Narrative-Movement Framework (NMF): A socio-ecological systems (SES) approach to human narratives, animal movement, and coexistence in shared landscapes

Katherine Victoria Hernandez[+1], Daniel T. Blumstein[1,2]

+Corresponding author: kvichernandez@g.ucla.edu

[1]Institute of the Environment and Sustainability, University of California Los Angeles, Los Angeles, CA, USA

[2]Department of Ecology and Evolutionary Biology, University of California Los Angeles, Los Angeles, CA

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Abstract

1. Managing human-wildlife coexistence is essential for biodiversity conservation in places where humans and nonhumans compete for access to ecosystems. Viewing human-wildlife conflict as part of a complex web of positive and negative connections that exist between humans and nature is essential.
2. The field of socio-ecological systems (SES) seeks to understand these connections between human-specific systems (i.e., cultural, political, economic) and related

ecological systems. We contribute to this growing literature with a coupled narrative-behavior SES framework, through which we present human environmental narratives as part of a cultural system that changes and is changed by altered animal movement behavior in shared landscapes.

3. The Narrative-Movement Framework (NMF) is built on a “people with nature” perspective of human-wildlife coexistence that can be used to understand connectivity and coexistence models. The NMF distinguishes itself from previous coupled ecological-cultural frameworks by placing the cultural system of human storytelling as a landscape-shaping factor, along with human-wildlife interactions and wildlife movement.
4. The NMF further encourages long-term thinking, and thinking with the complexity of target SES, to refine human-wildlife coexistence and conservation planning in ways that do not replace, but seek to complement relatively short-term and simplified approaches.

1. Introduction

The study of Human-Wildlife Coexistence (HWC) seeks a functional balance between humans and nonhumans. Human-wildlife conflict occurs when human systems (economic, political, infrastructural, etc.) are misaligned with the ecological systems on which wildlife depend. Systems of infrastructure and economy, for example, are often in conflict with the ecological systems needed to sustain wildlife and large ecosystem functions (Procko et al., 2023; Neumann et al., 2013; Ghent, 2018; van der Ree, Smith, & Grilo, 2015; Fletcher & Toncheva, 2021; Cozzi et al., 2019). Human well-being is likewise jeopardized by ongoing human-animal conflict, in ways like increased occurrences of zoonotic diseases, injury, livestock and crop loss, and other hidden financial and health impacts (Barua, Bhagwat, & Jadhav, 2013). HWC is thus an inherently socio-ecological systems (SES) issue, where many systems—be they political, social, economic, or ecological—are in a relationship with, influence, and are influenced by one another at multiple scales (McGinnis & Ostrom, 2014; Colding & Barthel, 2019; del Mar Delgado-Seeano & Ramos, 2015). The SES framework developed by Ostrom and contemporaries is a conceptual framework that illustrates the web of connections between various human and nonhuman systems, and was introduced as a way to analyze the sustainability of SES while challenging the idea of one simple solution, or panacea, to sustainability issues (McGinnis & Ostrom, 2014; Ostrom 2007; Ostrom 2009; Colding & Barthel, 2019). In other words, when seeking solutions to complex sustainability issues, we should not collapse this complexity but use it to guide our thinking.

A number of studies have used SES as the lens by which to study human-animal relationships, conflict, and coexistence (Dorresteijn et. al, 2015a; Dressel, 2018; Cumming & Allen, 2017;

Synes et. al, 2018; Serenari, 2020; Teixeira et al., 2020; Lischka et al., 2018; Orrick, Dove, & Schmitz, 2023; Volski et al., 2021; Matthews & Selman, 2006; to name a few). Some of the most recent developments have come in the form of new theory (Orrick, Dove, & Schmitz, 2023), guides (Gao & Clark, 2024), and frameworks (Metcalf et al., 2024), revealing a desire for applicable SES HWC research. Published SES scholarship has most commonly come from the environmental and social sciences, followed by agriculture, economics, engineering, and medicine (Colding & Barthel, 2019). Comparatively less SES research has been done in collaboration with the arts and humanities (Colding & Barthel, 2019). While this literature is rapidly growing, there exist gaps in SES scholarship on the many ways human cultural systems are or may be connected to ecological ones (Orrick, Dove, & Schmitz, 2023; Lischka et al., 2018; Guerrero et al., 2018; Bennett et al., 2016).

Research on human wildlife values and attitudes are an SES compatible field that is relevant to both managing ongoing conservation issues and is long-established in ecological research (Manfredo, 2008; Sage et. al, 2022; Mosimane et al., 2013; Volski et al., 2021; Jones et al. 2016; Andreassen et al. 2018; Brenner & Metcalf, 2019; Metcalf et al., 2024). Many conservation and wildlife attitude studies have been led by biologists with special interest in how human dynamics affect target biological systems, but not always with consideration of relevant socio-cultural scholarship, like that of narrative theory and the formation of persistent environmental narratives (Martin 2020; Keith et al., 2022).

In humanities scholarship, narrative can be defined as "…the representation of an event or a series of events" (Abbott, 2020, p. 12). Environmental narrative scholarship is concerned with how people communicate perceptions of the natural world, and the real-world consequences of these narratives. Human-wildlife attitude research and environmental narrative scholarship thus share an assumption: How we see the world informs how we live in and change it. When applied to human-wildlife coexistence, the two fields have different but complementary approaches. The former is adept at studying current attitude status with special consideration to relevant ecological systems, while the latter examines how attitudes have been formed over time within specific social-political contexts. A synthesis of the two, coupled with developed knowledge on landscape-dynamics, animal behaviour, community dynamics, and other ecological systems, would provide a more complete view of how our human stories affect real animal lives, while maintaining the inherent complexity of human-wildlife coexistence. In this paper, we do just that.

We develop a framework that connects human narratives with wildlife movement behavior through an SES perspective. We do so in a way that is grounded in ecological theory of animal perception, behaviour, and landscape change. We illustrate this framework in the context of human-wildlife coexistence, animal movement, and wildlife connectivity. Connectivity and corridor work provide unique opportunities to consider the complexity of shared human and "more-than human" landscapes, while also being especially affected by the results of shared landscape research (Hull et al., 2023). Connectivity research is an integral part of biodiversity conservation that seeks solutions to the consequences of habitat fragmentation, a persistent threat to many species in an increasingly urban-sprawled, human-dense world (Wilson et al., 2015). This demands an understanding of species movement, and what set of factors act as obstacles to healthy wildlife movement (Allen & Singh, 2016).

Animal movement behaviour connects animal perceptions of space and human perceptions of animals. This is because it is behavior that connects the many different needs, purposes, capabilities of both humans and nonhumans, and movement behavior is a key dimension that is directly impacted by changing landscape dynamics (Doherty & Driscoll, 2018; Knowlton & Graham, 2010; Jeltsch et al., 2013; Allen & Singh, 2016). Calls for integration of movement behaviour with biodiversity research—some less than ten years old—highlight how monitoring movement behaviour can reveal novel management insights on multi-species coexistence and population resilience (Jeltsch et al., 2013). New and improving technologies make such research easier to pursue than ever before (Kays et al., 2015). Even more exciting is the potential to study species movement and coexistence over longer periods of time, which may be more useful for predicting patterns of human-wildlife conflict (Zeller et al., 2020; Buchholtz et al., 2020). Connectivity studies have likewise used SES frameworks and perspectives to provide insight and land management recommendations for the conservation of shared landscapes (Cumming & Allen, 2017; Hull et al., 2023).

We aim to show how a practice as culturally varied as storytelling is connected to the physical reality of human-wildlife coexistence in shared landscapes. Importantly, while we focus on animal movement, we suggest that future researchers may find this framework helpful to connect the influences of human narratives to other ecological and behavioral systems..

2. The Framework

The Narrative-Movement Framework (NMF) connects human perception of a shared landscape to the perception, and consequential behaviors, of wildlife living in the same space (Figure 1). In this section we introduce the vocabulary and supporting literature from which we develop the framework.

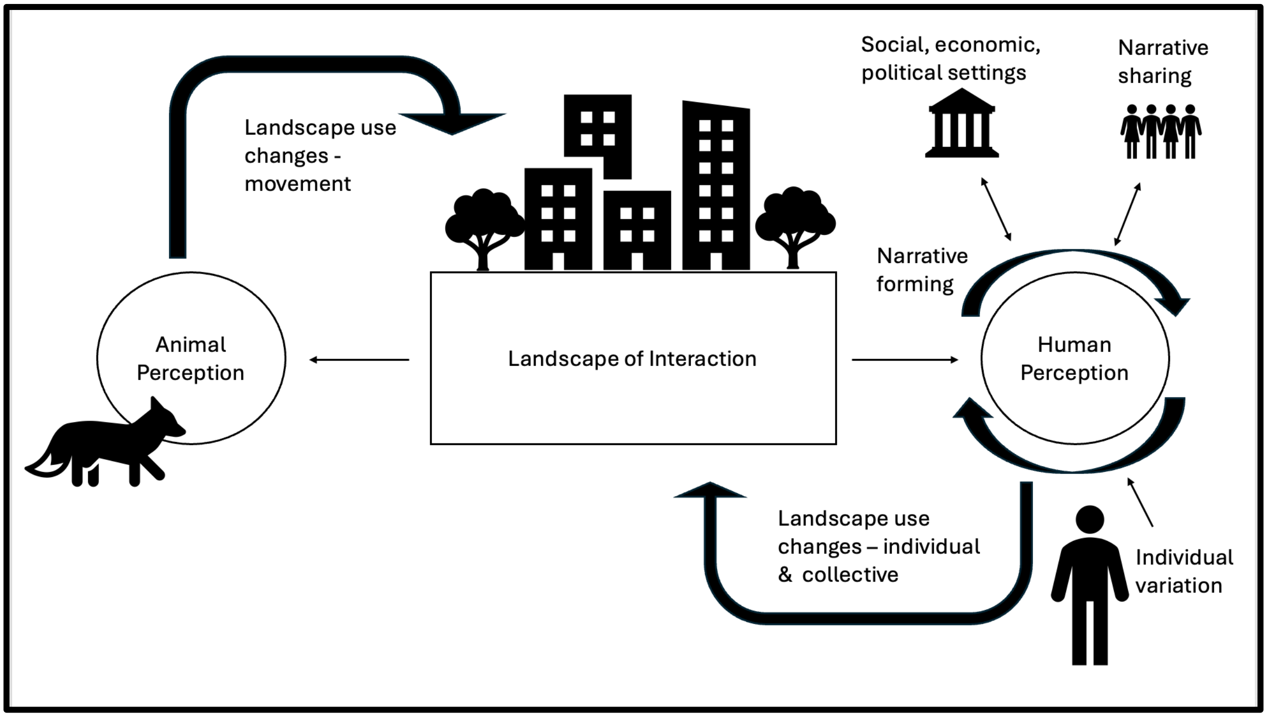

Figure 1. The Narrative-Movement Framework (NMF). In a shared landscape, human land use changes the environment non-humans must perceive and navigate. These changes in how non-humans navigate a shared landscape may lead to changes in human-animal interactions. The experience and communication of these altered human-wildlife interactions may alter human narratives about wildlife, the shared landscape, and any number of broader environmental topics. Persistent environmental narratives influence human social-political systems that include land and wildlife management policy, a largely influential type of human landscape use, bringing us

back to how human landscape use affects non-human perceptions of a shared landscape and the start of our coupled framework.

2.1. Narrative as an Iterative Process

The study of environmental narrative focuses on how people talk about nature, the environment, and ecosystems (James & Morel, 2020; Ross, 2013; Barr, 2004). The story analytical practice of environmental narrative scholarship is not to be confused with the art of environmental storytelling as one and the same; however, both practices of critiquing and creating stories are considered by our framework as ways we humans form, take apart, and reform our understanding of the natural world through story. Environmental narrative and the environmental humanities, more broadly, have gained increased interest by natural scientists for interdisciplinary environmental applications (Koch, 2024; Schaal-Lagodzinski et al., 2024; Kim et al., 2023; Hards, 2012; Lavery, Ross, & Baldwin, 2019; Holm et al., 2013; Holm et al., 2015; Avraamidou & Osborne, 2009; Lejano, Tavares-Reager, & Berkes, 2013).

Part of this growing interest relates to a critique of previous approaches to community engagement for conservation action and education (Koch, 2024; Metcalf et al., 2024; Kobluk et al., 2024; Carlen et al., 2024; Holm et al., 2013; Toomey, 2023). As we come to understand how narrative construction and communication can, has, and will affect environmental change, we must also contend with how past environmental narratives are shaped by the biases of their storytellers (Koch, 2024; von der Porten & de Loë, 2014). One example of this is the forceful removal of Indigenous peoples from their lands in order to designate their spaces as US National Parks, a choice that satisfied existing anti-Indigenous sentiments and was encouraged by a wilderness vs. civilization dichotomous view of nature, particularly during the years of Muir's first visit to the Sierra Nevada in 1869, through the establishment of Yellowstone National Park in 1872, Theodore Roosevelt and the 1906 Antiquities Act, and beyond (von Der Porten & Loë, 2014; Cronon, 1996). The concept of wilderness, where human life is decidedly separate from "true" nature, has persisted in US environmentalism thought to such a degree where we can consider "wilderness" as a persistent narrative plot, a pattern we see over and over again in all kinds of storytelling. With varying forms, and consequences. The concept of wilderness has been challenged as a narrative that is not applicable to places where the historical human-nature relationships differ from those in the US, and where the push to adopt or "import" strategies based on this environmental narrative may at best be misguided, and at worst is a form of "green settler-colonialism" (Guha, 2002; Brockington & Igoe, 2006; West, Igoe, Brockington; 2006). What this means for human-wildlife coexistence and conservation engagement is that, when we approach a shared landscape to mediate present conflicts between human and non-human inhabitants, we must consider how these conflicts are shaped by human-to-human social, political, and cultural histories.

If we accept that the scientific literature is its own kind of literary genre, with more-or-less expected practices, purpose, and form (Hyland, 2008; Malavska, 2016), then those of us who write in this space should not be surprised by the need to understand the context in which scholarship was written and published, and the consequences of that context. Neither lived experiences nor shared narratives need to accurately represent reality to shape people's opinions of their environment (Recharte et al., 2024). Facts do not always change minds, and change in individual minds does not always lead to change in social networks (Toomey, 2023). Community acceptance can be vital for change (Cowell, Bristow, & Munday, 2011); however, acceptance or even tolerance of pro-environmental change may not always be conscious, and can be influenced by other factors. Environmental policies associated, or seen as associated, with certain social-political groups may struggle to be accepted by groups that are opposed to a particular sociopolitical group, regardless of what the policy actually entails (Van Eeden et al., 2021; Dinat et al., 2019). People who have never had an experience with "pest" species may have strong opinions of them, formed by the stories they have heard from their immediate social group, trusted news sources, or even seemingly unrelated adjacent tales that have contributed to their opinion of a species for reasons that are unique to how that person has learned about the world (Baker et al., 2020). Our perception of reality is formed by our first-person experiences as well as by our stories (Avraamidou & Osborne, 2009). This perception shapes how we behave in the world through our daily activity, policy-making, storytelling and story-suppressing. In this way, our stories can, have, and will continue to change our reality. So, when it comes to HWC and wildlife connectivity, it is in our best interest to work with narrative scholarship through an SES perspective, as we have illustrated here with our Narrative-Movement Framework (Figure 1).

2.2. Shared Landscapes - The World(s) We Live In

We define a "shared landscape" as an area where humans and non-humans inhabit and rely on multiple co-occurring systems-of-being. Different SES on a shared landscape can affect human and non-human life in expected and unexpected ways, and thus connects both to, and through the land they inhabit (Fletcher & Tonchevea, 2021; Donfrancesco, 2024; Smith & McManus, 2023; Orrick, Dove, & Schmitz, 2023; Hull et al., 2023). These systems may be ecological (e.g., predator-prey dynamics, plant-animal interactions), social-political (e.g., governance systems, communication systems, housing systems), or a relationship between the two (e.g., local agriculture, water infrastructure, fisheries). There is growing scholarship that applies SES theory to conservation efforts in human-wildlife research that integrates the social and biophysical attributes of an area to better understand human-wildlife dynamics in shared landscapes (Williamson & Sage, 2020; Gao & Clark, 2023; Fletcher et al., 2023; Balasubramaniam et al., 2021; Cozzi et al., 2019; Dorresteijn et al., 2015b; Fletcher & Toncheva, 2021; Smith & McManus, 2023; Donfrancesco, 2024).

With this definition of shared landscapes, we exclude areas where human presence is minimal yet may have a non-negligible impact on wildlife (e.g., backcountry trails, long-distance pipelines, interstate highways not bordering on residential or commercial zones, etc.). This is not to say that areas with minimal human presence and alteration are not still affected by changes in human perceptions of wildlife and the ecological world (Benjamin et al., 2008; Bocco 2016; Horton & Barnes, 2020). Rather, we exclude these areas so that we can focus on the kinds of human-wildlife interactions, environmental narrative changes, and wildlife behaviour that occur in areas where human density and human-induced landscape alteration is especially high.

2.3. Landscape Use

Understanding how wildlife uses and does not use a landscape is essential for effective HWC planning, as is an understanding of how humans use the landscape (Ellis, 2021; Bevanda et al., 2015; Kretser, Sullivan, & Knuth, 2007). We define landscape use as the ways in which human and non-human individuals, populations, and communities use, move through, change, and otherwise interact with the landscape (Wiens et al., 1993). The field of behavioural landscape ecology offers a strong theoretical base to understand and discuss landscape use by non-human species, especially as a landscape changes (Knowlton & Graham, 2010; Lima & Zollner, 1996). Key landscape uses by wildlife include dispersal (Benz et al., 2016; Diniz et al., 2019), resource selection (Boyce et al., 2002; Launchbaugh & Howery, 2005; Searle, Hobbs, & Gordon, 2007), and home range selection (Morellet et al., 2011; Bevanda et al., 2015). Population landscape use is defined by multiple members of a species that interact over some defined shared space, no matter how social or asocial the population may be (Mueller et al., 2011). Examples of landscape use at the scale of a population include migration, resource-sharing, and reproductive behaviours, to name a few (Mueller & Fagan, 2008; Middleton et al., 2019; Semmens et al., 2009; Quevedo, Svanbäck, & Eklöv, 2009; Chamberlain et al., 2021; McNitt et al., 2020). Much of what we call wildlife landscape use are also part of inter- and intra-species dynamics, but by framing these dynamics in terms of landscape use, we focus on how these behaviours affect and are affected by a shared landscape where multiple actor-land relationships occur simultaneously.

Human landscape use can be similarly individual or collective. Direct, individual interactions—like home gardening, walking in the park, birdwatching, etc.—may have quantifiable impacts, most clearly on the individual human and non-humans involved (Power, 2005; Song, Richards, & Tan, 2020; Cammack, Convery, & Prince, 2011). For example, increased human activity in an area, by number of people and time spent there, has been shown to alter animal movements (Lewis et al., 2021). Some human-environment practices may be restricted to one community, social, or identity group and not others (Rosa et al., 2020; Miao & Cagle, 2020; Pinckney et al., 2024). This is especially relevant as we consider human landscape use systems that have been established by a few but affect many, including structural systems (e.g., water and energy distribution, agriculture, urban planning, transportation, waste disposal, etc.), and the social-political influences that have shaped them (Ellis, 2021; Newell, 2020; Lennon, 2017; Bates et al., 2024; Tanana, Combs, & Hoss, 2021). For instance, the widespread and lasting impacts of redlining (a form of racially biased zoning regulations) on the environment, people, and animals in the United States is now becoming clear, through research like that on health inequity and access to nature (Estien et al., 2024a; Estien et al., 2024b; Schell et al., 2021; Ward Thompson & Aspinall, 2011; Jennings & Gaither, 2015; Rigolon et al., 2021).

We include in our framework landscape use systems that are defined by human activity and presence, not only physical attributes. An area may not change much in its physical make-up, but policies of human access can change the amount and kinds of activities that occur (Ellis-Soto et al., 2023; Gaynor et al., 2018; Baker & Leberg, 2018; Lewis et al., 2021; Martin & Réale, 2007). Light and noise pollution are forms of human landscape use that change a landscape beyond physical alteration of the habitat (McMahon, Rohr, & Bernal, 2017). It is worth mentioning the temporal and spatial dimensions of landscape use; the concerns and needs of sustainable landscape planning change when considering an area at different scales of space and time (Bastian, Krönert, & Lipsky, 2006; Blaschke, 2005). The narrative-behaviour relationship our framework illustrates is not limited to one time or place, purposely, so that it may be applied at whatever temporal and spatial scale needed.

In a shared landscape, all kinds of human landscape use co-occur, influence, and are being influenced by non-human landscape use; this is not independent from, but a consequence of a shared landscape's biophysical makeup (Johst, Brandi, & Pfeifer, 2001; Gehrt, Anchor, & White, 2009; Bianco, Manning, & Schleuning, 2024; Wilkinson et al., 2023; He, Maldonado-Chaparro, Farine, 2019; Niesner et al., 2021; Kretser, Sullivan, & Knuth, 2007; Ciach & Fröhlichsources, 2016).

2.4. Interactions

Direct and indirect interactions occur between inhabitants in a shared landscape as a result of inhabitants' landscape use (Schmitz et al., 2017; Giuggioli & Kenkre, 2014; Dickman, 2008). These relationships have been explored by those studying community spatial ecology (Dray et al., 2012; Massol et al., 2011; Cottenie, 2005; Holt, 1984). Understanding the pattern of human-wildlife interactions across space, as well as their ecological and social-political influences, is necessary to guide solutions that support human-wildlife coexistence (Fortin et al., 2020; Williamson & Sage, 2020; Niesner et al., 2021; Kretser, Sullivan, & Knuth, 2007).

Examples of direct human-wildlife interactions may be positive, neutral, or negative; which it is depends on whose perspective we are speaking of. For instance, the moment after a seagull steals a person's lunch may be perceived as a negative interaction for the person (no lunch) and overall positive interaction for the gull (easy meal), despite the stress impacts a seagull experiences when getting shouted at by people who have caught them in the act (Raghav & Boogert, 2022). Or, when wildlife is hazed to restrict its access, this may be a negative, stress-inducing experience for the wildlife involved but people may see the restriction as an overall good for themselves and wildlife, as a protective measure before more intense action is taken, and so keeping wildlife away "for their own good" (Young, Hammill, & Breck, 2019). Likewise, when people go out of their way to see wildlife, this can be seen as a positive interaction by people, both for the general enjoyment of seeing sought-after wildlife, and the sense that wildlife tourism provides money to wildlife conservation efforts; however, for wildlife, these interactions may only be neutral or, worse, stress-inducing and an overall negative experience (Curtin, 2009; Randler, Friedrich, Koch, 2023; Tryjanowski et al., 2015).

Indirect human-wildlife interactions occur when individuals encounter other inhabitants' impact on a shared landscape, but not the individuals themselves (Destefano & DeGraaf, 2003). These may include when wildlife digs through human-made trash, where foraging behaviours are altered by local human waste and disposal systems (Newsome & Van Eeden, 2017), or when a nonhuman animal encounters a road that impedes or otherwise modifies its movement, but does not directly interact with humans on the road (Roedenbeck & Voser, 2008; Santos et al., 2018). Importantly, individuals (both humans and nonhumans) need not directly interact to be aware of and influence each other (Bell et al., 2017). Thus, we have an entire landscape of interactions, made possible through human and non-human landscape use. Use that is informed and directed by individuals' perceptions of the shred landscape.

2.5. Inhabitant Perception and Behavior

2.5.1. Animal Perception and Behavior

An individual's behavior is informed by their perception of their environment (Nathan et al., 2008). In other words, how an animal views the physical and biological world around it is based on its cognitive and sensory abilities, and available environmental stimuli (Van Dyck, 2011). These ideas of cognition and the living organism are old and trans-disciplinary, appearing in terms like "umwelt", or perceptual world, introduced by von Uexküll's (1909) in his argument that an individual organism's perceptual world is informed by their sensory and cognitive abilities. In 1974, Maturana, Varela, Uribe introduced their developed concept of autopoiesis--the characteristics that distinguish the living from non-living—and later Maturana presented number of cognitive theories considering the relations between individual cognition and an organism's environment (Mingers, 1991). As reviewed by John Mingers (1991:321) in "The cognitive theories of Maturana and Varela," Maturana argued that:

"In general usage, cognition refers to the process of acquiring and using knowledge, and as such it is assumed to be limited to organisms with a (fairly advanced) nervous system. The nervous system itself is viewed as a system which has developed to collect knowledge about the environment, enabling an organism to survive better… . Perception and cognition occur through the operation of the nervous system, which is realized through the autopoiesis of the organism. As we have seen, autopoietic systems operate in a medium to which they are structurally coupled. Their survival is dependent on certain recurrent interactions continuing."

In short, each organism perceives the world, and by extension the landscapes in which it finds itself, in its own way (Van Dyck, 2011; Searle, Hobbs, & Gordon, 2007).

Part of the difficulty of anticipating animal responses to human behaviour and landscape use is knowing exactly how different individuals and species experience the world. Areas in a shared landscape that could work as a wildlife corridor may not be *functional* corridors, or actually used by target species, because of some set of stimuli and circumstance that humans did not anticipate *or perceive* as an obstacle (Greggor, Berger-Tal, & Blumstein, 2020; Baguette & Van Dyck, 2007; Voigt et al., 2019; McMahon, Rohr, & Bernal, 2017; Korpach et. al, 2022). Human landscape use contributes to the overall makeup of a shared landscape, influencing what set of stimuli and physical geography non-human species must perceive, interpret, and thereafter navigate (Taylor et al., 2024; Ciach & Fröhlich, 2016; Voigt et al., 2019). Human landscape use therefore affects animal behavior by altering a species' perceivable environment.

2.5.2. Human Environmental Perceptions and Attitudes

Humans must speculate about the internal reality of other species, which brings challenge to designing wildlife corridors and other coexistence infrastructures. However, it is also important to note how highly varied environmental perceptions can be *within our own* species, and what this means for HWC, environmental equity, and long-term conservation strategies. As previously stated, the field of human-wildlife attitudes and environmental perceptions has long been established, with growing interdisciplinary methods, theory, and collaborations (Metcalf et al., 2024; Recharte et al., 2024). This work considers the effects of social-political dynamics on how various community groups view target species, ecosystems, and nature at-large. Research has shown how a number of different social-political factors, including those seemingly unrelated to the natural world, affect group views of the environment and wildlife (Ghasemi, Niemiec, & Crooks, 2024; Nesbitt et al., 2024; Howell, 2012). A non-exhaustive list of such factors includes variation in physical, cognitive, cultural, geographical, political, and economic situations

(Schaal-Lagodzinski et al., 2024; Howell, 2012; von Der Porten & Loë, 2014; Hamilton, Colocousis, & Duncan, 2010). And we humans are not limited to our own first-hand lived experience of the natural world when it comes to forming an opinion on it; we have our stories, and the ways we tell them.

3. Applications

Recently, Reyers & Bennett (2025) argued that a framing of conservation thinking, which they referred to as "people *with* nature," has become increasingly important and is needed to tackle the complex challenges present in the Anthropocene (Reyers & Bennett, 2025).

"Instead of focusing on linear trade-offs or synergies between outcomes for nature and outcomes for people, the 'people with nature' framing focuses on the nature and quality of relationships between the two, which offers important opportunities for a more dynamic and holistic analysis….Thus, the new framing suggests that problems of conservation or issues of development can only be truly addressed in concert with one another; there is no possibility to address one at the expense of the other because there is no 'one' or 'the other'—there is only the co-evolving relationship of people with nature, with each shaping and being shaped by the other..." (Reyers & Bennett, 2025:3).

The NMF follows a "people *with* nature" framing in how it uses our understanding of human narratives and animal movement to connect people with wildlife and with landscapes we share.

By focusing on narrative, movement, and shared landscapes we offer a framework that can be tested and applied to ongoing connectivity and coexistence efforts.

We know enough from past studies of human-wildlife interactions to know that conservation actions should be planned with the entire shared landscape, and its ability to change, in mind. The NMF allows us to organise existing and available knowledge into actionable models. Lasting change is a difficult thing to enact, and even harder to track and predict. But conservation practitioners attempt to do this every day as they aspire to change the set of human behaviors, policy, and infrastructure for the purpose of creating one future and avoiding another. Some conservation actions are defined by urgency, and have limited time to be carried out (Martin et al., 2012). Others are long-term, multi-team projects (Santana et al., 2014). And yet others can be likened to maintenance, working to keep already achieved and desired conservation changes from dissolving (Scott et al., 2010). In any case, conservation practitioners must plan for uncertainty (Meir et al., 2004; Lechner et al., 2014).

For example, in animal reintroduction projects, practitioners may evaluate the context in which they are bringing back an endangered animal. They may ask questions like “Are local people likely to accept this reintroduction?,” “What is the cultural and ecological history of the area?,” “Based on what we know, how might we expect residents to affect the success of the reintroduction?,” and, ultimately, “What can we do to shape the outcome?” Questions like these start from a desired change in wildlife presence and movement, to human reactions, back to the persistence of the introduced wildlife. It can be tempting to stop one’s thinking here, having gone full circle, but with the NMF we encourage others to continue on the spiral path and consider the previous questions again, going further into our imagined and still alterable future.

The NMF forces us to ask longer-term questions because there will be subsequent changes. It forces us to take a longer-term view when we ask ourselves how and where we should shape the future. So, if local acceptance of a species reintroduction seems likely, and as a consequence the repopulation of a species is expected, how can we follow this growth trajectory to predict future consequences? What if local acceptance has a limit, where once a population grows to a certain size we might see a switch in local attitudes from acceptance to hostility? Can we prepare for this? Are there features of the social-ecological landscape, its history and current events, that can help conservation practitioners predict not just the immediate consequence of a conservation action, but the set of possible changes that may unfold well into the future? By incorporating narrative as a landscape-shaping system into our theoretical framework we display a perspective of human-wildlife coexistence that works on, and asks others to think about the future.

This far-future thinking of the NMF does not need to be theoretical; it is a guide that can be applied and its predictions and assumptions tested. For instance, when thinking about connectivity we can view human narrative, human-wildlife interactions, and wildlife movement are explicitly landscape-shaping factors. By mapping historical physical and political landscape onto current ones, we add depth to our understanding of how different human systems may be influencing ecological ones. Thus, we suggest that the creation of predictive, multi-layered SES map models based on the NMF can aid long-term conservation planning, and can help identify potential areas present and future incongruity, where more effort will be needed to negotiate coexistence between human and non-human inhabitants. We can develop and test such a model now, using as case studies landscapes with known human-wildlife interaction and narrative histories for species that are the focus of conservation and coexistence projects. This is something we, the authors, are developing now, and with further testing and refinement, an NMF based model can be adapted for places where social-ecological relationships are especially complex and volatile.

Critically, the application of the NMF must consider the complexity of humans in every step of its use. Top-down approaches to community change—in other words, coming from the outside in—are limited in their effectiveness and can even be detrimental to creating the community-to-community and community-to-ecology relationships needed for lasting coexistence (Toomey, 2023; Madden, 2004). Bottom-up approaches—where community collaboration and shared decision-making are required praxis—prioritise human relationships for lasting change; this aligns well with NMF, where system and group relationships is foundational to how we understand social-ecological shared landscapes.

4. Conclusion

To summarize, in a shared landscape, human land use changes the environment that non-humans must move through. These changes in how non-humans move through a shared landscape may lead to changes in human-animal interactions. The experience and communication about these altered human-wildlife interactions may change human narratives about wildlife, the shared landscape, and any number of broader environmental topics. Persistent environmental narratives influence human social-political systems that include land and wildlife management policy, a largely influential type of human landscape use, bringing us back to how human landscape use affects non-human perceptions of a shared landscape and the start of our coupled framework.

Illustrating this web of connection through a framework provides a visual and theoretical map for conservation researchers, managers, and policy makers to reflect, evaluate, and plan human-wildlife coexistence efforts. Further, the inter- and trans-disciplinary theoretical foundation of this framework makes room for similarly inter- and transdisciplinary collaborations to take place. Within the larger disciplinary categories of physical sciences, social sciences, and humanities are many relevant sub-fields of environmental thought. While cross-disciplinary collaboration is often attempted in environmental work, epistemological differences can make this work difficult. By analogy, rather than finding many ways to run the same race, the NMF develops a view of coexistence that is more like a relay triathlon—we all have different ways to get where we're going, and for some parts of the race we best pass on the work to others to continue, but it's one race and one we'll have to work together to complete.

5. Acknowledgements

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6. Positionality Statement

We authors both come from the United States and so much of our examples for this manuscript's argument came from the U.S., because these were the examples most familiar to us and not because other equally appropriate examples from other locations do not exist.

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8. Conflict of Interest Statement

The authors declare no conflict of interest.

9. Data Availability Statement

This study did not collect or use data to share.

10. Author Contributions

Katherine Victoria Hernandez and Daniel T. Blumstein both contributed to the conceptualization and visualization of this manuscript. Katherine Victoria Hernandez wrote the manuscript and

sought out funding. Both Katherine Victoria Hernandez and Daniel T. Blumstein edited the manuscript to its final submitted form.

11. Statement of Inclusion

Our study was created through an in-depth literature review and conversations between the authors and the rest of the first author's dissertation committee. The resulting conceptual framework is not specific to any time or place; thus, no data were collected.

12. References

Abbott, H. P. (2020). *The Cambridge Introduction to Narrative*. Cambridge University Press.

Allen, A. M., & Singh, N. J. (2016). Linking Movement Ecology with Wildlife Management and Conservation. *Frontiers in Ecology and Evolution*, *3*. https://doi.org/10.3389/fevo.2015.00155

Andreassen, H. P., Gangaas, K. E., & Kaltenborn, B. P. (2018). Matching social-ecological systems by understanding the spatial scale of environmental attitudes. *Nature Conservation*, *30*, 69–81. https://doi.org/10.3897/natureconservation.30.28289

Avraamidou, L., & Osborne, J. (2009). The Role of Narrative in Communicating Science. *International Journal of Science Education*, *31*(12), 1683–1707. https://doi.org/10.1080/09500690802380695

Baguette, M., & Van Dyck, H. (2007). Landscape connectivity and animal behavior: Functional grain as a key determinant for dispersal. *Landscape Ecology*, *22*(8), 1117–1129. https://doi.org/10.1007/s10980-007-9108-4

Baker, A. D., & Leberg, P. L. (2018). Impacts of human recreation on carnivores in protected areas. *PLOS ONE*, *13*(4), e0195436. https://doi.org/10.1371/journal.pone.0195436

Baker, S. E., Maw, S. A., Johnson, P. J., & W. Macdonald, D. (2020). Not in My Backyard: Public Perceptions of Wildlife and 'Pest Control' in and around UK Homes, and Local Authority 'Pest Control.' *Animals*, *10*(2), 222. https://doi.org/10.3390/ani10020222

Balasubramaniam, K. N., Bliss-Moreau, E., Beisner, B. A., Marty, P. R., Kaburu, S. S. K., & McCowan, B. (2021). Addressing the challenges of research on human-wildlife interactions using the concept of Coupled Natural & Human Systems. *Biological Conservation*, *257*, 109095. https://doi.org/10.1016/j.biocon.2021.109095

Barr, S. (2004). Are we all environmentalists now? Rhetoric and reality in environmental action. *Geoforum*, *35*(2), 231–249. https://doi.org/10.1016/j.geoforum.2003.08.009

Barua, M., Bhagwat, S. A., & Jadhav, S. (2013). The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological Conservation*, *157*, 309–316. https://doi.org/10.1016/j.biocon.2012.07.014

Bastian, O., Krönert, R., & Lipský, Z. (2006). Landscape Diagnosis on Different Space and Time Scales – A Challenge for Landscape Planning. *Landscape Ecology*, *21*(3), 359–374. https://doi.org/10.1007/s10980-005-5224-1

Bates, A., Nwadiaru, O. V., Goldstein, A., Cantor, J., Cowan, M., Shokooh, M. P., & Harper, K. (2024). Whose low-carbon future? Community perceptions and expectations on the renewable energy transition in a post-industrial city. *Energy Research & Social Science*, *118*, 103781. https://doi.org/10.1016/j.erss.2024.103781

Bell, S. L., Westley, M., Lovell, R., & Wheeler, B. W. (2018). Everyday green space and experienced well-being: The significance of wildlife encounters. *Landscape Research*, *43*(1), 8–19. https://doi.org/10.1080/01426397.2016.1267721

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., Cullman, G., Curran, D., Durbin, T. J., Epstein, G., Greenberg, A., Nelson, M. P., Sandlos, J., Stedman, R., Teel, T. L., Thomas, R., Veríssimo, D., & Wyborn, C. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation*, *205*, 93–108. https://doi.org/10.1016/j.biocon.2016.10.006

Benz, R. A., Boyce, M. S., Thurfjell, H., Paton, D. G., Musiani, M., Dormann, C. F., & Ciuti, S. (2016). Dispersal Ecology Informs Design of Large-Scale Wildlife Corridors. *PLOS ONE*, *11*(9), e0162989. https://doi.org/10.1371/journal.pone.0162989

Bergthaller, H., Emmett, R., Johns-Putra, A., Kneitz, A., Lidström, S., McCorristine, S., Pérez Ramos, I., Phillips, D., Rigby, K., & Robin, L. (2014). Mapping Common Ground: Ecocriticism, Environmental History, and the Environmental Humanities. *Environmental Humanities*, *5*(1), 261–276. https://doi.org/10.1215/22011919-3615505

Bevanda, M., Fronhofer, E. A., Heurich, M., Müller, J., & Reineking, B. (2015). Landscape configuration is a major determinant of home range size variation. *Ecosphere*, *6*(10), 1–12. https://doi.org/10.1890/ES15-00154.1

Bianco, G., Manning, P., & Schleuning, M. (2024). A quantitative framework for identifying the role of individual species in Nature's Contributions to People. *Ecology Letters*, *27*(2), e14371. https://doi.org/10.1111/ele.14371

Blaschke, T. (2006). The role of the spatial dimension within the framework of sustainable landscapes and natural capital. *Landscape and Urban Planning*, *75*(3–4), 198–226. https://doi.org/10.1016/j.landurbplan.2005.02.013

Bocco, G. (2016). Remoteness and remote places. A geographic perspective. *Geoforum*, *77*, 178–181. https://doi.org/10.1016/j.geoforum.2016.11.003

Boyce, M. S., Vernier, P. R., Nielsen, S. E., & Schmiegelow, F. K. A. (2002). Evaluating resource selection functions. *Ecological Modelling*, *157*(2–3), 281–300. https://doi.org/10.1016/S0304-3800(02)00200-4

Brenner, L. J., & Metcalf, E. C. (2020). Beyond the tolerance/intolerance dichotomy: Incorporating attitudes and acceptability into a robust definition of social tolerance of wildlife. *Human Dimensions of Wildlife*, *25*(3), 259–267. https://doi.org/10.1080/10871209.2019.1702741

Brockington, D., & Igoe, J. (2006). Eviction for Conservation: A Global Overview. *Conservation and Society*, *4*(3), 424–470.

Buchholtz, E. K., Stronza, A., Songhurst, A., McCulloch, G., & Fitzgerald, L. A. (2020). Using landscape connectivity to predict human-wildlife conflict. *Biological Conservation*, *248*, 108677. https://doi.org/10.1016/j.biocon.2020.108677

Cammack, P. J., Convery, I., & Prince, H. (2011). Gardens and birdwatching: Recreation, environmental management and human-nature interaction in an everyday location: Gardens and birdwatching. *Area*, *43*(3), 314–319. https://doi.org/10.1111/j.1475-4762.2011.00992.x

Carlen, E. J., Estien, C. O., Caspi, T., Perkins, D., Goldstein, B. R., Kreling, S. E. S., Hentati, Y., Williams, T. D., Stanton, L. A., Des Roches, S., Johnson, R. F., Young, A. N., Cooper, C. B., & Schell, C. J. (2024). A framework for contextualizing social-ecological biases in contributory science data. *People and Nature*, *6*(2), 377–390. https://doi.org/10.1002/pan3.10592

Carter, N. H., Baeza, A., & Magliocca, N. R. (2020). Emergent conservation outcomes of shared risk perception in human-wildlife systems. *Conservation Biology*, *34*(4), 903–914. https://doi.org/10.1111/cobi.13473

Carter, N., Williamson, M. A., Gilbert, S., Lischka, S. A., Prugh, L. R., Lawler, J. J., Metcalf, A. L., Jacob, A. L., Beltrán, B. J., Castro, A. J., Sage, A., & Burnham, M. (2020). Integrated spatial analysis for human–wildlife coexistence in the American West. *Environmental Research Letters*, *15*(2), 021001. https://doi.org/10.1088/1748-9326/ab60e1

Chamberlain, M. J., Cohen, B. S., Wightman, P. H., Rushton, E., & Hinton, J. W. (2021). Fine-scale movements and behaviors of coyotes (*Canis latrans*) during their reproductive period. *Ecology and Evolution*, *11*(14), 9575–9588. https://doi.org/10.1002/ece3.7777

Ciach, M., & Fröhlich, A. (2017). Habitat type, food resources, noise and light pollution explain the species composition, abundance and stability of a winter bird assemblage in an urban environment. *Urban Ecosystems*, *20*(3), 547–559. https://doi.org/10.1007/s11252-016-0613-6

Colding, J., & Barthel, S. (2019). Exploring the social-ecological systems discourse 20 years later. *Ecology and Society*, *24*(1).

Cottenie, K. (2005). Integrating environmental and spatial processes in ecological community dynamics. *Ecology Letters*, *8*(11), 1175–1182. https://doi.org/10.1111/j.1461-0248.2005.00820.x

Cowell, R., Bristow, G., & Munday, M. (2011). Acceptance, acceptability and environmental justice: The role of community benefits in wind energy development. *Journal of*

Environmental Planning and Management, *54*(4), 539–557. https://doi.org/10.1080/09640568.2010.521047

Cozzi, M., Prete, C., Viccaro, M., & Romano, S. (2019). Impacts of Wildlife on Agriculture: A Spatial-Based Analysis and Economic Assessment for Reducing Damage. *Natural Resources Research*, *28*(S1), 15–29. https://doi.org/10.1007/s11053-019-09469-6

Cronon, W. (1996). The Trouble with Wilderness: Or, Getting Back to the Wrong Nature. *Environmental History*, *1*(1), 7–28. https://doi.org/10.2307/3985059

Cumming, G. S., & Allen, C. R. (2017). Protected areas as social-ecological systems: Perspectives from resilience and social-ecological systems theory. *Ecological Applications*, *27*(6), 1709–1717. https://doi.org/10.1002/eap.1584

Curtin, S. (2009). Wildlife tourism: The intangible, psychological benefits of human–wildlife encounters. *Current Issues in Tourism*, *12*(5–6), 451–474. https://doi.org/10.1080/13683500903042857

Danner, N., Molitor, A. M., Schiele, S., Härtel, S., & Steffan-Dewenter, I. (2016). Season and landscape composition affect pollen foraging distances and habitat use of honey bees. *Ecological Applications*, *26*(6), 1920–1929. https://doi.org/10.1890/15-1840.1

Delgado-Serrano, M. D. M., & Ramos, P. (2015). Making Ostrom's framework applicable to characterise social ecological systems at the local level. *International Journal of the Commons*, *9*(2), 808. https://doi.org/10.18352/ijc.567

DeStefano, S., & DeGraaf, R. M. (2003). Exploring the ecology of suburban wildlife. *Frontiers in Ecology and the Environment*, *1*(2), 95–101. https://doi.org/10.1890/1540-9295(2003)001[0095:ETEOSW]2.0.CO;2

Dickman, C. R. (2008). Indirect interactions and conservation in human-modified environments. *Animal Conservation*, *11*(1), 11–12. https://doi.org/10.1111/j.1469-1795.2008.00159.x

Dinat, D., Echeverri, A., Chapman, M., Karp, D. S., & Satterfield, T. (2019). Eco-xenophobia among rural populations: The Great-tailed Grackle as a contested species in Guanacaste, Costa Rica. *Human Dimensions of Wildlife*, *24*(4), 332–348. https://doi.org/10.1080/10871209.2019.1614239

Diniz, M. F., Cushman, S. A., Machado, R. B., & De Marco Júnior, P. (2020). Landscape connectivity modeling from the perspective of animal dispersal. *Landscape Ecology*, *35*(1), 41–58. https://doi.org/10.1007/s10980-019-00935-3

Doherty, T. S., & Driscoll, D. A. (2018). Coupling movement and landscape ecology for animal conservation in production landscapes. *Proceedings of the Royal Society B: Biological Sciences*, *285*(1870), 20172272. https://doi.org/10.1098/rspb.2017.2272

Donfrancesco, V. (2024). (Co)producing landscapes of coexistence: A historical political ecology of human-wolf relations in Italy. *Geoforum*, *149*, 103958. https://doi.org/10.1016/j.geoforum.2024.103958

Dorresteijn, I., Loos, J., Hanspach, J., & Fischer, J. (2015). Socioecological drivers facilitating biodiversity conservation in traditional farming landscapes. *Ecosystem Health and Sustainability*, *1*(9), 1–9. https://doi.org/10.1890/EHS15-0021.1

Dorresteijn, I., Schultner, J., Nimmo, D. G., Fischer, J., Hanspach, J., Kuemmerle, T., Kehoe, L., & Ritchie, E. G. (2015). Incorporating anthropogenic effects into trophic ecology: Predator–prey interactions in a human-dominated landscape. *Proceedings of the Royal Society B: Biological Sciences*, *282*(1814), 20151602. https://doi.org/10.1098/rspb.2015.1602

Dray, S., Pélissier, R., Couteron, P., Fortin, M.-J., Legendre, P., Peres-Neto, P. R., Bellier, E., Bivand, R., Blanchet, F. G., De Cáceres, M., Dufour, A.-B., Heegaard, E., Jombart, T., Munoz, F., Oksanen, J., Thioulouse, J., & Wagner, H. H. (2012). Community ecology in the age of multivariate multiscale spatial analysis. *Ecological Monographs*, *82*(3), 257–275. https://doi.org/10.1890/11-1183.1

Dressel, S., Ericsson, G., & Sandström, C. (2018). Mapping social-ecological systems to understand the challenges underlying wildlife management. *Environmental Science & Policy*, *84*, 105–112. https://doi.org/10.1016/j.envsci.2018.03.007

Ellis, E. C. (2021). Land Use and Ecological Change: A 12,000-Year History. *Annual Review of Environment and Resources*, *46*(1), 1–33. https://doi.org/10.1146/annurev-environ-012220-010822

Ellis-Soto, D., Oliver, R. Y., Brum-Bastos, V., Demšar, U., Jesmer, B., Long, J. A., Cagnacci, F., Ossi, F., Queiroz, N., Hindell, M., Kays, R., Loretto, M.-C., Mueller, T., Patchett, R., Sims, D. W., Tucker, M. A., Ropert-Coudert, Y., Rutz, C., & Jetz, W. (2023). A vision for incorporating human mobility in the study of human–wildlife interactions. *Nature Ecology & Evolution*, *7*(9), 1362–1372. https://doi.org/10.1038/s41559-023-02125-6

Estien, C. O., Fidino, M., Wilkinson, C. E., Morello-Frosch, R., & Schell, C. J. (2024). Historical redlining is associated with disparities in wildlife biodiversity in four California cities. *Proceedings of the National Academy of Sciences*, *121*(25), e2321441121. https://doi.org/10.1073/pnas.2321441121

Estien, C. O., Wilkinson, C. E., Morello-Frosch, R., & Schell, C. J. (2024). Historical Redlining Is Associated with Disparities in Environmental Quality across California. *Environmental Science & Technology Letters*, *11*(2), 54–59. https://doi.org/10.1021/acs.estlett.3c00870

Fletcher, R., Massarella, K., Ferraz, K. M. P. M. B., Kiwango, W. A., Komi, S., Mabele, M. B., Marchini, S., Nygren, A., Sandroni, L. T., Alagona, P. S., & McInturff, A. (2023). The production-protection nexus: How political-economic processes influence prospects for transformative change in human-wildlife interactions. *Global Environmental Change*, *82*, 102723. https://doi.org/10.1016/j.gloenvcha.2023.102723

Fletcher, R., & Toncheva, S. (2021). The political economy of human-wildlife conflict and coexistence. *Biological Conservation*, *260*, 109216. https://doi.org/10.1016/j.biocon.2021.109216

Fortin, D., Brooke, C. F., Lamirande, P., Fritz, H., McLoughlin, P. D., & Pays, O. (2020). Quantitative Spatial Ecology to Promote Human-Wildlife Coexistence: A Tool for Integrated Landscape Management. *Frontiers in Sustainable Food Systems*, *4*, 600363. https://doi.org/10.3389/fsufs.2020.600363

Gao, Y., & Clark, S. G. (2023). An interdisciplinary conception of human-wildlife coexistence. *Journal for Nature Conservation*, *73*, 126370. https://doi.org/10.1016/j.jnc.2023.126370

Gao, Y., & Clark, S. G. (2024). A practical guide to understanding the context of human-wildlife coexistence. *Journal of Environmental Studies and Sciences*, *14*(4), 720–731. https://doi.org/10.1007/s13412-024-00894-5

Gaynor, K. M., Hojnowski, C. E., Carter, N. H., & Brashares, J. S. (2018). The influence of human disturbance on wildlife nocturnality. *Science*, *360*(6394), 1232–1235. https://doi.org/10.1126/science.aar7121

Gehrt, S. D., Anchor, C., & White, L. A. (2009). Home Range and Landscape Use of Coyotes in a Metropolitan Landscape: Conflict or Coexistence? *Journal of Mammalogy*, *90*(5), 1045–1057. https://doi.org/10.1644/08-MAMM-A-277.1

Ghasemi, B., Niemiec, R., & Crooks, K. R. (2024). Public perspectives on hunting mountain lions and black bears in Colorado. *Conservation Science and Practice*, *6*(9), e13213. https://doi.org/10.1111/csp2.13213

Ghent, C. (2018). Mitigating the Effects of Transport Infrastructure Development on Ecosystems. *Consilience*, *19*, 58–68.

Giuggioli, L., & Kenkre, V. M. (2014). Consequences of animal interactions on their dynamics: Emergence of home ranges and territoriality. *Movement Ecology*, *2*(1), 20. https://doi.org/10.1186/s40462-014-0020-7

Greggor, A. L., Berger-Tal, O., & Blumstein, D. T. (2020). The Rules of Attraction: The Necessary Role of Animal Cognition in Explaining Conservation Failures and Successes. *Annual Review of Ecology, Evolution, and Systematics*, *51*(1), 483–503. https://doi.org/10.1146/annurev-ecolsys-011720-103212

Guerrero, A. M., Bennett, N. J., Wilson, K. A., Carter, N., Gill, D., Mills, M., Ives, C. D., Selinske, M. J., Larrosa, C., Bekessy, S., Januchowski-Hartley, F. A., Travers, H., Wyborn, C. A., & Nuno, A. (2018). Achieving the promise of integration in social-ecological research: A review and prospectus. *Ecology and Society*, *23*(3), art38. https://doi.org/10.5751/ES-10232-230338

Guha, R. (2002). Environmentalist of the Poor. *Economic and Political Weekly*, *37*(3), 204–207.

Halpern, B. S., Walbridge, S., Selkoe, K. A., Kappel, C. V., Micheli, F., D'Agrosa, C., Bruno, J. F., Casey, K. S., Ebert, C., Fox, H. E., Fujita, R., Heinemann, D., Lenihan, H. S., Madin, E. M. P., Perry, M. T., Selig, E. R., Spalding, M., Steneck, R., & Watson, R. (2008). A Global Map of Human Impact on Marine Ecosystems. *Science*, *319*(5865), 948–952. https://doi.org/10.1126/science.1149345

Hamilton, L. C., Colocousis, C. R., & Duncan, C. M. (2010). Place Effects on Environmental Views: Place Effects on Environmental Views. *Rural Sociology*, *75*(2), 326–347. https://doi.org/10.1111/j.1549-0831.2010.00013.x

Hards, S. (2012). Tales of transformation: The potential of a narrative approach to pro-environmental practices. *Geoforum*, *43*(4), 760–771. https://doi.org/10.1016/j.geoforum.2012.01.004

He, P., Maldonado-Chaparro, A. A., & Farine, D. R. (2019). The role of habitat configuration in shaping social structure: A gap in studies of animal social complexity. *Behavioral Ecology and Sociobiology*, *73*(1), 9. https://doi.org/10.1007/s00265-018-2602-7

Holm, P., Adamson, J., Huang, H., Kirdan, L., Kitch, S., McCalman, I., Ogude, J., Ronan, M., Scott, D., Thompson, K., Travis, C., & Wehner, K. (2015). Humanities for the Environment—A Manifesto for Research and Action. *Humanities*, *4*(4), 977–992. https://doi.org/10.3390/h4040977

Holm, P., Goodsite, M. E., Cloetingh, S., Agnoletti, M., Moldan, B., Lang, D. J., Leemans, R., Moeller, J. O., Buendía, M. P., Pohl, W., Scholz, R. W., Sors, A., Vanheusden, B., Yusoff, K., & Zondervan, R. (2013). Collaboration between the natural, social and human sciences in Global Change Research. *Environmental Science & Policy*, *28*, 25–35. https://doi.org/10.1016/j.envsci.2012.11.010

Holt, R. D. (1984). Spatial Heterogeneity, Indirect Interactions, and the Coexistence of Prey Species. *The American Naturalist*, *124*(3), 377–406. https://doi.org/10.1086/284280

Horton, A. A., & Barnes, D. K. A. (2020). Microplastic pollution in a rapidly changing world: Implications for remote and vulnerable marine ecosystems. *Science of The Total Environment*, *738*, 140349. https://doi.org/10.1016/j.scitotenv.2020.140349

Howell, R. A. (2013). It's not (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles. *Global Environmental Change*, *23*(1), 281–290. https://doi.org/10.1016/j.gloenvcha.2012.10.015

Hubbell, J. A., & Ryan, J. C. (2021). *Introduction to the Environmental Humanities* (1st ed.). Routledge. https://doi.org/10.4324/9781351200356

Hull, V., Bian, X., Episcopio-Sturgeon, D. J., Rivera, C. J., Rojas-Bonzi, V., & Morzillo, A. T. (2023). Living with wildlife: A review of advances in social-ecological analysis across landscapes. *Landscape Ecology*, *38*(12), 4385–4402. https://doi.org/10.1007/s10980-023-01778-9

Hyland, K. (2008). Genre and academic writing in the disciplines. *Language Teaching*, *41*(4), 543–562. https://doi.org/10.1017/S0261444808005235

James, E., & Morel, E. (2020). Narrative in the Anthropocene. In *Environment and Narrative: New Directions in Econarratology* (pp. 183–202).

Jeltsch, F., Bonte, D., Pe'er, G., Reineking, B., Leimgruber, P., Balkenhol, N., Schröder, B., Buchmann, C. M., Mueller, T., Blaum, N., Zurell, D., Böhning-Gaese, K., Wiegand, T., Eccard, J. A., Hofer, H., Reeg, J., Eggers, U., & Bauer, S. (2013). Integrating movement ecology with biodiversity research—Exploring new avenues to address spatiotemporal biodiversity dynamics. *Movement Ecology*, *1*(1), 6. https://doi.org/10.1186/2051-3933-1-6

Jennings, V., & Gaither, C. (2015). Approaching Environmental Health Disparities and Green Spaces: An Ecosystem Services Perspective. *International Journal of Environmental Research and Public Health*, *12*(2), 1952–1968. https://doi.org/10.3390/ijerph120201952

Johst, K., Brandl, R., & Pfeifer, R. (2001). FORAGING IN A PATCHY AND DYNAMIC LANDSCAPE: HUMAN LAND USE AND THE WHITE STORK. *Ecological*

Applications, *11*(1), 60–69. https://doi.org/10.1890/1051-0761(2001)011[0060:FIAPAD]2.0.CO;2

Jones, N. A., Shaw, S., Ross, H., Witt, K., & Pinner, B. (2016). The study of human values in understanding and managing social-ecological systems. *Ecology and Society*, *21*(1), art15. https://doi.org/10.5751/ES-07977-210115

Kays, R., Crofoot, M. C., Jetz, W., & Wikelski, M. (2015). Terrestrial animal tracking as an eye on life and planet. *Science*, *348*(6240), aaa2478. https://doi.org/10.1126/science.aaa2478

Keith, R. J., Given, L. M., Martin, J. M., & Hochuli, D. F. (2022). Collaborating with qualitative researchers to co-design social-ecological studies. *Austral Ecology*, *47*(4), 880–888. https://doi.org/10.1111/aec.13172

Killion, A. K., Ramirez, J. M., & Carter, N. H. (2021). Human adaptation strategies are key to cobenefits in human–wildlife systems. *Conservation Letters*, *14*(2), e12769. https://doi.org/10.1111/conl.12769

Kim, H., Peterson, G. D., Cheung, W. W. L., Ferrier, S., Alkemade, R., Arneth, A., Kuiper, J. J., Okayasu, S., Pereira, L., Acosta, L. A., Chaplin-Kramer, R., Den Belder, E., Eddy, T. D., Johnson, J. A., Karlsson-Vinkhuyzen, S., Kok, M. T. J., Leadley, P., Leclère, D., Lundquist, C. J., … Pereira, H. M. (2023). Towards a better future for biodiversity and people: Modelling Nature Futures. *Global Environmental Change*, *82*, 102681. https://doi.org/10.1016/j.gloenvcha.2023.102681

Knowlton, J. L., & Graham, C. H. (2010). Using behavioral landscape ecology to predict species' responses to land-use and climate change. *Biological Conservation*, *143*(6), 1342–1354. https://doi.org/10.1016/j.biocon.2010.03.011

Kobluk, H. M., Salomon, A. K., Ford, A. T., Kadykalo, A. N., Hessami, M. A., Labranche, P.-A., Richter, C., Palen, W. J., Happynook, Ḥapinyuuk Tommy, Humphries, M. M., & Bennett, E. M. (2024). Relational place-based solutions for environmental policy misalignments. *Trends in Ecology & Evolution*, *39*(3), 217–220. https://doi.org/10.1016/j.tree.2024.01.001

Koch, L. (2024). "Us versus them" mentalities in co-managing a Natura 2000 forest: Narratives, identities, and a culture of conflict. *Environmental Policy and Governance*, *34*(6), 582–597. https://doi.org/10.1002/eet.2102

Korpach, A. M., Garroway, C. J., Mills, A. M., Von Zuben, V., Davy, C. M., & Fraser, K. C. (2022). Urbanization and artificial light at night reduce the functional connectivity of migratory aerial habitat. *Ecography*, *2022*(8), e05581. https://doi.org/10.1111/ecog.05581

Kretser, H. E., Sullivan, P. J., & Knuth, B. A. (2008). Housing density as an indicator of spatial patterns of reported human–wildlife interactions in Northern New York. *Landscape and Urban Planning*, *84*(3–4), 282–292. https://doi.org/10.1016/j.landurbplan.2007.08.007

Launchbaugh, K. L., & Howery, L. D. (2005). Understanding Landscape Use Patterns of Livestock as a Consequence of Foraging Behavior. *Rangeland Ecology & Management*, *58*(2), 99–108. https://doi.org/10.2111/03-146.1

Lavery, H., Ross, H., & Baldwin, C. (2019). The power of the narrative. *Australasian Journal of Environmental Management*, *26*(2), 105–111. https://doi.org/10.1080/14486563.2019.1632586

Lechner, A. M., Raymond, C. M., Adams, V. M., Polyakov, M., Gordon, A., Rhodes, J. R., Mills, M., Stein, A., Ives, C. D., & Lefroy, E. C. (2014). Characterizing Spatial Uncertainty when Integrating Social Data in Conservation Planning. *Conservation Biology*, *28*(6), 1497–1511. https://doi.org/10.1111/cobi.12409

Lejano, R. P., Tavares-Reager, J., & Berkes, F. (2013). Climate and narrative: Environmental knowledge in everyday life. *Environmental Science & Policy*, *31*, 61–70. https://doi.org/10.1016/j.envsci.2013.02.009

Lennon, M. (2017). Decolonizing energy: Black Lives Matter and technoscientific expertise amid solar transitions. *Energy Research & Social Science*, *30*, 18–27. https://doi.org/10.1016/j.erss.2017.06.002

Lewis, J. S., Spaulding, S., Swanson, H., Keeley, W., Gramza, A. R., VandeWoude, S., & Crooks, K. R. (2021). Human activity influences wildlife populations and activity patterns: Implications for spatial and temporal refuges. *Ecosphere*, *12*(5), e03487. https://doi.org/10.1002/ecs2.3487

Lima, S. L., & Zollner, P. A. (1996). Towards a behavioral ecology of ecological landscapes. *Trends in Ecology & Evolution*, *11*(3), 131–135. https://doi.org/10.1016/0169-5347(96)81094-9

Lischka, S. A., Teel, T. L., Johnson, H. E., Reed, S. E., Breck, S., Don Carlos, A., & Crooks, K. R. (2018). A conceptual model for the integration of social and ecological information to understand human-wildlife interactions. *Biological Conservation*, *225*, 80–87. https://doi.org/10.1016/j.biocon.2018.06.020

Madden, F. (2004). Creating Coexistence between Humans and Wildlife: Global Perspectives on Local Efforts to Address Human–Wildlife Conflict. *Human Dimensions of Wildlife*, *9*(4), 247–257. https://doi.org/10.1080/10871200490505675

Malavska, V. (2016). Genre of an Academic Lecture. *International Journal on Language, Literature and Culture in Education*, *3*(2), 56–84. https://doi.org/10.1515/llce-2016-0010

Manfredo, M. J. (2008). Attitudes and the Study of Human Dimensions of Wildlife. In M. J. Manfredo, *Who Cares About Wildlife?* (pp. 75–109). Springer US. https://doi.org/10.1007/978-0-387-77040-6_4

Martin, J. G. A., & Réale, D. (2008). Animal temperament and human disturbance: Implications for the response of wildlife to tourism. *Behavioural Processes*, *77*(1), 66–72. https://doi.org/10.1016/j.beproc.2007.06.004

Martin, T. G., Nally, S., Burbidge, A. A., Arnall, S., Garnett, S. T., Hayward, M. W., Lumsden, L. F., Menkhorst, P., McDonald-Madden, E., & Possingham, H. P. (2012). Acting fast helps avoid extinction. *Conservation Letters*, *5*(4), 274–280. https://doi.org/10.1111/j.1755-263X.2012.00239.x

Martin, V. Y. (2020). Four Common Problems In Environmental Social Research Undertaken by Natural Scientists. *BioScience*, *70*(1), 13–16. https://doi.org/10.1093/biosci/biz128

Massol, F., Gravel, D., Mouquet, N., Cadotte, M. W., Fukami, T., & Leibold, M. A. (2011). Linking community and ecosystem dynamics through spatial ecology: An integrative approach to spatial food webs. *Ecology Letters*, *14*(3), 313–323. https://doi.org/10.1111/j.1461-0248.2011.01588.x

Matthews, R., & Selman, P. (2006). Landscape as a Focus for Integrating Human and Environmental Processes. *Journal of Agricultural Economics*, *57*(2), 199–212. https://doi.org/10.1111/j.1477-9552.2006.00047.x

McGinnis, M. D., & Ostrom, E. (2014). Social-ecological system framework: Initial changes and continuing challenges. *Ecology and Society*, *19*(2), art30. https://doi.org/10.5751/ES-06387-190230

McInturff, A., Miller, J. R. B., Gaynor, K. M., & Brashares, J. S. (2021). Patterns of coyote predation on sheep in California: A socio-ecological approach to mapping risk of livestock–predator conflict. *Conservation Science and Practice*, *3*(3), e175. https://doi.org/10.1111/csp2.175

McMahon, T. A., Rohr, J. R., & Bernal, X. E. (2017). Light and noise pollution interact to disrupt interspecific interactions. *Ecology*, *98*(5), 1290–1299. https://doi.org/10.1002/ecy.1770

McNitt, D. C., Alonso, R. S., Cherry, M. J., Fies, M. L., & Kelly, M. J. (2020). Sex-specific effects of reproductive season on bobcat space use, movement, and resource selection in the Appalachian Mountains of Virginia. *PLOS ONE*, *15*(8), e0225355. https://doi.org/10.1371/journal.pone.0225355

Meir, E., Andelman, S., & Possingham, H. P. (2004). Does conservation planning matter in a dynamic and uncertain world? *Ecology Letters*, *7*(8), 615–622. https://doi.org/10.1111/j.1461-0248.2004.00624.x

Metcalf, A. L., Metcalf, E. C., Brenner, L. J., Nesbitt, H. K., Phelan, C. N., Lewis, M. S., & Gude, J. A. (2024). The wildlife attitude-acceptability framework's potential to inform human dimensions of wildlife science and practice. *Human Dimensions of Wildlife*, 1–15. https://doi.org/10.1080/10871209.2024.2318330

Miao, R. E., & Cagle, N. L. (2020). The role of gender, race, and ethnicity in environmental identity development in undergraduate student narratives. *Environmental Education Research*, *26*(2), 171–188. https://doi.org/10.1080/13504622.2020.1717449

Middleton, A. D., Sawyer, H., Merkle, J. A., Kauffman, M. J., Cole, E. K., Dewey, S. R., Gude, J. A., Gustine, D. D., McWhirter, D. E., Proffitt, K. M., & White, P. (2020). Conserving transboundary wildlife migrations: Recent insights from the Greater Yellowstone Ecosystem. *Frontiers in Ecology and the Environment*, *18*(2), 83–91. https://doi.org/10.1002/fee.2145

Mingers, J. (1991). The cognitive theories of Maturana and Varela. *Systems Practice*, *4*(4), 319–338. https://doi.org/10.1007/BF01062008

Morellet, N., Van Moorter, B., Cargnelutti, B., Angibault, J.-M., Lourtet, B., Merlet, J., Ladet, S., & Hewison, A. J. M. (2011). Landscape composition influences roe deer habitat selection at both home range and landscape scales. *Landscape Ecology*, *26*(7), 999–1010. https://doi.org/10.1007/s10980-011-9624-0

Mosimane, A. W., McCool, S., Brown, P., & Ingrebretson, J. (2014). Using mental models in the analysis of human–wildlife conflict from the perspective of a social–ecological system in Namibia. *Oryx*, *48*(1), 64–70. https://doi.org/10.1017/S0030605312000555

Mueller, T., & Fagan, W. F. (2008). Search and navigation in dynamic environments – from individual behaviors to population distributions. *Oikos*, *117*(5), 654–664. https://doi.org/10.1111/j.0030-1299.2008.16291.x

Mueller, T., Olson, K. A., Dressler, G., Leimgruber, P., Fuller, T. K., Nicolson, C., Novaro, A. J., Bolgeri, M. J., Wattles, D., DeStefano, S., Calabrese, J. M., & Fagan, W. F. (2011). How landscape dynamics link individual- to population-level movement patterns: A multispecies comparison of ungulate relocation data: Population-level movement patterns. *Global Ecology and Biogeography*, *20*(5), 683–694. https://doi.org/10.1111/j.1466-8238.2010.00638.x

Nathan, R., Getz, W. M., Revilla, E., Holyoak, M., Kadmon, R., Saltz, D., & Smouse, P. E. (2008). A movement ecology paradigm for unifying organismal movement research. *Proceedings of the National Academy of Sciences*, *105*(49), 19052–19059. https://doi.org/10.1073/pnas.0800375105

Nesbitt, H. K., Metcalf, A. L., Floyd, T. M., Uden, D. R., Chaffin, B. C., Gulab, S., Banerjee, S., Vallury, S., Hamlin, S. L., Metcalf, E. C., Fogarty, D. T., Twidwell, D., & Allen, C. R. (2024). Social networks and transformative behaviours in a grassland social-ecological system. *People and Nature*, pan3.10695. https://doi.org/10.1002/pan3.10695

Neumann, W., Ericsson, G., Dettki, H., & Radeloff, V. C. (2013). Behavioural response to infrastructure of wildlife adapted to natural disturbances. *Landscape and Urban Planning*, *114*, 9–27. https://doi.org/10.1016/j.landurbplan.2013.02.002

Newell, P. (2021). Race and the politics of energy transitions. *Energy Research & Social Science*, *71*, 101839. https://doi.org/10.1016/j.erss.2020.101839

Newsome, T., & Van Eeden, L. (2017). The Effects of Food Waste on Wildlife and Humans. *Sustainability*, *9*(7), 1269. https://doi.org/10.3390/su9071269

Niesner, C. A., Blakey, R. V., Blumstein, D. T., & Abelson, E. S. (2021). Wildlife Affordances of Urban Infrastructure: A Framework to Understand Human-Wildlife Space Use. *Frontiers in Conservation Science*, *2*, 774137. https://doi.org/10.3389/fcosc.2021.774137

Ojala, M., Cunsolo, A., Ogunbode, C. A., & Middleton, J. (2021). Anxiety, Worry, and Grief in a Time of Environmental and Climate Crisis: A Narrative Review. *Annual Review of*

Environment and Resources, *46*(1), 35–58. https://doi.org/10.1146/annurev-environ-012220-022716

Orrick, K., Dove, M., & Schmitz, O. J. (2024). Human–nature relationships: An introduction to social–ecological practice theory for human–wildlife interactions. *Ambio*, *53*(2), 201–211. https://doi.org/10.1007/s13280-023-01945-x

Ostrom, E. (2007). A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences*, *104*(39), 15181–15187. https://doi.org/10.1073/pnas.0702288104

Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science*, *325*(5939), 419–422. https://doi.org/10.1126/science.1172133

Pinckney, H. P., Hicks, A. S., Sène, A. L., & Floyd, M. F. (2025). "We have our own cultural ways of being in nature": New perspectives on African Americans' relationships to U.S. National Parks. *Journal of Leisure Research*, *56*(2), 296–313. https://doi.org/10.1080/00222216.2023.2295869

Power, E. R. (2005). Human–Nature Relations in Suburban Gardens. *Australian Geographer*, *36*(1), 39–53. https://doi.org/10.1080/00049180500050847

Prince, G. (2019). Narratology. In G. Prince, *Oxford Research Encyclopedia of Literature*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190201098.013.996

Procko, M., Naidoo, R., LeMay, V., & Burton, A. C. (2023). Human presence and infrastructure impact wildlife nocturnality differently across an assemblage of mammalian species. *PLOS ONE*, *18*(5), e0286131. https://doi.org/10.1371/journal.pone.0286131

Quevedo, M., Svanbäck, R., & Eklöv, P. (2009). Intrapopulation niche partitioning in a generalist predator limits food web connectivity. *Ecology*, *90*(8), 2263–2274. https://doi.org/10.1890/07-1580.1

Raghav, S., & Boogert, N. J. (2022). Factors associated with Herring Gulls *Larus argentatus* stealing food from humans in coastal towns. *Bird Study*, *69*(3–4), 103–108. https://doi.org/10.1080/00063657.2022.2162846

Randler, C., Friedrich, S., & Koch (Née Nagel), S. (2023). Psychological restoration, place attachment and satisfaction in birders and non-birding visitors. *Journal of Outdoor Recreation and Tourism*, *44*, 100679. https://doi.org/10.1016/j.jort.2023.100679

Recharte, M., Lee, P., Meza, D., Vick, S. -J., & Bowler, M. (2024). Perceptions and reality in fisher coexistence with aquatic predators in the Peruvian Amazon. *Animal Conservation*, *27*(4), 566–579. https://doi.org/10.1111/acv.12932

Reyers, B., & Bennett, E. M. (2025). Whose conservation, revisited: How a focus on people–nature relationships spotlights new directions for conservation science. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *380*(1917), 20230320. https://doi.org/10.1098/rstb.2023.0320

Rigolon, A., Browning, M. H. E. M., McAnirlin, O., & Yoon, H. (Violet). (2021). Green Space and Health Equity: A Systematic Review on the Potential of Green Space to Reduce Health Disparities. *International Journal of Environmental Research and Public Health*, *18*(5), 2563. https://doi.org/10.3390/ijerph18052563

Roedenbeck, I. A., & Voser, P. (2008). Effects of roads on spatial distribution, abundance and mortality of brown hare (Lepus europaeus) in Switzerland. *European Journal of Wildlife Research*, *54*(3), 425–437. https://doi.org/10.1007/s10344-007-0166-3

Rosa, C. D., Larson, L. R., Silvia Collado, Cloutier, S., & Profice, C. C. (2023). Gender Differences in Connection to Nature, Outdoor Preferences, and Nature-Based Recreation Among College Students in Brazil and the United States. *Leisure Sciences*, *45*(2), 135–155. https://doi.org/10.1080/01490400.2020.1800538

Ross, D. G. (2013). Common Topics and Commonplaces of Environmental Rhetoric. *Written Communication*, *30*(1), 91–131. https://doi.org/10.1177/0741088312465376

Sage, A. H., Hillis, V., Graves, R. A., Burnham, M., & Carter, N. H. (2022). Paths of coexistence: Spatially predicting acceptance of grizzly bears along key movement corridors. *Biological Conservation*, *266*, 109468. https://doi.org/10.1016/j.biocon.2022.109468

Santana, J., Reino, L., Stoate, C., Borralho, R., Carvalho, C. R., Schindler, S., Moreira, F., Bugalho, M. N., Ribeiro, P. F., Santos, J. L., Vaz, A., Morgado, R., Porto, M., & Beja, P. (2014). Mixed Effects of Long-Term Conservation Investment in Natura 2000 Farmland. *Conservation Letters*, *7*(5), 467–477. https://doi.org/10.1111/conl.12077

Santos, R. A. L., Mota-Ferreira, M., Aguiar, L. M. S., & Ascensão, F. (2018). Predicting wildlife road-crossing probability from roadkill data using occupancy-detection models. *Science of The Total Environment*, *642*, 629–637. https://doi.org/10.1016/j.scitotenv.2018.06.107

Schaal-Lagodzinski, T., König, B., Riechers, M., Heitepriem, N., & Leventon, J. (2024). Exploring cultural landscape narratives to understand challenges for collaboration and their implications for governance. *Ecosystems and People*, *20*(1), 2320886. https://doi.org/10.1080/26395916.2024.2320886

Schell, C. J., Dyson, K., Fuentes, T. L., Des Roches, S., Harris, N. C., Miller, D. S., Woelfle-Erskine, C. A., & Lambert, M. R. (2020). The ecological and evolutionary consequences of systemic racism in urban environments. *Science*, *369*(6510), eaay4497. https://doi.org/10.1126/science.aay4497

Schmitz, O. J., Miller, J. R. B., Trainor, A. M., & Abrahms, B. (2017). Toward a community ecology of landscapes: Predicting multiple predator–prey interactions across geographic space. *Ecology*, *98*(9), 2281–2292. https://doi.org/10.1002/ecy.1916

Scott, J. M., Goble, D. D., Haines, A. M., Wiens, J. A., & Neel, M. C. (2010). Conservation-reliant species and the future of conservation. *Conservation Letters*, *3*(2), 91–97. https://doi.org/10.1111/j.1755-263X.2010.00096.x

Searle, K. R., Hobbs, N. T., & Gordon, I. J. (2007). It's the "Foodscape", not the Landscape: Using Foraging Behavior to Make Functional Assessments of Landscape Condition. *Israel Journal of Ecology & Evolution*, *53*(3–4), 297–316. https://doi.org/10.1560/IJEE.53.3.297

Semmens, B. X., Ward, E. J., Moore, J. W., & Darimont, C. T. (2009). Quantifying Inter- and Intra-Population Niche Variability Using Hierarchical Bayesian Stable Isotope Mixing Models. *PLoS ONE*, *4*(7), e6187. https://doi.org/10.1371/journal.pone.0006187

Serenari, C. (2021). Reconsidering the role of the built environment in human–wildlife interactions. *People and Nature*, *3*(1), 104–114. https://doi.org/10.1002/pan3.10163

Smith, P., & McManus, P. (2024). Geographies of Coexistence: Negotiating urban space with the Grey-Headed Flying-Fox. *Australian Geographer*, *55*(1), 95–114. https://doi.org/10.1080/00049182.2023.2289198

Song, X. P., Richards, D. R., & Tan, P. Y. (2020). Using social media user attributes to understand human–environment interactions at urban parks. *Scientific Reports*, *10*(1), 808. https://doi.org/10.1038/s41598-020-57864-4

Synes, N. W., Brown, C., Palmer, S. C. F., Bocedi, G., Osborne, P. E., Watts, K., Franklin, J., & Travis, J. M. J. (2019). Coupled land use and ecological models reveal emergence and feedbacks in socio-ecological systems. *Ecography*, *42*(4), 814–825. https://doi.org/10.1111/ecog.04039

Tanana, H., Combs, J., & Hoss, A. (2021). Water Is Life: Law, Systemic Racism, and Water Security in Indian Country. *Health Security*, *19*(S1), S-78-S-82. https://doi.org/10.1089/hs.2021.0034

Taylor, M., Brook, B., Johnson, C., & De Little, S. (2024). *Wildlife conservation on private land: A social-ecological systems study*. In Review. https://doi.org/10.21203/rs.3.rs-3916808/v1

Teixeira, L., Tisovec-Dufner, K. C., Marin, G. D. L., Marchini, S., Dorresteijn, I., & Pardini, R. (2021). Linking human and ecological components to understand human–wildlife conflicts across landscapes and species. *Conservation Biology*, *35*(1), 285–296. https://doi.org/10.1111/cobi.13537

Toomey, A. H. (2023). Why facts don't change minds: Insights from cognitive science for the improved communication of conservation research. *Biological Conservation*, *278*, 109886. https://doi.org/10.1016/j.biocon.2022.109886

Tryjanowski, P., Skórka, P., Sparks, T. H., Biaduń, W., Brauze, T., Hetmański, T., Martyka, R., Indykiewicz, P., Myczko, Ł., Kunysz, P., Kawa, P., Czyż, S., Czechowski, P., Polakowski, M., Zduniak, P., Jerzak, L., Janiszewski, T., Goławski, A., Duduś, L., … Wysocki, D. (2015). Urban and rural habitats differ in number and type of bird feeders and in bird species consuming supplementary food. *Environmental Science and Pollution Research*, *22*(19), 15097–15103. https://doi.org/10.1007/s11356-015-4723-0

Turner II, B., Esler, K. J., Bridgewater, P., Tewksbury, J., Sitas, N., Abrahams, B., Chapin, F. S., Chowdhury, R. R., Christie, P., Diaz, S., Firth, P., Knapp, C. N., Kramer, J., Leemans, R., Palmer, M., Pietri, D., Pittman, J., Sarukhán, J., Shackleton, R., … Mooney, H. (2016). Socio-Environmental Systems (SES) Research: What have we learned and how can we use this information in future research programs. *Current Opinion in Environmental Sustainability*, *19*, 160–168. https://doi.org/10.1016/j.cosust.2016.04.001

Van Der Ree, R., Smith, D. J., & Grilo, C. (2015). The Ecological Effects of Linear Infrastructure and Traffic: Challenges and Opportunities of Rapid Global Growth. In R. Van Der Ree, D. J. Smith, & C. Grilo (Eds.), *Handbook of Road Ecology* (1st ed., pp. 1–9). Wiley. https://doi.org/10.1002/9781118568170.ch1

Van Dyck, H. (2012). Changing organisms in rapidly changing anthropogenic landscapes: The significance of the 'Umwelt'-concept and functional habitat for animal conservation. *Evolutionary Applications*, *5*(2), 144–153. https://doi.org/10.1111/j.1752-4571.2011.00230.x

Van Eeden, L. M., S. Rabotyagov, S., Kather, M., Bogezi, C., Wirsing, A. J., & Marzluff, J. (2021). Political affiliation predicts public attitudes toward gray wolf (*Canis lupus*) conservation and management. *Conservation Science and Practice*, *3*(3), e387. https://doi.org/10.1111/csp2.387

Voigt, C. C., Scholl, J. M., Bauer, J., Teige, T., Yovel, Y., Kramer-Schadt, S., & Gras, P. (2020). Movement responses of common noctule bats to the illuminated urban landscape. *Landscape Ecology*, *35*(1), 189–201. https://doi.org/10.1007/s10980-019-00942-4

Volski, L., McInturff, A., Gaynor, K. M., Yovovich, V., & Brashares, J. S. (2021). Social Effectiveness and Human-Wildlife Conflict: Linking the Ecological Effectiveness and

Social Acceptability of Livestock Protection Tools. *Frontiers in Conservation Science*, *2*, 682210. https://doi.org/10.3389/fcosc.2021.682210

Von Der Porten, S., & De Loë, R. C. (2014). How Collaborative Approaches to Environmental Problem Solving View Indigenous Peoples: A Systematic Review. *Society & Natural Resources*, *27*(10), 1040–1056. https://doi.org/10.1080/08941920.2014.918232

Von Uexküll, J. (1909). *Umwelt und innenwelt der tiere*. Springer.

Ward Thompson, C., & Aspinall, P. A. (2011). Natural Environments and their Impact on Activity, Health, and Quality of Life. *Applied Psychology: Health and Well-Being*, *3*(3), 230–260. https://doi.org/10.1111/j.1758-0854.2011.01053.x

West, P., Igoe, J., & Brockington, D. (2006). Parks and Peoples: The Social Impact of Protected Areas. *Annual Review of Anthropology*, *35*(1), 251–277. https://doi.org/10.1146/annurev.anthro.35.081705.123308

Wiens, J. A., Stenseth, N. Chr., Horne, B. V., & Ims, R. A. (1993). Ecological Mechanisms and Landscape Ecology. *Oikos*, *66*(3), 369. https://doi.org/10.2307/3544931

Wilkinson, C. E., Xu, W., Solli, A. L., Brashares, J. S., Chepkisich, C., Osuka, G., & Kelly, M. (2023). *Spotted hyena navigation of social-ecological landscapes on a coexistence frontier*. Preprints. https://doi.org/10.22541/au.169788434.48207147/v2

Wilson, M. C., Chen, X.-Y., Corlett, R. T., Didham, R. K., Ding, P., Holt, R. D., Holyoak, M., Hu, G., Hughes, A. C., Jiang, L., Laurance, W. F., Liu, J., Pimm, S. L., Robinson, S. K., Russo, S. E., Si, X., Wilcove, D. S., Wu, J., & Yu, M. (2016). Habitat fragmentation and biodiversity conservation: Key findings and future challenges. *Landscape Ecology*, *31*(2), 219–227. https://doi.org/10.1007/s10980-015-0312-3

Xiu, N., Ignatieva, M., Van Den Bosch, C. K., Chai, Y., Wang, F., Cui, T., & Yang, F. (2017). A socio-ecological perspective of urban green networks: The Stockholm case. *Urban Ecosystems*, *20*(4), 729–742. https://doi.org/10.1007/s11252-017-0648-3

Young, J. K., Hammill, E., & Breck, S. W. (2019). Interactions with humans shape coyote responses to hazing. *Scientific Reports*, *9*(1), 20046. https://doi.org/10.1038/s41598-019-56524-6

Zeller, K., Lewison, R., Fletcher, R., Tulbure, M., & Jennings, M. (2020). Understanding the Importance of Dynamic Landscape Connectivity. *Land*, *9*(9), 303. https://doi.org/10.3390/land9090303