin *et al.* 2009). Particularly in

farmland, there can be a risk that complex problems are being subdivided into a series of specific local interventions, which are then tested for their effectiveness (e.g., Scheper *et al.* 2013). Thus, the best evidence at hand may not be relevant for those spatial scales controlling population-level responses, such as landscape complementation/supplementation, or meta-population processes (Smith *et al.* 2014). The lack of availability of larger-scale evidence can thus lead to an unfortunate mismatch in knowledge of the relative effects of local-scale interventions versus regional-scale ecological processes, and thus also to incomplete knowledge about where local conservation interventions would be most effective.

The above mismatch could be bridged if the implementation of specific interventions was explicitly considered in a context of general, multiscale guiding principles for biodiversity conservation. Guiding ecological principles have been based on conceptual or mechanism-informed models (e.g., Lindenmayer & Franklin 2002; Hanski 2011). For farmland systems, one of the best known general principles is the notion of promoting habitat heterogeneity at multiple spatial scales (Benton *et al.* 2003); other widely agreed upon principles are to expand the amount of native vegetation in a given landscape or buffer sensitive areas (Fischer *et al.* 2006).

Integrating specific intervention-guided conservation with a deeper understanding of moderating regional ecological contexts requires combining intervention-driven conservation thinking with "holistic" conservation thinking. As an example, incentives intended to benefit farmland biodiversity may increase one resource, such as food availability, but fail to provide other key resources such as nesting sites or overwintering habitats (Kleijn *et al.* 2011). Thus, it is not only important to know whether individual interventions benefit a particular outcome locally (e.g., species richness), but also how locally implemented interventions contribute to larger-scale ecological processes such as landscape complementation, spillover or meta-population dynamics (Smith *et al.* 2014). Embedding evidence on conservation interventions within general ecological principles across a range of spatial scales would add an improved understanding of the context to specific interventions.

While integration is essential for effective decision support systems (Dicks, Walsh *et al.* 2014), it is challenging because of geographical variation in environmental conditions, as well as in habitat specificity and mobility of organisms. Therefore, there may always be exceptions where a given general principle may not be desirable for biodiversity conservation. For example, despite the general value of connectivity, there may be instances in which wildlife corridors are undesirable because they exacerbate existing problems or cause new ones (Simberloff *et al.* 1992). Evidence-based conservation thus retains an important role when embedded within a regional ecological context, in that evidence should be generated to validate, refute and refine an emerging set of guiding principles across multiple spatial scales.

Considering a context of multilevel governance

Embedding specific conservation interventions within the context of multiscale ecological principles could help alleviate the problem that a focus on local conservation interventions is unable to deal with multiscale phenomena. However, it does not yet address another main criticism raised in the past, namely that existing work on evidence-based practice in general has been overly technocratic in its conception of real-world policy implementation and governance (Greenhalgh & Russell 2009, but see Pullin *et al.* 2009). In this context, drawing on insights from multilevel governance research could help to understand key challenges of implementing evidence-based interventions in practice. Such insights can be applied to both specific interventions, as well as to a more general, multiscale approach to conservation that is based on guiding ecological principles.

Multilevel governance research brings together multiple forms of knowledge with the issues of politics, power, democratic legitimacy, accountability, and actor capacity for conservation governance. Multilevel governance systems have evolved, among others, in the United States and the EU as layered systems of decision–making, whereby each level (e.g., supranational, national, regional, local) has considerable autonomy (Bache & Flinders 2004)—although lower levels of government are typically bound by the rules set at higher levels. That said, multilevel governance is more than just multiple levels of government, and central themes in multilevel governance research include actors, their relationships and interactions within and between levels, as well as the way they make decisions (e.g., Hooghe & Marks 2003).

A multilevel governance system presents multiple science-policy interfaces at which decision-making engages with ecological evidence. Broadly, two types of multilevel governance have emerged (Hooghe & Marks 2003). Type I refers to nested systems of all-purpose jurisdictions, such that different sectors (e.g., biodiversity, water, energy) are integrated at each level of decision-making. In this form, decisions are taken at multiple jurisdictional levels. By contrast, Type II multilevel governance refers to more fluid, potentially overlapping levels of decision-making, which are functionally specific, that is, concerning either biodiversity or water, or another function. This, in turn, allows matching the scale of decision-making with the scales most relevant to a

particular issue (e.g., watersheds or landscapes, etc.). For example, under the EU's Water Framework Directive, the river basin district is introduced as a management level that crosses boundaries of existing administrative jurisdictions. Multiple levels of administrative units within the river basin must collaborate to plan and implement water management (Newig & Koontz 2014). Moreover, decision spaces are also characterised by the actors engaged in decision-making. In some systems, central government units are primarily responsible for decision-making, implementation and enforcement, whereas in more participatory systems, a broader range of civil society is involved. Thus, science-policy interfaces can occur at a range of decision-making levels.

By understanding the principles of multilevel governance, we can think critically about the scale of knowledge needed for decision-making. For example, the EU embodies a principle of subsidiarity, whereby decisions should be made at the most locally appropriate level. Environmental federalism (Oates 2002) and institutionalism (Young 2002) advise that for environmental decision-making, this is the level that most closely matches the scale of the environmental issue. If decisions are taken on too local a level, jurisdictions will not cover the full area over which the ecological process plays out, so common good dilemmas might prevail, and rules and actions will be fragmented (Cumming *et al.* 2006). Similarly, if decisions are made on too high a level, decision-makers risk lacking the relevant knowledge or using knowledge that is too general to (appropriately) inform the management of very different areas. Although such spatial "fit" to ecological processes is important, it is not the only consideration in multilevel governance. For example, more local decisions can have higher democratic legitimacy because they are closer to citizens, but may be more development-oriented than decisions made at higher levels (Newig & Fritsch 2009). In practice, multilevel governance systems in the EU tend to have multiple levels of decision-making over a single issue, such that higher levels set agendas and goals, and lower levels translate these into practice in context-appropriate ways.

Multilevel governance provides a lens for understanding decision-making challenges that differs from dominant understandings in the conservation literature. Notably, the ecologically appropriate level of decision-making will vary for different species (e.g., grassland plants vs. large-ranging mammals), or different aspects of biodiversity (e.g., rare species vs. ecosystem service providers; see Kleijn *et al.* 2011). An effective response to the wide variety in governance and ecological systems therefore calls for the creation of new decision-making forums that engage diverse constellations of actors and knowledge across spatial and temporal scales, in ways relevant to specific decisions (Paavola *et al.* 2009). This in turn raises issues of democratic legitimacy and accountability, because for citizens it may become difficult to assume democratic responsibilities when being part of overlapping sites of decision-making (Peters & Pierre 2005). It also increases governance complexity and the likelihood of negative interplay, where actions taken in one policy arena hinder those in another (Moss 2003; Paavola *et al.* 2009).

Conservation interventions in a complex, multiscale world

In practice, small-scale conservation interventions would be substantially enhanced if they took more careful account of the governance context—in many instances, governance arrangements will be just as important in shaping the success of a particular intervention as the ecological science underpinning the intervention. While locally specific conservation interventions can be informed by solid empirical evidence, this, on its own, is necessary but insufficient to inform effective governance of entire landscapes or regions. We therefore highlight two challenges in accounting for the governance context in evidence-informed decision–making, and two practical suggestions for how conservation decision-making can address these challenges.

In terms of challenges, first we contend that a management approach based on a combination of context-dependent, local conservation interventions, and general ecological principles should underpin decision-making at all spatial scales, by drawing on, and seeking out, relevant evidence at multiple scales to fill evidence gaps. Second, we argue that this approach should be embedded within a multilevel governance context (Figure 1). Doing so implies that decisions will need to be taken at multiple governance levels, with some match between ecological scale and governance level. These governance levels should be informed by considering appropriate democratic legitimacy, fit to ecological scale, and fit to existing governance structures.

To meet these challenges, the first step, according to our nested framework, is to implement conservation interventions in the context of nested, regional-scale conservation plans. Such plans will draw on general models, experience (including traditional knowledge), and large-scale data sets. They will be refined at increasingly local levels, drawing on empirical evidence relevant to local-scale interventions in particular contexts, and accounting for prioritizations concerning particularly important habitat types (in Europe, e.g., Natura 2000 sites). Broader-scale ecological principles will need to be communicated primarily to higher levels of governance (e.g., on the need

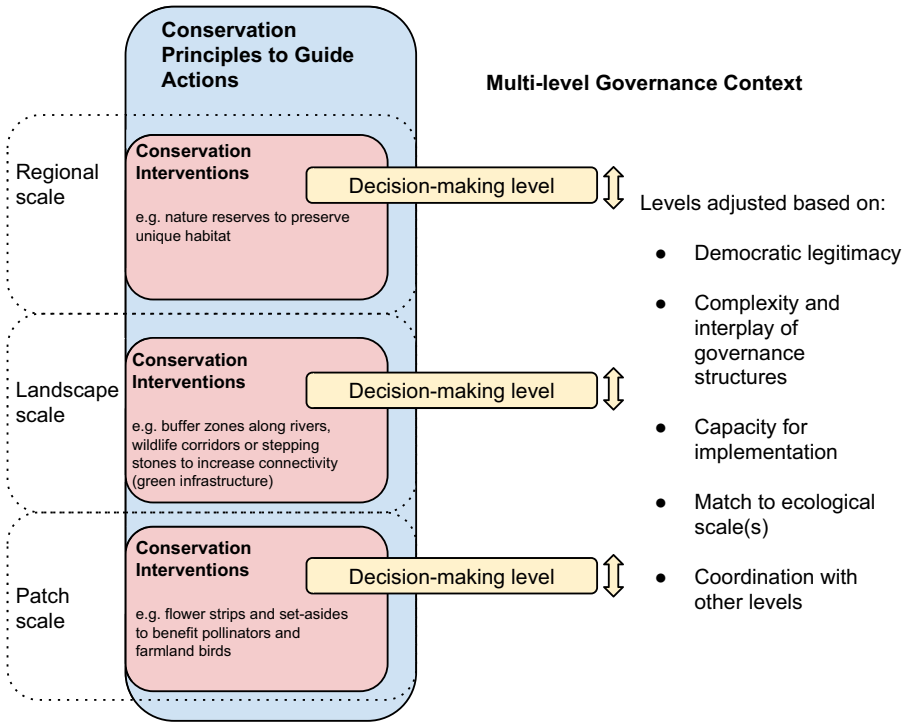

Figure 1 Schematic showing how specific conservation interventions should be considered within a context of general ecological principles (i.e., conceptual or mechanistic models), which in turn plays out within the context of a multilevel governance system to facilitate the fit between decision-making and ecological scales. The body of conservation evidence and principles (blue, central box) should be drawn on at a range of ecological scales in order to design scale-specific conservation interventions (pink boxes) to best match landscape contexts where individual interventions would be most efficient. These interventions should in turn be designed and adopted in coordination with aims set at a range of decision-making levels (yellow boxes). Decision-making levels should be adjusted to match ecological scales, but also to consider the implications to a range of context-dependent concerns highlighted on the figure.

for functional green infrastructure at regional levels). In contrast, local studies will help inform individual farmers and extension services to shape the way in which targets are met through on-ground actions (e.g., on how local practices can best promote a functional green infrastructure across larger spatial scales). This is shown by the regional- and landscape-scale interactions between conservation interventions and decision-making levels in Figure 1. Such an approach will ensure that local interventions are not piecemeal, but work together as part of a multilevel biodiversity strategy.

The second step will be to ensure that scientists, policy makers, and practitioners participate in the cocreation of policy-relevant science, going beyond identifying stakeholder-relevant questions for systematic reviews. From the outset, scientists and decision-makers should jointly consider how administrative and ecological scales fit in order to balance democratic legitimacy and ecological efficacy. Plans therefore will not be forced into existing, mismatched jurisdictional units, but instead will be relevant to biodiversity conservation, while also being mindful of the complexity this creates (e.g., through interplay with other environmental issues, such as water management). By being clear as to the types and scales of knowledge needed, and the limitations of existing knowledge to inform policy, decision-makers will also play a role in highlighting knowledge gaps. We thus frame decision-makers as actively participating stakeholders in shaping what evidence base is needed for conservation, rather than framing conservation policy as something that must respond to the agenda of scientists who produce evidence. As a consequence, there is a strong need to develop practical solutions, based on a joint effort by researchers, decision-makers and land-use planners, on how to integrate evidence-based practices and general ecological principles within a multilevel governance framework. Through embedding locally implemented conservation interventions within a broader context, we are confident they would gain both in legitimacy and effectiveness.

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