Understanding conflicting cultural models of outdoor cats to overcome conservation impasse

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Abstract: Many conservation conflicts are scientifically complex yet are rooted in value conflicts, which result in an impasse. Additional biological information alone is insufficient to resolve this type of conflict. Conceptual models that articulate the material aspects of a system are increasingly used to identify areas where parties disagree. Yet, modeling processes typically follow the conveners' rules for discussing and assessing the topic, which can exacerbate conflict. Researchers have identified a need for processes that require participants to reflect on the limits of their own philosophical assumptions and acknowledge other perspectives. Cultural models are a promising tool for this purpose because they include nonmaterial beliefs, morals, and values that guide people's understanding of how to interact with an issue, sometimes subconsciously. We explored how cultural models used with conceptual models can improve understanding of value conflicts and used outdoor cat management as a case study. We conducted interviews and focus group discussions with wildlife conservation and cat welfare professionals involved in outdoor cat policy discussions in Hawaii and Washington, D.C. From these conversations, we developed a conceptual model of the outdoor cat management system and cultural models that led stakeholders to weigh elements of the conceptual model differently. Although wildlife conservation professionals generally spoke about outdoor cats as invasive species, cat welfare professionals spoke about them as homeless pets. These conflicting conceptualizations of what an outdoor cat is may help explain the root of many longstanding disagreements. Examining how and when stakeholders invoke different cultural models allowed us to identify management actions that work with, rather than challenge, those models. Dialogue that embraces conflicting cultural models can be difficult and uncomfortable, but has great potential to overcome conservation impasse and achieve lasting conservation results.

Keywords: conceptual model, conflict transformation, levels of conflict, out of place animals, social construction, value conflicts

Comprensión de Modelos Culturales Opuestos de Gatos en Exteriores para Sobrepasar el Callejón sin Salida en la Conservación

Resumen: Muchos conflictos de conservación son científicamente complejos pero cimentados en los conflictos de valores, lo que puede resultar en un callejón sin salida. La pura información biológica adicional no es suficiente para resolver este tipo de conflictos. Cada vez se usan más los modelos conceptuales que articulan los aspectos materiales de un sistema para identificar las áreas en que las partes se encuentran en desacuerdo. Sin embargo, los procesos del modelado típicamente siguen las reglas de los convocantes para discutir y evaluar el tema, lo que puede agravar un conflicto. Los investigadores han identificado una necesidad por contar con procesos que requieran que los participantes reflexionen sobre los límites de sus propias suposiciones filosóficas y que reconozcan otras perspectivas. Los modelos culturales son una herramienta prometedora para este propósito ya que incluyen las creencias no materiales, la moral y los valores que guían el entendimiento de las personas sobre cómo interactuar con un asunto, a veces de forma subconsciente. Exploramos cómo los modelos culturales usados junto con los modelos conceptuales pueden mejorar el entendimiento de los conflictos de valores y usamos el

manejo de gatos en exteriores como estudio de caso. Realizamos entrevistas y discusiones en grupos de sondeo con profesionales de la conservación de fauna y del bienestar de los gatos involucrados en las discusiones de las políticas sobre gatos en exteriores en Hawái y Washington, D.C. A partir de estas conversaciones, desarrollamos un modelo conceptual del sistema de manejo de gatos en exteriores. También desarrollamos modelos culturales que llevaron a los actores a sopesar de forma distinta los elementos del modelo conceptual. Mientras que los profesionales de la conservación de fauna se refirieron a los gatos en general como una especie invasora, los profesionales del bienestar de los gatos los mencionaron como mascotas abandonadas o sin hogar. Estos conceptos opuestos de lo que es un gato en exteriores puede ayudar a explicar la raíz de muchos conflictos duraderos. La examinación de cómo y cuándo los actores invocan modelos culturales diferentes nos permitió identificar las acciones de manejo que funcionan con esos modelos en lugar de retarlos. El diálogo que acepta los modelos culturales opuestos puede ser complicado e incómodo, pero tiene un gran potencial para sobrepasar las conversaciones sin salida y lograr resultados de conservación de larga duración.

Palabras Clave: animales fuera de lugar, conflicto de valores, construcción social, modelo conceptual, niveles de conflicto, transformación del conflicto

摘要: 许多保护冲突在科学上是复杂的问题, 但其根源却在于价值冲突, 因而走向了僵局。因此, 仅凭额外的生物学信息不足以解决这类冲突。目前阐明一个系统物质方面的概念模型正越来越多地用于确定各方不一致的领域。然而, 建模过程中通常会遵循发起者的规则来讨论和评估问题, 这可能会导致冲突的加剧。研究人员已经指出, 需要特定的过程来要求参与者反思其哲学假设的局限性, 并认可其它观点。文化模型这个工具具有实现该目标的前景, 因为其包含指导人们理解如何与问题互动的非物质信仰、道德和价值观, 且这些因素有时是在潜移默化中起到作用。本研究探讨了概念模型与文化模型的使用如何提高对价值冲突的理解, 并以流浪猫管理作为案例进行了研究。我们在夏威夷和华盛顿特区与参与流浪猫管理政策讨论的野生动物保护及猫的福利的专业人士进行了采访及小组讨论, 并从中开发了流浪猫管理系统的概念模型, 以及使利益相关者以不同的方式衡量概念模型中的元素的文化模型。野生动物保护专业人士通常把流浪猫看作入侵物种, 而猫福利专业人士则认为它们是无家可归的宠物。这些关于流浪猫的相互冲突的概念可能有助于解释造成许多长期分歧的根源。通过研究利益相关者如何以及何时使用不同的文化模型, 我们可以确定与这些模型共同起作用的管理操作, 而不是去挑战这些模型。接受相互冲突的文化模型对话可能有困难且不舒服, 但是它有很大的潜力来克服保护中的僵局, 并取得持久的保护成果。**翻译: 胡怡思; 审校: 聂永刚**

关键词: 社会建构, 价值观冲突, 概念模型, 冲突等级, 冲突转化, 流浪动物

Introduction

Conservation conflicts are a persistent global problem in which disagreements over conservation goals and public dissatisfaction with management have had detrimental effects on resource sustainability (Peterson et al. 2002; Nie 2003; Frank et al. 2019). Often, incompatible priorities, value systems, and worldviews manifest as conflicts that are highly emotional, resistant to resolution, and ultimately impede conservation action (Pearce & Littlejohn 1997; Peterson et al. 2002; Nie 2003). Long-standing disagreements are often deeply rooted in value conflicts between stakeholder groups who employ different moral assessments of what is right or wrong, moral or immoral (Peterson et al. 2002; Lute et al. 2016; Hill et al. 2017). Biological science is insufficient to settle value conflicts in which stakeholders may disagree on the definition of the problem (Nie 2003). Stakeholders act and understand the issue based on what it means to them (Pearce & Littlejohn 1997), without considering that it might mean something else to others (Lederach 1995). Stakeholders often express their different understandings of the problem in disagreements over what counts as a relevant contribution or whether data supports, refutes, or is irrelevant to a hypothesis (Pearce & Littlejohn 1997).

As a result, practitioners and managers have turned to dialogue-based processes to help stakeholders in conflict develop a shared understanding of how to define and manage the conservation issue. Tools such as conceptual models (e.g., Gray et al. 2018) are increasingly used to articulate the material aspects of a system that can be affected by management and places where parties disagree. Conceptual models are a way to visualize the relevant components of the management system, relationships between components, and assumptions about how these components interact and react to different management inputs (Heemskerk et al. 2003; Margoluis et al. 2009; Gray et al. 2018). The outputs of conceptual models typically visualize surface-level disputes, which are the immediate, material aspects of the conflict (Madden & McQuinn 2014). Additional outcomes of model building can include social learning and conflict reduction (Gray et al. 2018).

Whether intentional or not, dialogue-based processes are often designed based on the conveners' understanding of how to talk about and assess the topic, which Pearce and Littlejohn (1997) call their normal discourse. We view ecological science as the normal discourse for conservation. Yet, the normal discourse for stakeholders who hold different values

about nature may be based on different procedures for arguing claims and standards for judging the validity of those arguments. Ecological facts may be less relevant to what they hold dear. Processes that ignore these differences often escalate through predictable phases. Participants start by emphasizing the facts and technical data consistent with their own internal definition of the problem, which exacerbates conflict as parties become increasingly focused on demonizing the opposition to protect their own cultural identity (e.g., Lederach 1995; Peterson et al. 2002; Madden and McQuinn 2014). In these situations, Pearce and Littlejohn (1997) described the need for transcendent discourse, which requires participants to reflect on the limits of their own philosophical assumptions and break out of their normal discourse to acknowledge other perspectives. We are not suggesting ecological science be abandoned to appease conflict, but rather that there is a need for processes that help conservation professionals transform the way they approach value conflicts. Approaches that identify cultural models can provide opportunities for such transcendent discourse, although they are not yet common in conservation practice (Paolisso et al. 2013).

Cultural models are assumed conceptualizations of an issue that are widely shared by a social group (Kempton 1997; Paolisso et al. 2013). Unlike conceptual models, cultural models typically are not articulated as visual representations. Instead, cultural models are internalized concepts that people unconsciously use as shortcuts to understand how the world works, guide their decision making and behavior, and process unfamiliar ideas (Kempton & Falk 2000; Paolisso et al. 2013). Cultural models reflect the nonmaterial relationships between people and natural resources, based on psychological, philosophical, social, or spiritual considerations (Echeverri et al. 2018). Hence, cultural models are not what one sees but rather the lens through which one sees it (Holland & Quinn 1987), which can affect what is perceived to be normal discourse about a topic. Cultural models can help people behave appropriately with little information. However, reliance on cultural models can become problematic when they are applied to new phenomena that do not match the existing model or when groups employ different cultural models to understand the same phenomenon (Kempton & Falk 2000).

Research that elucidates cultural models can be a powerful tool to help people understand an issue through an alternative cultural lens (Kempton 1997; Kempton & Falk 2000). This research is based on the assumption that cultural, historical, and social context affect the way people ascribe meaning to the issue of interest, also known as social construction (Lederach 1995; Peterson et al. 2002; Echeverri et al. 2018). For example, how people understand an animal is based as much on the meanings they impose as it is on empirical reality (Leong 2009; DeMello 2012; Frank et al. 2019). Research on

cultural models seeks to articulate the unstated, shared knowledge used by different groups to understand an issue. Representation of cultural models can range from a series of statements about how the world works, to diagrams that illustrate relationships between those ideas, to identifying existing cultural concepts used by a group to understand new ideas (Paolisso et al. 2013, Kempton & Falk 2000). Although not yet common, research on cultural models has improved dialogue and collaborative learning for conservation conflicts as diverse as emerging fish diseases, rural land conservation disputes, and climate change (Kempton 1997; Kempton & Falk 2000; Paolisso et al. 2013).

The management of free-roaming owned and unowned domestic cats (*Felis catus*, hereafter outdoor cats) in the United States has eluded policy consensus for decades. Conflicts related to outdoor cats occur predominantly between wildlife conservation professionals most concerned about the impacts of cat predation and cat-related diseases (such as toxoplasmosis) on native wildlife species and cat welfare professionals who believe outdoor cats deserve assistance and care (Peterson et al. 2012; Van Patter & Hovorka 2018). Much of the controversy has been over lethal control versus trap-neuter-return (TNR). With TNR, cats are trapped, neutered (sterilized), and returned to the environment, sometimes to managed colonies, where they may be provided food, water, shelter, and veterinary care (i.e., Van Patter & Hovorka 2018). Researchers have quantified differences in beliefs and attitudes about outdoor cats and appropriate management options across different stakeholder groups (e.g., Lohr et al. 2014; Gramza et al. 2016; Wald et al. 2016), and multistakeholder groups have convened to work together on the issue (e.g., Adler 2014). However, there has been minimal follow through on the items identified in studies or agreed on by working groups, resulting in general frustration over policy inaction. Thus, outdoor cat management provides an important example of a value conflict that lacks a shared understanding among stakeholders and in which dialogue has resulted in an impasse.

Few researchers have used social construction approaches to understand the nonmaterial relationships between people and cats (Van Patter & Hovorka 2018). We applied concepts from anthropology and social psychology and used qualitative, narrative methods to explore conceptual and cultural models of outdoor cat management and to identify opportunities to transform conservation dialogues. We focused our efforts on members of 2 working groups: conservation agencies in Hawaii that have been involved in multistakeholder efforts over the past decade (Adler 2014) and a group working in Washington, D.C., to develop a method for counting cats (http://www.dccatcount.org/). We had 3 objectives: develop a conceptual model to improve understanding of surface disputes in outdoor

cat management; examine the relationships between cultural and conceptual models and their role in creating conservation impasse; and identify ways to use cultural models to transform dialogue and break through the impasse. Based on insights from this work, we developed diagnostic questions and advice to assist conservation professionals in recognizing and addressing conservation impasse driven by conflicting cultural models.

Methods

We first sought to understand surface-level disputes related to outdoor cats. We used our 40 years of combined experience studying and engaging with stakeholders on social aspects of outdoor cat management to develop a draft conceptual model. We synthesized common themes and arguments that we have observed and researched with respect to sources and drivers of outdoor cat populations and specific problems resulting from outdoor cats, generally following a process established by Leong et al. (2007) for suburban white-tailed deer (*Odocoileus virginianus*). We focused on the perspectives of wildlife conservation professionals and cat welfare professionals. We recognize that both groups represent a range of perspectives, but we concentrated on the most common arguments voiced by these groups. The resulting conceptual model identified the collective material elements of the outdoor cat management system, assumptions about how these elements interact, and places in the model where different management options act directly or indirectly.

To identify cultural models that reflect value conflicts, we used 2 frameworks increasingly applied in conservation: levels of conflict (Madden & McQuinn 2014) and cognitive hierarchy (Fulton et al. 1996). In addition to surface-level disputes, the levels of conflict framework recognizes 2 deeper levels of conflict. Underlying conflicts reflect a history of unresolved disputes, and deep-rooted conflicts involve values, beliefs, or social–psychological needs that are central to the identity of at least one stakeholder in conflict (Madden & McQuinn 2014). The cognitive hierarchy outlines how a person's behavioral intentions and expressed behavior, such as in response to a dispute, are influenced by underlying social–psychological processes at multiple levels (Fulton et al. 1996). The higher levels of the hierarchy are more context dependent and flexible to change, whereas the basal levels reflect core values that are few in number, central to cognition, and slow to change. We aligned underlying conflicts with the higher levels of the cognitive hierarchy: attitudes, norms, and beliefs. Collectively, these concepts represent evaluations of an issue and assessments of what is proper and true applied to specific contexts (Fulton et al. 1996). At the deep-rooted conflict level, we included identity (a person's sense of

self in relation to the outside world [Madden & McQuinn 2014]) and values (basal cognitions about how the world ought to be [Fulton et al. 1996]). We then reexamined our data for concepts that reflected those constructs and might be associated with different cultural models. Finally, we analyzed the conceptual model to identify potential outdoor cat management actions that might be acceptable, regardless of cultural model.

During development, the conceptual and cultural models were shared with the outdoor cat working groups in Hawaii and Washington, D.C., and refined iteratively based on stakeholder feedback. The first author presented initial ideas for the models and received feedback at the 24th Annual Hawaii Conservation Conference in 2017. We also attended a symposium called "Rethinking the Cat" in Honolulu, Hawaii, in 2017 to learn more about specific concerns and current management approaches of the cat welfare community and discussed ideas presented in the models with participants. The first and second author facilitated discussions about the models with the outdoor cat working groups in Hawaii and Washington D.C. Last, the first author conducted interviews with 8 leaders in outdoor cat management from both the wildlife conservation and cat welfare communities who have discussed ideas with working group members. We conducted interviews in person or via telephone from January to May 2018. Interviews lasted approximately 1 h. Due to the sensitive nature of the topic, we did not record interviews. Detailed notes were taken and written up following the interview. We used the content of the models to structure the interviews and focus group discussions. At each stage, all authors discussed insights about the specific elements in the models, appropriate labels for concepts, relationships between the elements, and representations of concepts reflecting stakeholder attitudes, norms, beliefs, values, and identity. We then updated the models accordingly. We continued the iterative process until we reached saturation and no new themes emerged.

In total, 39 people participated in the development and refinement of the models via the working group discussions and interviews, including individuals associated with universities, federal and state agencies, and nongovernmental organizations from both the wildlife conservation and cat welfare communities. We chose this approach rather than convening multistakeholder groups to develop the models together because the working groups are still building trust across stakeholder cultures. We followed best practices outlined in the Declaration of Helsinki for work with human subjects.

Results

The collective conceptual model for outdoor cats describes tangible components of the system and how
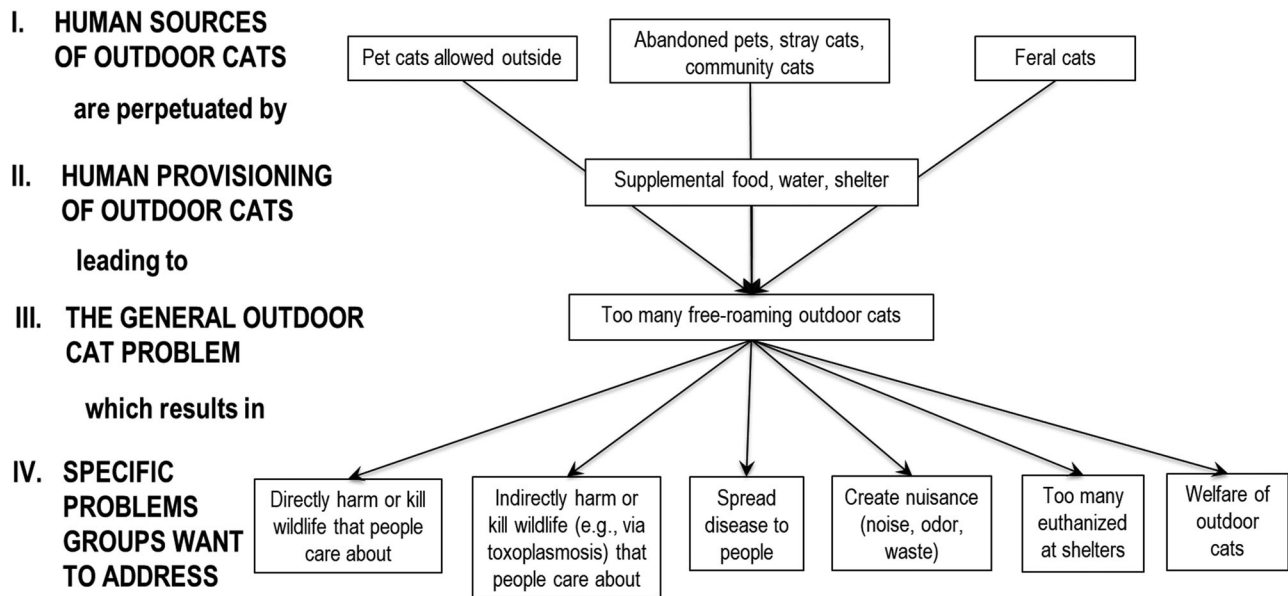
Figure 1. *Conceptual model of free-roaming outdoor cat management showing key elements and relationships among the elements.*
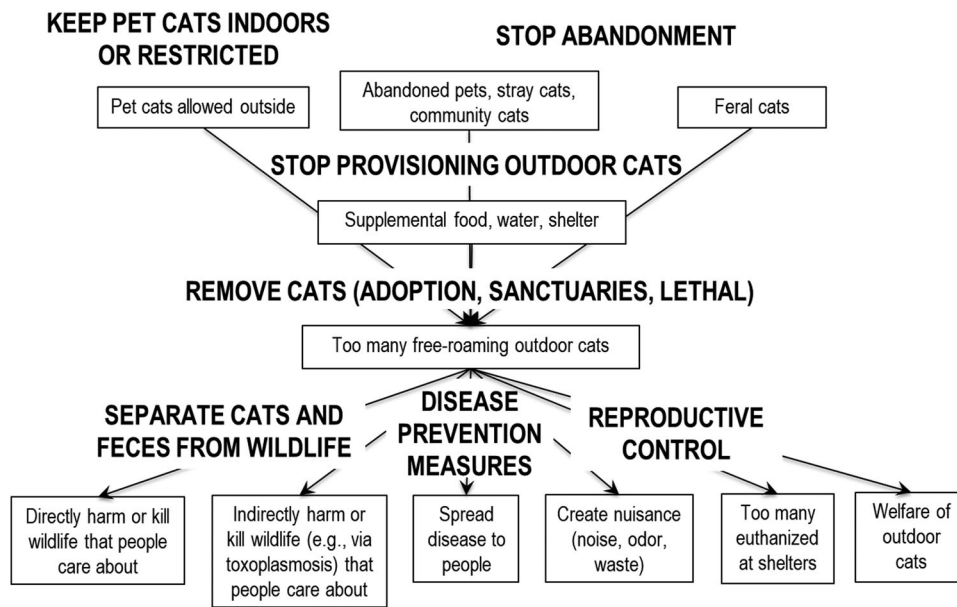

Figure 2. *Pathways in the conceptual model of outdoor cat management that can be addressed directly via a suite of management actions to mitigate that specific element (bold, all capital letters). Management undertaken at higher levels indirectly affects lower level components.*

these components interact to produce specific ecosystem impacts that concern wildlife conservation and cat welfare professionals (Fig. 1). The model is neither exhaustive nor does it represent feedback loops or long-range projections, which led to some disagreements about interpretation. However, it articulates the breadth of topics most commonly mentioned in our discussions about outdoor cat management and the immediate linkages between them, which allowed for more in-depth discussion and reflection. Each component in the conceptual model encompassed a range of specific situations, each of which may be addressed through a

suite of management actions (Fig. 2). For example, pet cats may be allowed outside only during certain times of day or all the time. Impacts from outdoor pet cats can be mitigated at the first level of the conceptual model by keeping pet cats indoors, restricting them to outdoor enclosures, or allowing them outdoors only on a leash. Identifying where each type of management action occurs within the model helps delineate assumptions about how various management activities directly or indirectly affect the specific problems of interest (Fig. 1, level IV). We identified key insights at each level of the conceptual model.

Regardless of stakeholder group, respondents identified human behavior as the primary cause of outdoor cat populations (Fig. 1, level I), people intentionally or unintentionally introducing cats to the ecosystem. Most stakeholders spoke about owned pet cats differently than unowned stray or feral cats. The distinction between stray and feral cats was not as clear cut, although there seemed to be 2 ways people thought about the difference. For some, all cats that were not friendly to humans were considered feral. For others the proximity to human communities was more important, and only cats living far from human development were considered feral. Stakeholders also noted that people provide the basic needs (food, water, and shelter) of outdoor cats in a number of ways (Fig. 1, level II). Cats may take advantage of open dumpsters at restaurants or grocery stores and find sources of shelter in places like backyard sheds or abandoned cars. Other cats are intentionally fed or provided with shelter. Thus, strategies to address the conditions that lead to the proliferation of outdoor cats will vary depending on the situation.

The third level of the conceptual model represents what is typically articulated as the general problem: too many outdoor cats (Fig. 1, level III). Yet, concern about different specific underlying problems (Fig. 1, level IV) led to varying tolerances for outdoor cats, both in terms of absolute numbers and acceptable time frames for population reduction. It was acknowledged that provisioning outdoor cats stems from concerns about cat welfare and contributes to increasing populations. People's tendency to articulate the problem as being about numbers of cats rather than impacts cats impose or incur resulted in discussions about the effectiveness of different management approaches to reduce cat populations. This, in turn, often led to weighing the merits of lethal versus reproductive control (TNR), but again without clarifying the underlying specific goals (e.g., concerns identified in Fig. 1, level IV) that led to the desire for lower populations of outdoor cats. Both lethal and reproductive controls affect basic population vital rates, but in different ways. Lethal control reduces existing outdoor cats and their potential future offspring, whereas reproductive control only reduces future offspring. The conceptual model makes this difference explicit by illustrating where these activities occur in the model; reproductive control of existing outdoor cats does not reduce their immediate impacts on many of the level-IV (Fig. 1) concerns.

All stakeholders generally acknowledged the same objective components of the conceptual model. However, the standards used to judge those components were not represented because they were not part of the modeled physical reality. To understand how stakeholders ascribed meaning to the conceptual model, we analyzed focus group and interview data with our modified levels of conflict framework. This process revealed core concepts that shaped the way stakeholders thought about the information or the cultural models they used to assess the conceptual model (Fig. 3). The surface-level disputes represent the entirety of the conceptual model (Fig. 2), although only the bottom row (Fig. 1, level IV) is displayed for reference. The underlying conflict level outlines concepts reflecting the attitudes, norms, and beliefs we heard consistently about outdoor cats and the wildlife they affect, management of outdoor cats, and the people who manage outdoor cats. We also identified central concepts related to values and identity, which we placed at the deep-rooted conflict level. Although many of the specific phrases were not stated explicitly, they represent core underlying concepts that seemed to motivate actions and contribute to distrust between stakeholders. We noticed that whenever we identified an insight about one cultural model, those drawing on the other cultural model immediately provided a parallel counterpoint. Therefore, we strove to provide balanced items in the depiction of the cultural models. We labeled the collection of terms used by wildlife conservation professionals *invasive species* and those used by cat welfare professionals *homeless pet*. These labels reflect the language used by stakeholders and serve as a useful shorthand to convey the overall cultural models because they are tied to existing shared concepts of invasiveness, species, homelessness, and pet.

The underlying conflicts clearly reflected very different purposes for managing outdoor cats. Although both groups desired fewer outdoor cats on the landscape, the overall goal of wildlife conservation professionals was to reduce negative impacts to native wildlife at the population level, and the overall goal of cat welfare professionals was to uphold the welfare of the individual cats. The articulated shared objective of population reduction masked the divergence of long-term goals. This divergence can lead to one group emphasizing facts related to their own cultural model that are less relevant to the problem the other is trying to solve. This one-sided emphasis can cause groups to become frustrated when one feels ignored by the other or can lead to groups not accepting facts from each other. For example, if a cat welfare professional's concern is that fewer healthy cats are taken to shelters where they might be euthanized, then compelling evidence about the harm cats inflict on native wildlife is not relevant to their problem. Similarly, that TNR prevents individual cats from contributing to future cat populations is not relevant to a wildlife conservation professional whose main concerns include immediate reduction of the risks imposed by outdoor cats on native wildlife. Because the different cultural models have not been broadly recognized and acknowledged, the scenario of groups only presenting information relevant to their own concerns has played out repeatedly, fueling frustration and affecting willingness to engage in dialogue.

| SURFACE LEVEL DISPUTES | Directly harm or kill wildlife that people care about | Indirectly harm or kill wildlife (e.g., via toxoplasmosis) that people care about | Spread disease to people | Create nuisance (noise, odor, waste) | Too many euthanized at shelters | Welfare of outdoor cats |

Invasive Species | **Homeless Pet**

UNDERLYING CONFLICTS (attitudes, norms, and beliefs about <u>animals, management, and managers</u>)

Native wildlife shouldn't suffer because people aren't properly caring for cats

Goal is protection at the population level | Native wildlife is more important than outdoor cats

Cat welfare professionals don't care about native wildlife

Outdoor cats shouldn't suffer because people aren't properly caring for them

Goal is welfare at the individual animal level | Outdoor cats are as important as native wildlife

Wildlife conservation professionals don't care about cats

DEEP-ROOTED CONFLICTS (values, identity)

Lethal removal is an acceptable management tool | I am the kind of person who takes care of native wildlife

It is not acceptable to kill healthy animals | I am the kind of person who takes care of cats
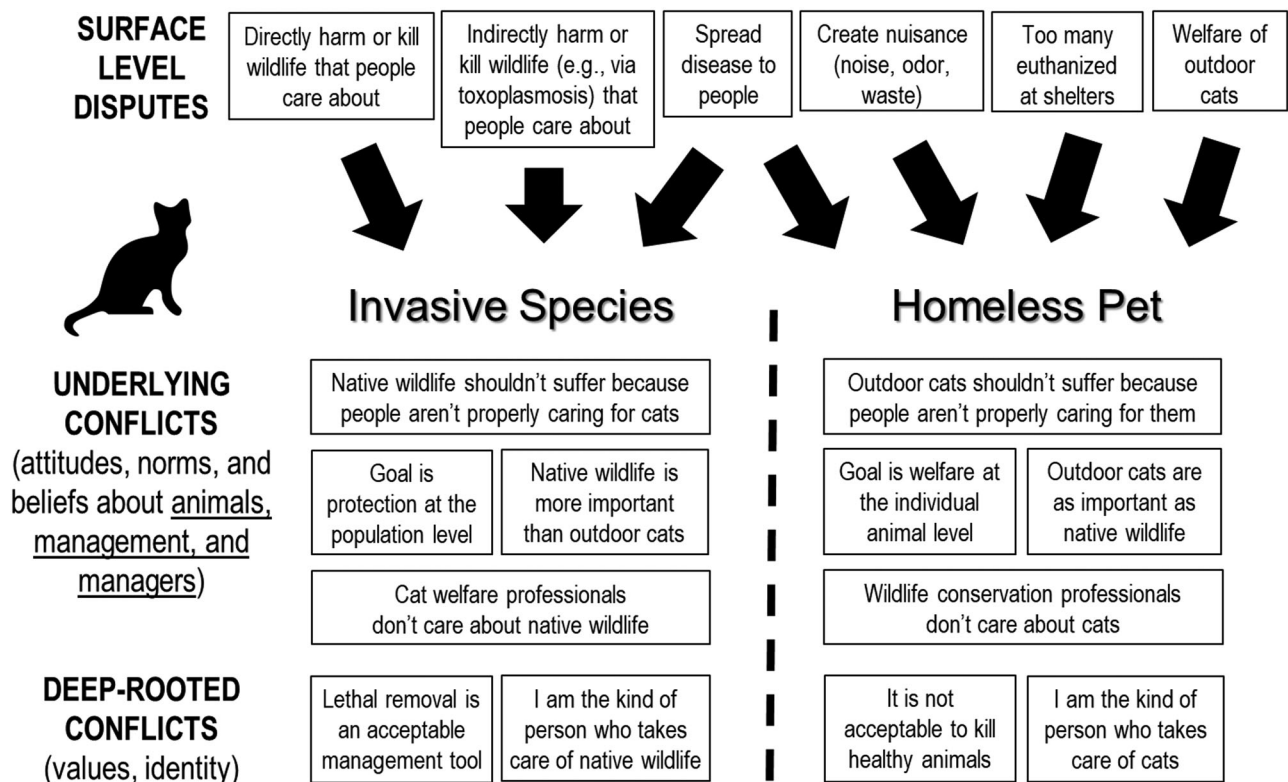
Figure 3. Drivers of conflicting cultural models used by wildlife conservation professionals who view outdoor cats primarily as invasive species (left hand side) versus cat welfare professionals who view outdoor cats primarily as homeless pets (right hand side).

These conflicting cultural models also reflect different standards applied to core terms, including euthanasia, welfare, and humaneness, which activate deep-rooted conflicts. These deep-rooted conflicts surfaced when people were asked to accept options that went against core values and identity. For example, culling is a primary tool for management of overabundant invasive species and veterinary standards for humane euthanasia methods exist for cats (AVMA 2013). Eliminating this option may be a nonstarter for someone who identifies as a wildlife conservation professional. Similarly, for someone devoted to the welfare of individual homeless pets, euthanizing seemingly healthy animals may seem inhumane, regardless of method.

Our interviews and group discussions identified 3 distinct categories of outdoor cats. Most stakeholders used the same cultural model of pet for owned outdoor cats, and this resulted in fewer conflicts. The conflicting cultural models became activated when thinking about unowned outdoor cats. Therefore, we analyzed each element of the conceptual model to identify management strategies based on the shared cultural model of the pet cat. These included strategies that: encourage cat owners to restrict pet cats from roaming freely, such as licensing, keeping pets indoors or in outdoor enclosures, or walking them on a leash; increase sterilization rates of pet cats; prevent abandonment of pet cats by promoting enrichment for indoor cats and education to address behavioral problems; and increase adoption rates of unowned cats. We also identified options that did not require altering cultural models in their implementation. For example, erecting cat-proof fences around sensitive wildlife areas can reduce direct harm to wildlife without affecting the status of cats outside the fence as homeless pets (such a fence was built at Kaena Point Natural Area Reserve in Oahu, Hawaii).

Discussion

Our results illustrate how conceptual models provide a useful starting point to understand conservation conflicts, yet these models are inadequate to fully address value conflicts. Conceptual models do not acknowledge the conflicting cultural models stakeholders use to evaluate the elements of the conceptual models, which allows many of the deeper levels of conflict to go unaddressed. Research that demonstrates understanding of conflicting cultural models can be used to design participatory processes that directly address the deeper sources of disagreements that result in impasse. Although we focused on outdoor cats,

this approach has potential to transform conservation dialogues for other longstanding value conflicts.

Our conceptual model provided a visual representation of the main contested elements of the outdoor cat management system and the assumed relationships among them. Conceptual modeling that engages multistakeholder groups is an increasingly popular tool in environmental management (Gray et al. 2018). It has become institutionalized in structured decision making used heavily by the U.S. Fish and Wildlife Service and U.S. Geological Survey and the Open Standards for the Practice of Conservation (http://cmp-openstandards.org/). The Open Standards emphasize the importance of accurate assumptions to achieve project success (http://cmp-openstandards.org/about-os/os-why/). For value conflicts, it is critical that all stakeholders have a shared understanding of assumptions, especially related to initial problem definition and purpose of the model. One limitation of our study was that we did not convene a multistakeholder collaborative model-building process. However, even limited collaboration via individual interviews has opened up important channels of communication between wildlife conservation and cat welfare representatives in Hawaii.

In our research, unstated assumptions about what an outdoor cat is appeared to be a key impediment to conservation progress, consistent with findings of Van Patter and Hovorka (2018). Whether cats were predominantly considered invasive species or homeless pets led stakeholders to weigh elements of the conceptual model differently and led to different standards for evaluating euthanasia, welfare, and humaneness, as has been seen in other studies (Farnworth et al. 2014). Arguments, positions, and facts that are logical from the perspective of one cultural model may appear to be illogical, or even an attack on identity, when they are viewed through the lens of another cultural model (Lederach 1995; Pearce & Littlejohn 1997; Madden & McQuinn 2014). Explicitly identifying and acknowledging conflicting cultural models and linking them to familiar constructs can improve communication between parties in conflict (Kempton & Falk 2000). The cultural models that emerged in our study represented already established societal constructs (invasive species, homeless pet) for which both sides had a shared understanding of goals for that type of animal, as well as appropriate management actions. Although this understanding does not allow one side to convince the other to change their views, it provides a tool to better understand and empathize with each other's perspectives. In Hawaii, there has been turnover in many of the conservation and welfare organizations. As newer staff reengage in discussions about potential management actions, efforts to demonstrate understanding of the different cultural models have helped keep the focus on areas of common ground.

Orchestrating value shifts for conservation is unlikely to be successful, and there is a need for conservation strategies that work within existing value structures (Manfredo et al. 2017; Linklater et al. 2019). We identified strategies that work within the shared cultural model of a pet cat as an initial starting point. Most of these strategies (restricting outdoor access, sterilizing, and preventing abandonment of pet cats) do not directly address the commonly articulated problem of too many outdoor cats and thus they may be unsatisfactory for some. However, they encompass recommendations from previous efforts that have noted general areas of agreement among stakeholders (Adler 2014) and thus would be politically efficacious to implement. These areas of common ground may also be an easier starting point from which to build a foundation of small successes that can lead to incrementally achieving more aspirational dialogue on the deep value conflicts. This approach has been suggested for outdoor cats (Linklater et al. 2019) and has been an effective strategy for making progress in long-standing conflicts, such as wolf management, HIV/AIDS funding priorities, and religion in politics (Pearce & Littlejohn 1997; Forester 1999, Hill et al. 2017). In these situations, processes that focus dialogue on understanding each other's value systems without expecting people to change these values can still identify practical solutions that move beyond impasse (Pearce & Littlejohn 1997; Forester 1999).

We identified 3 main categories of outdoor cats that we labeled pet cats allowed outside, stray cats, and feral cats. Although the terminology and language used to describe them is not yet consistent enough to constitute shared cultural models, these categories are similar to those adopted legislatively in New Zealand (Farnworth et al. 2010). Other recent studies show that people think about outdoor cats differently in spaces associated with humans versus nature (Van Patter & Hovorka 2018) or suggest different management approaches based on ecological context and risk that cats impose or incur (Duffy & Capece 2012; Peterson et al. 2012). It is well known that the labels assigned to animals can vary by context and affect the way people think about their moral status (e.g., Knight 2000; Philo & Wilbert 2005; DeMello 2012). For example, rabbits may be thought of as pets in the home, pests in the garden, game when hunted, or wildlife in the forest (Leach 1964). The context-specific cultural models of pest, pet, game, or wildlife are generally shared for those animals in those contexts. Urban wildlife and feral animals exist in spaces that are out of place compared with broad cultural expectations for wildlife in nature and domestic animals as associated with people (Philo & Wilbert 2005; Wischermann et al. 2019), which can result in conflict when context-specific cultural models are not yet fully formed (Leong 2009; Van Patter & Hovorka 2018). To create and solidify shared cultural models for outdoor cats in different contexts, we suggest refocusing dialogue

Table 1. Diagnostic questions that help identify signals of conflicting cultural models.

Diagnostic question	*Signal*
Is it easy to reach consensus among colleagues who are like-minded, but very difficult to have reasonable conversations with people who think differently?	There are likely deeper levels of conflict at play that need to be examined.
Does the opposition seem to be operating on flawed logic?	
Do the same arguments keep coming up despite statements of agreement and resolution?	
Are people being asked to choose whether or not to do something or to choose one option over another?	Cultural models are pitted against each other, closing off potential for creative solutions.
Is the argument about who is right?	
Does the information, behavior, or management action being promoted make other people feel bad, obligate them to do something they do not want to do, or challenge their moral order or daily routines?	People are being asked to act against their own cultural model, which may cause them to avoid information or go to great lengths to find arguments that counter the information.

to purposefully embrace the conflicting cultural models. Dialogue focused on understanding core values and standards of evaluation related to the cultural models may help determine whether there are ecological and social contexts where stakeholders can agree cats should be treated more like an invasive species or homeless pet.

Our analysis has important applicability beyond outdoor cats. Conservation professionals can use our process to examine conflicting cultural models for other out of place animals, such as feral horses (*Equus caballus*, Nuñez et al. 2016) and hogs (*Sus scrofa*, Weeks & Packard 2009). Further, we believe that many conservation impasses may arise primarily from conflicting cultural models, rather than lack of biological data. Therefore, using our experience from this case study, we developed a series of diagnostic questions to help detect signals of conflicting cultural models (Table 1). Just recognizing that cultural models may be at play can allow teams to begin to identify them. For instance, wildlife conservation professionals regularly refer to feral cats as invasive species and include them in invasive species management plans. However, until the concept of invasive species was identified as a social construct, competing cultural models (e.g., homeless pet) were not considered.

When competing cultural models are suspected, interdisciplinary research may be beneficial. Some of the most applicable specializations in social science include conflict transformation, stakeholder engagement and participation, and communication. Disciplinary expertise in anthropology, governance, philosophy, psychology, and ethics is also helpful. Early discussions with professionals in these fields can help in the design of dialogue-based processes that work with, rather than subvert, conflicting cultural models. Dialogue that embraces conflicting cultural models is challenging and can be uncomfortable, but has great potential to transform conflicts and achieve lasting conservation results.

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