CHAPTER 12

The human dimensions of dog–wildlife interactions

Kelly K. Miller, Euan G. Ritchie, and Michael A. Weston

12.1 Introduction

> "Science is, however, often one of the first casualties when wildlife management enters the public and political arena" (Thompson et al., 2003).

Throughout history, dogs (*Canis familiaris*) have had a complex and fascinating relationship with humans, with the best-documented domestication records dating back to around 14,000–9,000 years ago, but perhaps occurring as early as ~30,000 years ago (Clutton-Brock, 1995; Napierala and Uerpmann, 2012; Ovodov et al., 2011). The connection between people and dogs is profound, rivaling that of any domesticated animal. There is contention and great uncertainty about how many dogs exist worldwide, but they likely number in the hundreds of millions (Gompper, Chapter 1). Dogs have been, and in many places still are, used for food, companionship, tourism, health aids (e.g., guide dogs), and wildlife management or extraction (e.g., livestock and wildlife guardian dogs, hunting dogs).

The focus of this chapter is on the human dimensions of dog–wildlife interactions, which are far less-studied than the complex and diverse relationships between humans and dogs. The human dimensions of dog–wildlife interactions often constitute what are commonly referred to as human–wildlife conflicts (HWCs; Manfredo and Dayer, 2004). Some well-known examples of HWCs include human conflicts with white-tailed deer (*Odocoileus virginianus*) in North America (Chase et al., 1999), common brushtail possums (*Trichosurus vulpecula*) in Australia (Whiting and Miller, 2008), and elephants (*Loxodonta africana*) in Africa (O'Connell-Rodwell et al., 2000). Manfredo and Dayer (2004) suggest that "despite the diversity of situations and species that spawn HWC, there is one common thread: the thoughts and actions of humans ultimately determine the course and resolution of the conflict." Thus, from a wildlife conservation perspective, understanding the human dimensions of HWC is critical.

The first step in understanding the human dimensions of dog–wildlife interactions is to clearly define the nature of the interaction. In this case, the interactions can be positive or negative depending on the subject (human, dog, or wild animal), and are varied and complex (Table 12.1). The focus of this chapter is on the intersection between humans, dogs, and wildlife and their interactions, and includes their sometimes competing interests.

Since the 1960s, it has been widely acknowledged that it is necessary to investigate the human dimensions of wildlife management issues and problems. Environmental and wildlife management issues almost always arise because of competing human interests and values. If these are not well understood, even the best ecological and biological science may not provide adequate solutions. The field of human dimensions has been defined as "how people value wildlife, how they want wildlife to be managed, and how they affect or are affected by wildlife management decisions" (Decker et al., 2001, p. 3), and is concerned with improving representation in decision-making and with influencing policy and management outcomes (Loker et al., 1998). Human dimensions research is important because, too often, wildlife management decisions

Free-Ranging Dogs and Wildlife Conservation. Edited by Matthew E. Gompper

Table 12.1 Summary of positive and negative interactions between humans, dogs, and wildlife. The interactions listed in this table are not intended to be exhaustive. These interactions can be positive (i.e., benefit) or negative (i.e., cost) to biodiversity, such as wildlife and/or humans, and some are less evident than others. Perceptions of what constitutes a positive interaction versus a negative interaction can vary.

Human–dog interactions	Human–dog–wildlife interactions	Dog–wildlife interactions
Positive interactions: human–dog bond; companion animals; working dogs (guard dogs, guide dogs, herding dogs, hunting dogs, etc.)	**Positive interactions**: dog walking facilitates human connections with nature	**Positive interactions:** dogs can work as guardians for vulnerable wildlife populations (e.g., Maremma dogs protecting penguins against fox predation)
Negative interactions: threats (perceived and actual) posed by feral dogs (e.g., to humans, livestock, pets); dogs acting as vectors for disease	**Negative interactions:** large carnivores can prey on dogs and this can lead to various human–wildlife conflicts (for example, threats to human safety)	**Negative interactions:** hybridization between dogs and wild canids; dogs directly or indirectly impact wildlife

are based on untested assumptions about people's views and their responses to management programs (Enck and Decker, 1997). This can potentially result in ineffective management and ongoing conflicts (Miller, 2009).

Although there is a significant body of research, particularly in developed countries, on the human dimensions of some large carnivores (involving, for example, wolves, *C. lupus*, and coyotes, *C. latrans*; Lukasik and Alexander, 2011; Meadow et al., 2005; see Boxes 12.1 and 12.2), there has been much less attention paid to the human dimensions of dog–wildlife interactions. This chapter presents an overview of research in the field of the human

Box 12.1 Human dimensions and large carnivores

A significant body of research has been completed on the conflicts that can occur between humans and large carnivores. Studies have focused on attitudes toward large carnivores (for example, gray wolves, bears (*Ursus* spp.), lions (*Panthera leo*)) and views about their conservation and management. This research has revealed several key themes that may inform human dimensions research for dog–wildlife interactions:

- An absence of human dimensions research can contribute to poor management outcomes (Decker et al., 2012; Kellert, 1991). For example, a wolf restoration program in Michigan, USA, in the 1970s failed, in part, because of a lack of information about the social feasibility of the program (see Decker et al., 2001).
- When dealing with human–wildlife conflicts, there will always be a wide range of stakeholder groups and attitudes about the most appropriate management and/or conservation approaches. Given the links between attitudes and behaviors (see Figure 12.1) and the importance of human behaviors in conservation programs (Schultz, 2011), a clear understanding of the full range of attitudes and opinions is essential.
- As large carnivore populations increase and/or human populations increase, human–wildlife conflicts are likely to increase (Bruskotter and Shelby, 2010).
- Level of damage or threat posed by a species will influence attitudes toward that species and management options. Generally speaking, the greater the conflict, the more likely it will be that people accept lethal management techniques (Wittmann et al., 1998). However, this is not a hard and fast rule and the situational context and deep-rooted social identities can also influence judgments about management acceptability (Naughton-Treves et al., 2003).
- Opportunities for public participation in decision-making are essential (Meadow et al., 2005).

Although human dimensions research is now recognized as a critical component of the decision-making process, the "traditional view of wildlife management as limited to biology and ecology still dominates" (Bruskotter and Shelby, 2010).

Box 12.2 A cultural caveat

The role of culture and individual experience of researchers or authors is recognized as a significant influence on the study of people and their attitudes, so much so that authors in the social sciences often declare their backgrounds to enable readers to interpret qualitative human research. The authors of this chapter are not immune to these unintended biases, and acknowledge that they bring a developed world viewpoint to the human dimensions of dog–wildlife interactions. Indeed, there is a clear bias in the available literature towards dogs in the developed world. Such is the diversity of human cultures of which dogs are a part, that all viewpoints and philosophies cannot be detailed in the available space.

However, acknowledging cultural relativities is important (see Ortolani et al., 2009). For example, terms such as 'dog walking' may adequately describe the intentional exercising of a pet, but poorly describe the circumstance whereby a dog accompanies a person going about their daily routine or travels. 'Ownership' of animals such as dogs may be a workable concept in some cultures but not others. The concept of a pet (a companion animal) is more evident in some cultures than others. Managing dogs or any damage they cause is, similarly, not a universal concept and must take the cultural context into account.

dimensions of dog–wildlife interactions and proposes potential solutions for the problems and issues raised.

12.2 Conceptual basis

Human dimensions research focuses largely on human values of wildlife, attitudes toward wildlife and wildlife management issues and approaches, and human behaviors. The field draws from a range of social science disciplines including social psychology, sociology, and economics (Decker et al., 2012). Theories in social psychology often provide the basis for examining the human dimensions of wildlife management and help explain why people hold the values and attitudes that they do and act in particular ways. Social psychological theories can be used to help explain human values, attitudes, behaviors, and knowledge across a range of wildlife management issues and scenarios and can therefore provide a useful framework for understanding the human dimensions of dog–wildlife interactions (Figure 12.1).

The framework presented in Figure 12.1 suggests that values and attitudes are important in predicting subsequent behaviors, but the link is complex and difficult to measure (Fulton et al., 1996). Values can influence attitudes, and attitudes can influence behaviors, but so too can other factors such as availability of time and money, physical barriers (e.g., access to a place), management regulations, cultural context, past experiences, views of others, and so on.

The theories summarized in Figure 12.1 have been further developed and applied within the field of wildlife management. For example, Decker and Purdy (1988) proposed the Wildlife Acceptance Capacity model where there is a "maximum wildlife population level in an area that is acceptable to people." Social factors (what cultural groups and stakeholder groups does a person identify with, and what are their views?), cognitive factors (what beliefs and attitudes does a person hold?), and contextual factors (e.g., the species being controlled; the location of the conflict or issue) all contribute to acceptability judgments (Bruskotter et al., 2009).

Similarly, Wittmann et al. (1998) investigated stakeholder positions on HWCs and wildlife management decisions for specific contexts and animal species. They found that the acceptability of destroying an animal increased as the severity of impact of the human–wildlife interaction on humans increased. Human dimensions studies also report that people view charismatic fauna differently to less charismatic fauna (Kellert, 1996) and that divergent and often polarized views can affect management programs (for example, lethal wolf control in Utah, USA (Bruskotter et al., 2009); wolf restoration in the Rocky Mountains, USA (Meadow et al., 2005)). An understanding of human dimensions aided by such theoretical frameworks can assist managers in developing more socially sustainable and successful long-term management programs.

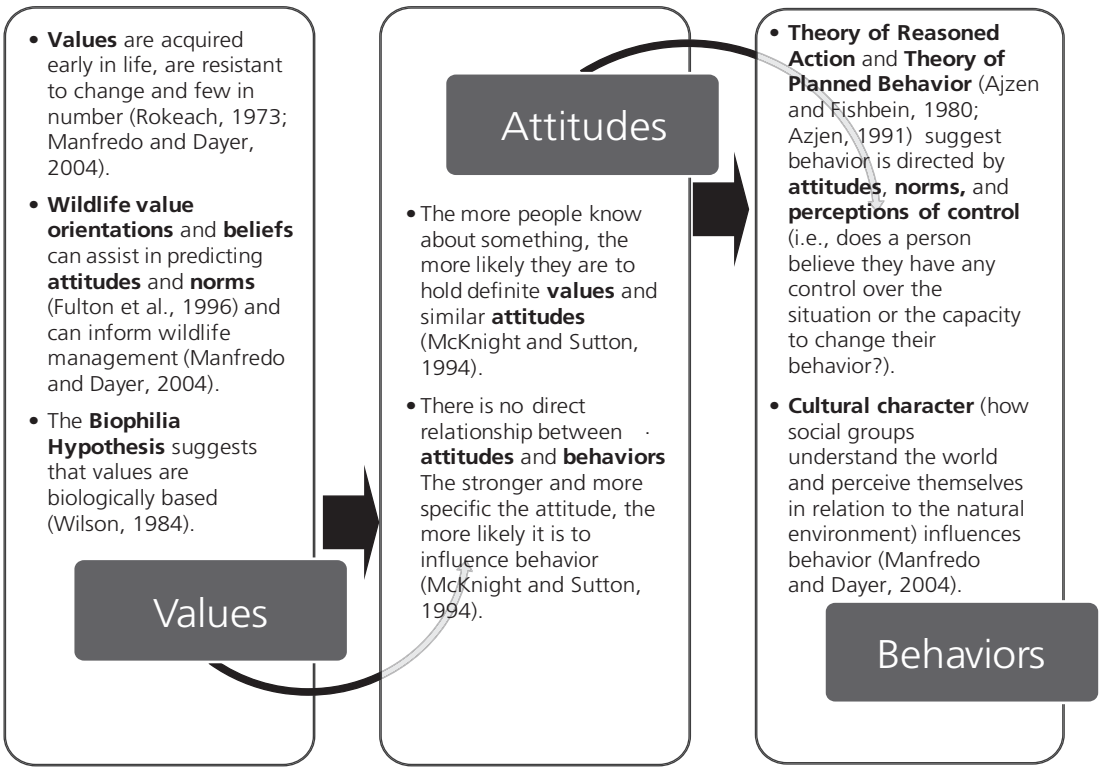

Figure 12.1 Summary of the value–attitude–behavior hierarchy (Fulton et al., 1996) and associated major theories. The list of theories presented here is not exhaustive.

12.3 Human dimensions research on dog–wildlife interactions

It is well established that humans have a longstanding and strong association with dogs (Sillero-Zubiri, 2009) which offers many benefits for both humans (e.g., companionship, mental health; Miller and Howell, 2008) and dogs (e.g., access to food, safety) (see Table 12.1). However, we do not yet fully understand the human dimensions of either the interactions or the conflicts occurring between humans, dogs, and wildlife. This is where we need to draw from human dimensions research as well as ecological and biological science. Given the global and extensive nature of human–dog–wildlife interactions, it is surprising that there has been so little human dimensions research in this field. The human dimensions research completed to date on free-ranging dogs and their interactions with wildlife has focused on pet dogs, working dogs, and feral dogs; and this research is reviewed below.

12.3.1 Pet dogs

It has been estimated that 20–30% of households, globally, have a dog as a companion animal (Ioja et al., 2011), with dog walking being one of the world's most popular recreational activities (Banks and Bryant, 2007). In many areas, dogs are owned and regularly fed but allowed to roam free for much of the time (e.g., Brazil; Torres and Prado, 2010; also see Gompper, Chapter 1); and in many countries dogs are permitted in protected areas with their owners (for example, dogs can accompany human visitors to >96% of protected lands in California, USA, although in most national parks in the USA dogs are only allowed on leashes, near residences and visitor centers, or in campgrounds; Reed and

Merenlender, 2011). In many developed countries, the occurrence of dogs in wildlife habitat mirrors the partitioning of recreational time within societies; peak dog numbers occur during weekends, holidays and outside working hours (Sastre et al., 2009).

To date, studies have focused on behaviors and attitudes relating to 'dog walking' (the act of walking in the presence of a dog) in areas where wildlife occurs. These studies often highlight the spectrum of views on dogs and dog access to natural areas (for example, those who desire unconditional access for dogs versus those who want access limited or controlled; Ioja et al., 2011). There has also been some research documenting threats posed to pet dogs by wildlife and vice versa (e.g., disease, attack) and associated human behaviors (e.g., owner management of dogs) (e.g., Aguirre et al., 1995; Paquet-Durand et al., 2007).

Dog owners place a very high value on being able to walk their dog off-leash (Jenkinson et al., 2009; Maguire et al., 2011; Underhill-Day and Liley, 2007). Therefore, it is not surprising that dog walking studies have reported high rates of non-compliance with dog-leashing laws and other regulations (see Weston and Stankowich, Chapter 4). For example, in a study of wetland buffers in Victoria, Australia, Weston et al. (2009) found that, despite the leashing laws and interpretive and regulatory signs, 68.3% of dogs (n = 104) were unleashed. This rate of non-compliance was similar to that found by Arnberger and Hinterberger (2003) where only one third of visitors to an Austrian national park walked their dog on-leash. Weston et al. (2009) also found walkers and dog walkers were more likely to access a wetland, despite it being closed to the public, than other recreational users (see also, Antos et al., 2007). While the motivation to enter the wetlands when closed to the public is not known, it may be partly because poorly socialized, aggressive dogs, are sometimes deliberately taken to 'no-dog' areas to avoid conflicts with other dogs and their owners (M.A. Weston, pers. obs.).

To understand such non-compliance with leashing laws, Williams et al. (2009) investigated the perceived importance of leashing dogs when visiting beaches. Dog owners expressed moderate support for dog leashing, and were more likely to leash dogs if they thought other beach users expected it or that their dogs would harm wildlife or people. Many participants in their study believed that other dogs caused more damage than their own dog. Williams et al. (2009) also reported that most dogs on the beaches they studied were unleashed, even when their owners were aware of dog regulations and the impact dogs have on nesting shorebirds (see Box 12.3 and Figure 12.2). This was also found by Bridson (2000) when they interviewed dog owners on beaches in New Zealand and found that 42% of dog owners interviewed believed dogs should be allowed on beaches, despite being aware that dogs posed a threat to beach-nesting birds.

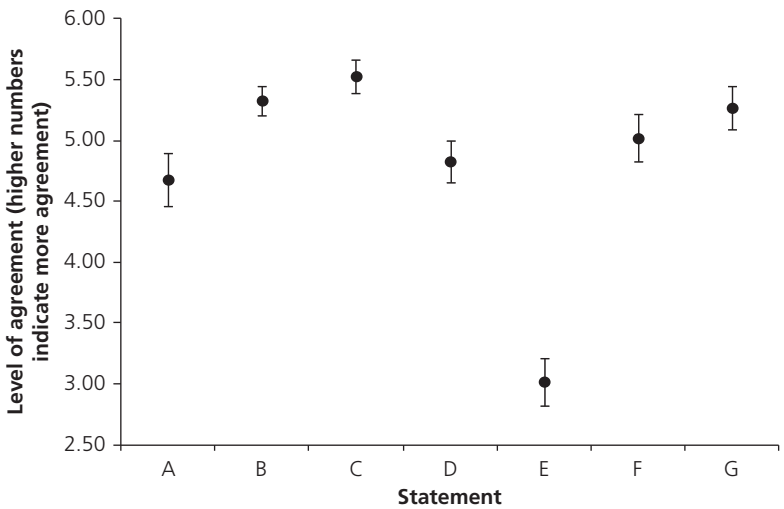

Figure 12.2 Levels of agreement among dog owners (means ± 95% confidence intervals, where 1 is 'strongly disagree' and 7 is 'strongly agree') with the following statements: (A) I feel obliged to leash my dog at the beach, (B) Importance of wildlife protection on beaches, (C) Importance of unleashed exercise for dogs, (D) Unleashed dogs in general have negative consequences, (E) Their own dog has negative consequences, (F) People generally expect dogs to be leashed on beaches and (G) People generally think beaches are a good place for dogs to run around unleashed (after Williams et al., 2009).

Box 12.3 Reining in the roamers: owners' sense of obligation to leash pet dogs

The use of a leash profoundly reduces the roaming behavior of pet dogs in open habitats (i.e., those with structurally simple lower strata through which dogs can move easily) such as wetlands, grasslands, and beaches, and reduces the rate at which dogs disturb wildlife (Weston and Stankowich, Chapter 4). Leashed dogs are less likely to chase or prey upon wildlife, and less likely to interact negatively with other dogs or humans. In many areas, regulations, zoning, and compliance activities seek to maintain a matrix of 'no dogs,' 'leash-only,' 'leash-sometimes' (seasonally or at particular times of day), and 'off-leash' areas, which are designed to accommodate multiple uses including wildlife, and those of dogs and their walkers. A prerequisite for the success of this approach is that compliance with leashing rules is high. However, in countries across the globe where studies are available, which are admittedly biased to the developed world where many dogs live in urban areas, compliance with these leashing regulations is apparently very low (see Weston and Stankowich, Chapter 4).

In some areas inadequate signage and lack of clarity of regulations contribute to low compliance, but even clearly designated 'on-leash' areas are subject to many off-leash dogs. On Victorian (Australia) beaches, while compliance with leashing laws is low, beach goers tend to comply with other management efforts such as temporary beach closures (Weston et al., 2012). Thus, the lack of compliance is not generalized to all regulations, but apparently specifically involves leashing rules. Why compliance with leashing regulations is so low is a critical aspect of the human dimensions of owned dog–wildlife interactions that deserves more attention.

While changing human behavior underpins many potential solutions to environmental problems, it is not well studied, and examples of sustained behavior change are few. Indeed, the available information suggests that many assumptions regarding behavior change (e.g., that education is associated with more pro-environmental attitudes) are questionable and require testing (see Kahan et al., 2012). Similarly, the management solutions to promote behavioral change among humans also need revision in light of new information. For example, a common management response to inappropriate human behavior is to educate the relevant stakeholders. Education, however, rarely changes human behavior by itself (Schultz, 2011). On the other hand, humans are guided strongly by social expectations (norms), and so alternative approaches that seek to change norms hold promise on sustained behavior change (Schultz, 2011).

A case study of underlying human attitudes and perceptions to dog leashing (Williams et al., 2009) involved dog walkers on beaches in southern Victoria, Australia, where unleashed dogs are regarded as a conservation problem for beach-nesting birds, such as the threatened hooded plover *Thinornis rubricollis*. Off-leash dogs disturb, chase, and prey upon eggs, chicks, and breeding adult birds, which occur on beaches heavily used by dog walkers and their dogs. Despite many restrictions involving leashing and 'no dog' zones, compliance is low, particularly with regard to leashing regulations. Thus, enhancing compliance with leashing regulations is considered a conservation management objective.

Williams et al. (2009) surveyed or interviewed 385 dog owners to explore their attitudes to dogs on beaches (see Figure 12.2), and in particular their sense of obligation to leash dogs on beaches. Dog owners were more likely to feel obliged to leash their dog when they believed other people expected dogs to be leashed, and when they believed their dog was a threat to wildlife or people. Dog owners were less likely to feel obliged to leash their dog if they considered unleashed dog recreation was important.

A sense of obligation to leash a dog, as measured by Williams et al. (2009), does not always translate into actual leashing (see Figure 12.2). Nevertheless, a series of recommendations were made that might potentially improve compliance. First, improved compliance may be achieved through community-based approaches to foster social norms (expectations) for dog leashing, and this means that once higher compliance is achieved it may continue to improve. This suggests that work by land managers to improve compliance is not 'pushing against the tide' but may reap ongoing rewards.

For example, on Phillip Island, Victoria, Australia, a concerted management campaign involving awareness, education, and enforcement has led to a reduction in the occurrence of off-leash dogs, especially in hooded plover breeding territories (P. Dann, pers. comm.). Such an approach may not always work; at Mornington Peninsula National Park, adjacent to Phillip Island, compliance slowly improved but remained far from universal (Dowling and Weston, 1999). The differences between these regions remain perplexing, but different management authorities with different approaches dealt with different populations of dog walkers. A second recommendation from the social research conducted was to tailor information products to emphasize the risk that unleashed dogs may pose to wildlife such as

continued

Box 12.3 *Continued*

beach-nesting birds, and raising awareness of designated off-leash dog exercise recreation areas.

Given that the ultimate measure of management success is fewer unleashed dogs where they are not permitted, an understanding of the effectiveness of dog management on compliance rates could inform dog management. Currently, however, little systematically collected data are available on these issues, and this represents a key information gap in managing pet dogs. In particular, if compliance with leashing laws is to be improved, social research will play a critical role in unraveling the complex influences on the decision to leash or not.

These high levels of non-compliance may be related to the low likelihood, in many places, of being caught or fined (Jenkinson et al., 2009; Pelletier, 2006). Alternatively, low compliance may occur where suitable options for off-leash dog exercise are not available or when people place a higher priority on off-leash dog exercise than wildlife conservation. It may also be related to a perception that dogs do not cause significant damage or disturbance in natural environments, or that when they do cause damage it is part of a 'natural process.' Such perceptions may prove to be accurate in some situations. For example, Bekoff and Meaney (1997), in their study of interactions between dogs, people, and the environment in Boulder, Colorado, USA, found that off-leash dogs did not travel far off tracks and that when they did it was for short periods of time. Observations in their study suggested that dogs rarely chased other dogs or wildlife, disturbed people, destroyed vegetation, or entered bodies of water. Their questionnaire found that dog owners and non-dog owners held a view that people were significantly more disruptive to the environment (including wildlife, vegetation, bodies of water) than dogs, and that the quality of the visit would diminish if dogs were required to be leashed.

Yet while dogs may have little impact on the environment in some locations, in other settings the disturbance appears significant (e.g., for shorebirds, Burger et al., 2004; Le Corre et al., 2009; woodland birds, Banks and Bryant, 2007). As science begins to reveal the complex nature of such disturbances (Weston and Stankowich, Chapter 4), these processes need to be fully communicated to the public alongside appropriate behavior change programs if coexistence between dogs and wildlife is to improve. Similarly, an understanding of human perceptions is critical as perceptions can sometimes play as great a role in shaping attitudes as actual experience (Naughton-Treves et al., 2003). Human perceptions of wildlife span from a focus on the individual animal (welfare) to the population (conservation), and even among wildlife scientists, different emphases are evident (Miller and Jones, 2005; Miller and Weston, 2009). It seems prudent, therefore, to define the spectrum of impacts of dogs on wildlife and assess perceptions towards a set of clearly defined impacts.

This recommendation aligns with the work by Sterl et al. (2008) in their study of visitor awareness and assessment of recreational disturbance of wildlife in the Donau-Auen National Park in Austria. Their survey of 271 park visitors found that only 40% of the respondents were aware that wildlife can be disturbed through recreational activities; and only 12% believed that their own visit could have potentially disturbed wildlife. They suggested that this low awareness, coupled with impacting behaviors, is even more problematic given the nature of the area being used. The park studied is in an urban setting, is relatively small in size and lacks buffer zones, is heavily used, has unlimited access, and is highly fragmented by trails. Globally these characteristics are typical of many places visited by people and their dogs. If visitors perceive little or no impact on wildlife when they visit such places, then impacting behaviors are likely to continue (Sterl et al., 2008). It may also be that many (but not all) areas where dog walking occurs tend to be highly degraded as wildlife habitat, and thus most of the impacts are on remnant wildlife species, or on abundant or pest species.

Overall, studies highlight diverse views of visitors to parks, reserves, beaches and protected areas, and these views vary by location and the type of park or open space. For example: Morgan (1999) found that 74.6% of beach users in Wales, UK, wanted dogs banned from the beach; Breton et al. (1996) reported that most beach users would 'forbid' the presence of dogs on the beaches of Barcelona, Spain; Semken et al. (2011) found that 92% of dog walkers and 54% of other users would like the Balcombe Estuary Reserve in Victoria, Australia, to remain open for dog walking; Glover et al. (2011) reported that residents of a major embayment in Victoria supported buffers (exclusion zones) around shorebirds for a variety of recreational activities including dog walking. Therefore, while there are common themes revealed in human dimensions research, management needs to take into account the unique characteristics and contexts of different settings (Manfredo and Dayer, 2004). Studies also need to be contextualized; obtaining representative samples of humans is notoriously difficult, and the perceptions of people will probably vary depending on whether sampling occurs primarily among dog owners, dog walkers, or other user groups.

In addition to human dimensions research on pet dogs accompanying their owners into places important for wildlife, there has also been some human dimensions research focusing on pet dogs and threats posed to them by wildlife. For example, in an analysis of coyote interactions with humans and pets as reported in the Canadian print media from 1995 to 2010 (453 articles reviewed; Alexander and Quinn, 2011), 91 incidents involved dogs (as reported in 108 articles documenting coyote–dog interactions). Coyote-caused dog mortality occurred in 38 cases, many in yards; dogs were off-leash in 92.3% of coyote–dog encounters. While not discussed for the reported coyote attacks on pet dogs, food conditioning was a significant factor in coyote attacks on humans (for example, the person had been feeding the coyote prior to the attack). Thus, Alexander and Quinn suggested that many attacks could be avoided with better waste management and education to deter people from feeding coyotes and to advise dog owners that conflicts can be greater during the coyote pup-rearing season (see also Lukasik and Alexander, 2011).

Dogs can also act as vectors for pathogens that cause disease and this can present a threat to human health (Paquet-Durand et al., 2007). Management regimes in many places are such that dogs are not permitted in parks and protected areas where wildlife occur, or if dogs are permitted they must be leashed. Aguirre et al. (1995), in a survey of individuals representing 179 national parks, 123 state agencies, 103 federal agencies, and 98 colleges and universities in the United States, found that some respondents were concerned because visitors in national parks do not leash their dogs. Their concern was two-fold: dogs posing a health risk to wildlife and dogs acting as vectors for disease transmission to humans. As such, they recommended that parks need comprehensive animal health programs or management plans. Such management programs must take into account the likelihood of compliance by park visitors, and this again points to the need for a better understanding of the human dimensions of dog–wildlife interactions.

12.3.2 Working dogs

The human–dog association is not just one of companionship. Throughout history, dogs have also been placed in working roles to interact with wildlife; for example, as hunting dogs (Chitwood et al., 2011) or livestock guardian dogs (Baker et al., 2007). More recently, dogs have been used as guardians for vulnerable wildlife populations (e.g., Australasian gannets (*Morus serrator*) breeding at Point Danger, Portland, Australia (Peter, 2012); little penguins (*Eudyptula minor*) near Warrnambool, Australia, (Poole, 2010); see VerCauteren et al., Chapter 9; Woollett et al., Chapter 10, and Koster and Noss, Chapter 11 for discussion of how working dogs and wildlife interact).

Such human–dog–wildlife interactions can be complex and difficult to define when diverse stakeholder groups are involved. In some countries it is mandatory to use trained hunting dogs to ensure humane kills (see Chitwood et al., 2011), while in other countries restrictions or bans have been placed

on wildlife hunting with dogs (e.g., red fox, *Vulpes vulpes*, hunting in the United Kingdom; Loveridge et al., 2007). Restrictions often come about because of concerns over both dog and wildlife welfare (White et al., 2003) when hunting with dogs and concerns about dog hunting in highly fragmented landscapes (Chitwood et al., 2011). However, many hunters argue that hunting is "woven into the very fabric of personal and social history" (Marks, 1991, p. 5) and that hunting with dogs can help define relationships with family, friends, and nature (Chitwood et al., 2011). Chitwood et al.'s (2011) study on hunter identity in coastal North Carolina, USA, suggested that banning dog hunting "may destabilize rural communities by removing critical elements of community identity and means through which communities cope with challenges to their identity." They also made note of the suggestion by Manfredo et al. (2009) that wildlife managers face a moral imperative to consider the impacts their decisions have on human well-being.

Understanding such hunter perspectives and values is important, as is understanding the perspectives and values of other stakeholders. Chitwood et al. (2011) described hunters' teleological views of animal wellbeing (that they are fulfilling their purpose) and how these contrast with the utilitarian views of other groups (e.g., minimizing stress or pain). They also discussed the role of hunting (with dogs) in facilitating human connections with nature. In order to manage human–dog–wildlife conflicts, such values and perspectives need to be understood fully and common themes across regions identified.

While hunting with dogs is important for some hunters, it does not affect hunter satisfaction for others. For example, in their study of hunter satisfaction when pheasant (*Phasianus colchicus*) hunting in Utah, Frey et al. (2003) found that the presence of dogs did not affect hunter satisfaction or success. Rather, harvest success, relative density of hunters, and the number of cocks seen by hunters predicted hunter satisfaction. Such influences vary in their importance, depending on the location and the hunted species (Frey et al., 2003).

Although there is a significant body of research in the human dimensions field relating to hunting (including with dogs), there has been much less attention paid to the human dimensions of guardian dogs. Livestock guardian dogs (LGDs) have received considerable attention in the literature (Baker et al., 2007; Gehring et al., 2010); indeed, the role of dogs in protecting vulnerable wildlife is gaining more prominence as a wildlife management tool (Ritchie et al., 2012). However very little human dimensions research is documented regarding the role of dogs in assisting with the survey of certain cryptic wildlife, or enabling the use of nonlethal management of pest wildlife (for example, discouraging birds from some airports) (see Weston and Stankowich, Chapter 4).

Van Bommel and Johnson (2012) assessed the role of working dogs for livestock protection in Australia and found them to be an effective management tool with significant reductions in livestock depredation. This, in turn, resulted in less need to control wild predators (often feral dogs and dingoes) through poisoning or shooting. They suggested this was important given the ethical concerns associated with lethal control and the better understanding we now have about the role of top-order predators in ecosystem health (Ritchie et al., 2012). This interaction between feral dogs and working dogs points to the need to understand landholder perceptions of the problem (Ballard and Fleming, 2010) and the likely acceptance of alternative management approaches, such as the use of dogs for livestock protection (see Box 12.4). In a separate study in Namibia (Potgieter, 2011), it was also found that livestock guardian dogs were successful (91% of the LGDs eliminated or reduced livestock losses) at protecting stock against predators, which include black-backed jackal (*C. mesomelas*), chacma baboon (*Papio ursinus*), and cheetahs (*Acinonyx jubatus*). However, farmer satisfaction was more likely to be associated with 'good' LGD behavior than perceptions of a reduction in livestock losses. Common and undesirable LGD behavior included staying at home rather than accompanying livestock and chasing other wildlife. These studies highlight the need to appreciate human perceptions, rather than realities, when assessing the costs and benefits of dogs in mediating human–wildlife conflict.

Box 12.4 Cultures, communities, and canids

Dingoes and wide-ranging dingo–dog hybrids evoke a level of passion and variety of responses from the Australian community that are perhaps unrivaled by any other species. These canids are often reviled by farmers for their impacts on livestock, treasured by others for their inherent beauty and quintessential Australian identity, and spiritually important for many indigenous people as a totemic animal. Others remain largely apathetic. Attitudes towards these wild canids vary as much within groups of the Australian community as they do between. However, it is perhaps in rural and remote Australia where the divide in opinions regarding dingoes and dingo–dog hybrids is most obvious and intense. Such divisions have substantial consequences both for dingoes and dingo–dog hybrids, but also for the people who live within these communities.

Many landholders are aware of the benefits dingoes and dingo–dog hybrids provide in reducing populations of native and introduced herbivores (e.g., kangaroos, goats, pigs, and rabbits) and hence their ability to reduce competition for food with livestock. However, others are non-tolerant of dingoes and hybrid wild dogs and will control them through combinations of poisoning and shooting, in some cases beyond the bounds of their properties. This reduces dingo–dog populations not only in the areas where farmers do not tolerate dogs but also in areas where farmers are tolerant or even encourage these dogs (due to their perceived ecological and management benefits), due to the considerable ranging behavior of dingoes and dogs. Such an effect has been seen for many other carnivores worldwide, where due to their typically wide-ranging behavior, small reserves and their borders afford little protection for carnivores, irrespective of species' population sizes within reserves (Woodroffe and Ginsberg, 1998). The result is animosity between landholders with differing viewpoints about canid management. Indeed, cases exist in which individual landholders who have chosen to encourage wild canid populations on their properties claim to have been harassed by neighbors and ostracized by their local communities. Thus, decisions about the management of wild canids have significant social and potential health costs for individuals living and working in rural and remote Australia, where neighbors may be scores of kilometers away and people are already isolated.

To understand and appreciate just how greatly opinion varies as to the functional roles of dingoes and wild dogs, and what their place should be in the landscape, a study (Kean, 2011) was undertaken in Victoria, Australia, which examined attitudes toward dingo and wild dog management in Victoria. The study had three objectives:

- Identify if attitudes vary between regions where both canid 'species' are present to those where they are absent.
- Identify if attitudes toward dingo and wild dogs vary across stakeholder (community) groups.
- Identify factors influencing attitudes toward dingoes and wild dogs and their management.

There were no significant differences between regions with respect to overall attitudes regarding dingoes and wild dogs. Interestingly, however, differences among stakeholders' viewpoints within regions were apparent. Wildlife managers overall had positive attitudes toward dingoes, while farmers and non-farmers were either indifferent or inconsistent with respect to their attitudes toward dingoes. Farmers and non-farmers in the north-east region of Victoria (where wild dogs are present and common) held stronger negative attitudes toward wild dogs than did farmers in the Grampians region of Victoria (where wild dogs are largely absent). Attitudes toward canids were influenced by both direct (personal stock loss) and indirect experiences (impacts on neighbors' properties or those of other members of the community). In response to wild canids attacking livestock, farmers advocated lethal methods of control whereas non-farmers and wildlife managers of the same communities preferred non-lethal methods. This study demonstrates that the human dimensions of dingo and wild dog management are complex, and preconceived notions of how communities and various stakeholder groups may view canid management do not necessarily hold.

12.3.3 Feral and wide-ranging dogs

Feral dogs, which are sometimes referred to as wild dogs or free-ranging dogs, are widespread canids that occur in the North, Central and South America, Europe, Australia, Africa, and on several remote ocean islands (Green and Gipson, 1994). However, to avoid confusion and due to the importance of how dogs are described in relation to conservation and management actions (Letnic et al., 2012), we make a further distinction. There are truly wild

dogs, such as the dingo in Australia, and other dogs, which are free and sometimes wide-ranging, but still rely on human subsidies. The latter type is typical of most dogs in the world, with the dingo being a relatively rare case. Furthermore, sitting between these two groups of dogs (owned/confined vs. feral/wild), are village dogs, which are usually owned or affiliated with a household but that are not easily handled or tame and yet are also heavily dependent on human subsidies. It has been suggested that village dogs are perhaps the most common type of dog in less developed parts of the world (Ortolani et al., 2009).

Populations of free-ranging and feral dogs that inhabit natural areas can present a significant threat to wildlife populations, acting as vectors for disease, competing with, preying upon, or disturbing wildlife, and hybridizing with other wild canids. A 'triple bottom line' analysis in Australia to assess the impact of invasive animals on the environment and agriculture found the feral dog (including the dingo) to be the fifth most significant vertebrate pest (McLeod, 2004). Similarly, a review in the United States found feral dog damage to amount to more than $620 million annually (Bergman et al., 2009). In some situations, however, feral dogs may fulfill an important ecological role and removing them might have unforeseen impacts on biodiversity (Letnic et al., 2012). Thus, management of feral dogs is a key challenge for wildlife managers in some parts of the world.

While there have been numerous studies on the techniques available for feral dog management (for example, repellents, toxicants, fumigants, trapping, shooting, frightening; Green and Gipson, 1994) and human concerns about impacts on livestock, there has been less research on the human dimensions of the interactions between feral dogs and wildlife. So, again, the human–dog interaction is well documented, but our understanding of the human–dog–wildlife interaction is far less developed.

However, we do know that there is a wide spectrum of human views concerning feral dogs and these highlight some important, common themes across wildlife management issues. First, opinions about the problem vary widely and are complicated by the fact that it is difficult to separate a native wild dog, such as the dingo, from a feral dog of more recent ancestry due to hybridization across its range (Fleming et al., 2001; Letnic et al., 2012; Ritchie et al., 2012). The dingo is generally treated as a native Australian species, has a unique place in Aboriginal culture, is protected in many parts of Australia, can be important for tourism, and is considered by many to be an ecologically important predator (Burns and Howard, 2003; Ritchie and Johnson, 2009; Thompson et al., 2003). Feral dogs, on the other hand, are widely perceived to be agricultural pests that derived from animals introduced from Europe or Asia within the past several hundred years.

Second, there are often conflicts between individuals and stakeholder groups over the most appropriate tools for managing the problem. For example, studies on a range of species show that many people are reluctant to accept lethal management techniques, such as shooting or poisoning, and that acceptability of lethal methods varies widely between stakeholder groups (Bruskotter et al., 2009; Nimmo et al., 2007). There is concern about the pain and suffering caused to target and non-target animals (including pet dogs) when managing problem wildlife (McLaren et al., 2007). As noted earlier, people are generally more likely to accept lethal techniques if the problem is severe for them (Wittmann et al., 1998). Such diverse opinions make management challenging and a combination of management approaches is therefore needed.

12.4 Discussion and recommendations

> "When attempting to address human-wildlife conflict, it is well accepted that understanding the role of humans is as important as understanding the ecology of species (Alexander and Quinn, 2011)."

The human dimensions research reviewed above suggests that a combination of management strategies is required to effectively resolve human–dog–wildlife conflicts. Given the complex and varied nature of the conflict, it is important to fully understand both the ecological and human dimensions of the conflict before developing and implementing management programs. This is true of all wildlife management issues (Decker et al., 2012).

Given the long history of human–dog interactions and the strong bond between humans and pet dogs in particular, people and their dogs often need to be managed as a cooperative social unit (Bekoff and Meaney, 1997). Management programs may include:

- education and communication;
- regulations (e.g., leashing laws) and enforcement;
- modifying the environment or managing the wildlife species or dog population (e.g., fences, land use planning, wildlife management tools);
- conflict resolution and public participation.

Management success is likely to result from a combination of the above strategies (see, for example, Dowling and Weston, 1999), and it is important to note that successful outcomes will be influenced by attitudes toward different management options (see Box 12.5).

Box 12.5 Perceptions and awareness of the management of pet dogs

Different management approaches enjoy varying levels of support among the public and, in many areas, managers are sensitive to the views of the public regarding the management of public places. However, public views vary between stakeholder groups (Ioja et al., 2011) and are often assumed rather than documented (but see Glover et al., 2011). Where studies have been conducted, higher levels of support for dog management than expected has been evident.

Christie et al. (2010) documented stakeholder views (n = 295) of shorebird management issues around the 270 km^2 Ramsar-listed Westernport Bay in central southern Victoria, Australia. Cluster analysis of the activities recreationists undertook in the bay revealed a distinct recreational group of 'dog walkers.' The ability to take dogs, or the lack of dogs, did not explain the sites recreationists chose to visit around the bay. Among all recreationists, there were high levels of support for dog management, which was intended to help conserve shorebirds (Figure 12.3). This included support for buffer designations around shorebirds to reduce disturbance caused by dog walking (Glover et al., 2011). There was also at least substantial agreement among dog walkers that the presence of people is detrimental to many bird species (54%), that land and water that provides critical habitat for birds should be protected (92%), that it was good to share the bay with birds (92%), and that they would be upset if bird species went extinct (69%). About half of the dog walkers felt that managers were oversensitive to the needs of birds.

In a related study, dog walkers from a selection of Victorian beaches were highly aware of dog regulations (96%), aware of the consequences of not complying with these regulations (94%), and had seen relevant signage (88%) (Williams et al., 2009). Fewer were aware of their potentially negative influence on beach-nesting birds, had seen enforcement officers, or knew of alternative off-leash zones (Williams et al., 2009).

Like all human studies, the issue of a non-random sample in the two studies mentioned above cannot be absolutely discounted. Nevertheless, levels of awareness and support for dog management should not always be assumed to be low, either among the general public or dog walkers themselves.

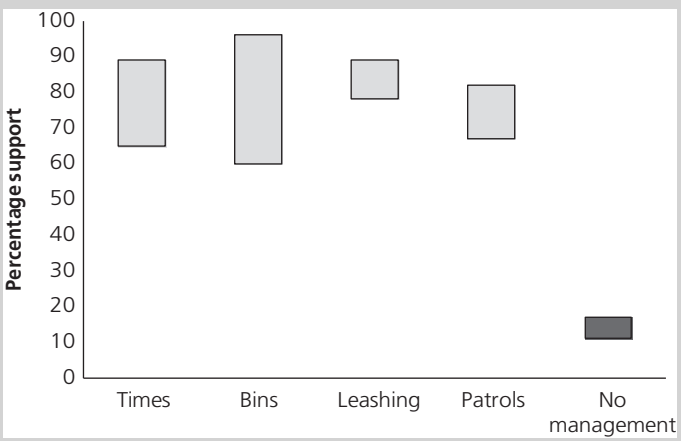

Figure 12.3 Support among 295 stakeholders for dog management (and no management) at Westernport Bay, Victoria, Australia (range of means across four sites shown). The dog managements are restrictions on the times in which dogs were permitted, the installation of dog tidy bins, leashing regulations, ranger patrols, and no management; 14 other managements, not relevant to dogs, are not depicted (after Christie et al., 2010).

12.4.1 Education and communication

> "Neglecting to unpack the intertwined issues wrapped up in a complex wildlife controversy holds the potential pitfall of overlooking important stakes and stakeholders who should be audiences for educational communication (i.e., their concerns might not be addressed and the right channels might not be used to reach them)" (Loker et al., 1998).

Education programs are widely used in wildlife management to raise awareness and foster 'conservation-sympathetic' attitudes in the community. In the absence of human dimensions research, however, education programs are often developed and implemented based on assumptions about the target audience, opinions of the managers and educators, or the views of a vocal minority. As such, the first step in developing any education program is to understand what people already know and the attitudes they hold about the issue (Sterl et al., 2008).

In this case, lessons can be learnt from settings where education programs have already been implemented for resolution of human–dog–wildlife conflicts. For example, Ormsby and Forys (2010) investigated public attitudes toward dog restrictions and the effectiveness of a beach user education program (signs, web pages, print media) in Florida, USA. Their pre-education and post-education survey showed that beach visitors had a similar or more positive attitude after the education program was delivered. They also commented on a need to lessen the focus on the scientific study of birds and to increase the focus on creative education programs that lead to applied conservation.

Managers and educators can use social psychological theories (Figure 12.1) to identify what is already known about the targeted stakeholder groups and to identify gaps. For example, we might have a good understanding of how park visitors behave when walking their dogs but have limited understanding of the underlying reasons and motivations for this behavior (e.g., beliefs, attitudes). Such information is essential in developing educational materials that 'speak the right language' to the intended audience. Social psychological theories have recently expanded into the field of social marketing, which holds promise in longer-term, more widespread, human behavioral change.

The human dimensions literature on dog–wildlife interactions suggests that social norms are an important influence on human behavior (e.g., when people choose to walk their dog off-leash). As such, education campaigns could focus on the development of social norms and community expectations in such contexts. McKenzie-Mohr (2011) suggests that norms should be presented or communicated to the intended audience at the time the targeted behavior is to occur. For example, when entering a park or beach, a sign could display the percentage of visitors who engage in positive environmental behaviors (e.g., dogs on-leash). This gives visitors a sense of what is normal or expected in the environment they are visiting and is likely to be an important influence on subsequent behaviors.

Education campaigns are only part of the solution though. Given that some dog owners know about dog-leashing laws and understand the impacts their dog may have on wildlife (Bridson, 2000; Williams et al., 2009), but still choose to walk their dog off-leash, other behavior change strategies are needed. McKenzie-Mohr (2011) outlines a range of tools that can be used to modify human behavior and they are all based on understanding the barriers and benefits for people in choosing whether or not to participate. Tools available include *communication* (education campaigns), *prompts* (signs, advertisements), *commitment* (seeking a verbal or written commitment from people), *norms* (communication of community expectations), *social diffusion* (early adopters of the behavior spreading the word to others), *convenience* (making it easy for people to change), and *incentives* (financial or otherwise) (McKenzie-Mohr, 2011). Examples of actual implementation of these tools are provided in Table 12.2.

12.4.2 Regulations and enforcement

Regulating human behavior through laws and penalties is another commonly used tool in environmental and wildlife management (Thomas and Murfitt, 2011). The use of such regulations should be considered carefully as it has been found people are

Table 12.2 Examples of management aimed at creating social change to improve dog management for the benefit of wildlife.

Tool	Example	Example Sources
Communication	Campaigns by television, Internet, brochures, rate notices, information with dog registrations, etc.	Dowling and Weston 1999
Prompts	Unambiguous and conspicuous signage in critical areas.	Dowling and Weston 1999
Commitment	Informal agreements fostered through relevant meetings e.g., 'dog breakfasts.'	Maguire 2008
Norms	Expectations to remove dog feces from public areas.	Collier 2011
Social diffusion	Community 'wardens' and 'champions.'	Maguire 2008; Weston et al. 2012
Convenience	Adequate planning for dog zones. Small 'no-dog' wildlife zones which promote coexistence.	McIntosh 1995; Weston et al. 2011
Incentives	Enforcement, free 'leashes' and dog food.	Dowling and Weston 1999; Maguire 2008

more likely to be motivated to change their behavior when they feel they are in control and that their behavior aligns with their values and perceived best interests (DeCaro and Stokes, 2008). That is, approaches that give people control over their decisions (e.g., making a pledge) can work more effectively than the 'fences and fines' approach. As DeCaro and Stokes (2008) note, the "fences and fines approach to conservation has alienated stakeholders from local resources and has undermined intrinsic interest in conservation." Miller and Howell (2008) support this and suggest that social marketing and collaborative management can be more effective than the 'big stick' approach.

Even so, regulations are often needed as one component of an overall management program (Jenkinson et al., 2009). When used, regulations can be most effective when enforced; for example, when a ranger or law enforcement officer is present during peak times of usage or non-compliance (Arnberger and Eder, 2008). However, the application of enforcement is limited; in more rural or underdeveloped settings it may not be feasible.

Before implementing new regulations or enforcing existing regulations, it is important for managers to assess the costs involved and the potential for positive outcomes. That is, are resources being directed where they are most needed? As Reed and Merenlender (2011) point out in their study of dog influences on native carnivores in recreation areas in California, the key factors associated with impacts on wildlife appear to be the presence and number of human visitors. Carnivore abundance and species richness did not differ between recreation areas with different dog policies (i.e., dogs allowed off-leash, allowed on-leash, not allowed), although low leashing compliance may mean that areas with different policies may actually have had a similar presence of dogs. Even so, they suggested that the enforcement of leashing laws may not be the best way to direct limited resources and that restrictions on human visitation (e.g., closing some areas to the public) may be more effective. Clearly, there is a need to better understand the ecological impacts of dog leashing policies in different environments as well as the human dimensions. Where required human behavior change is modest, high compliance (including among dog owners) can be achieved. Weston et al. (2012) describe high compliance among recreationists, including dog walkers, with temporary beach closures that had signs, signs and fences, or signs, fences, and wardens. Thus, coexistence between dogs and threatened wildlife may be possible in some circumstances.

12.4.3 Modifying the environment or managing the species

A commonly used approach in HWCs is to modify the environment in some way. The focus of this may be on changing some aspect of the environment to modify human behavior, for example, fences or boardwalks. Alternatively, and depending on the nature of the conflict, the wildlife population or dog population at the center of the conflict may be managed in some way; for example, through shooting, poisoning, birth control, and other measures.

McKenzie-Mohr (2011) suggests that behavior change strategies focusing on internal barriers for an individual person (e.g., attitudes, opinions, lack of knowledge) are powerful but ineffective if the desired behavior is unpleasant or time-consuming. As a hypothetical example, a person may know that their dog may disturb wildlife and agree with the leashing regulations but find it more convenient to walk through a natural, sensitive, and readily damaged environment to get back to their car with their dog off-leash. As such, the first step in removing external barriers (e.g., the environment, access to an area) is to identify them (McKenzie-Mohr, 2011).

Behavior change strategies focusing on the removal of external barriers are often combined with other strategies. For example, Burger et al. (2004) examined the effect of human activities on migratory shorebirds on Delaware Bay, New Jersey, USA. They documented human recreational behaviors and identified patterns of disturbance to shorebirds. They then developed a management program that included education and communication (through signs), restricted access, wildlife viewing platforms, patrols, and summonses for infractions. These strategies resulted in a significant reduction in the number of recreationists disturbing shorebirds (see also Dowling and Weston, 1999). Although such strategies can be very effective, they also have the potential to create conflict if visitors do not agree with the strategies proposed or implemented (e.g., Kahan et al., 2012). Human dimensions research can provide insights into the acceptability of different management approaches (Bruskotter et al., 2009) and the likely levels of community support once plans are implemented (e.g., Glover et al., 2011).

Strategic land use planning is also increasingly important as human population size increases and pressures mount on parks and open spaces and their biodiversity. If human–dog–wildlife conflicts are considered significant in these areas, planners should consider options for dog walking in other categories of green space (for example, collective house gardens in urban areas; Ioja et al., 2011). Ioja et al. (2011) suggests that such spaces be considered as walking spaces for companion animals to reduce the pressures on urban parks. Options may also exist for establishing designated, fenced, off leash areas, or specific 'dog trails,' which may involve specific facilities such as watering points and 'activity trails' for dogs (Jenkinson, 2011).

12.4.4 Conflict resolution and public participation

No matter what combination of techniques is used to manage human–dog–wildlife conflicts, there will always be an element of disagreement between stakeholders. As such, public and community participation, consensus-building, and conflict resolution strategies are essential for an effective decision-making process (Harding et al., 2009). As with the broader field of environmental management, stakeholder involvement is an important component of wildlife management (Chase et al., 2002; Riley et al., 2003) and there are numerous texts and guides available to inform appropriate participation (e.g., Chase et al., 2002; Harding et al., 2009; Shindler and Cheek, 1999). Loker et al. (1998) suggest that in any wildlife management conflict or problem, a combination of human dimensions and stakeholder approaches can result in decision-making outcomes that can be considered fair, efficient, wise, and stable.

12.5 Future research

This chapter points to a need for further research to examine the human dimensions of dog–wildlife interactions. As this area of research is still emerging in many parts of the world, our understanding of the human values, attitudes, and behaviors relevant for any particular wildlife–human conflict is in its infancy. As Le Corre et al. (2009), in their study of bird disturbance on conservation sites, point out ". . . it is striking to note that the great majority of current studies derive from biology (among the 272 articles selected in our study, there was no social sciences laboratory)." This 'biological bias' is evident in wildlife management globally and may be related to a relative lack of human dimensions training in many university courses (Decker et al., 2001; Miller, 2009).

One of the challenges for human dimensions specialists and wildlife managers is that "human

dimensions studies that reveal differences between what managers think stakeholders want and what they really want are not readily embraced by all professionals" (Loker et al., 1998). Nevertheless, if we are to fully understand the nature of human–wildlife conflicts we need to adopt a multi-disciplinary, integrated approach (e.g., Glover et al., 2011).

To date, the scarce human dimensions research on human–dog–wildlife interactions has focused on human behaviors mainly in developed countries; for example, patterns of visitation, the nature of recreational activities, and the number of visitors walking their dog off-leash. While there has been significant research effort in understanding values, attitudes, and motivations of people with regard to working dogs (especially for hunting), there appears to be much less attention paid to the underlying values and attitudes of people living with or near dogs in relation to dog–wildlife interactions (Le Corre et al., 2009). This is an important area for future research.

Acknowledgments

We thank the Environmental Sustainability Research Group at Deakin University and BirdLife Australia's beach-nesting birds project (funded by the Australian Government's Caring For Our Country programme) for supporting this work. Special thanks go to Geoff Wescott, Kasun Ekanayake, Amy Shaw, James Fitzsimons, Thomas Schneider, and Grainne Maguire for their contributions to related projects.

References

Aguirre, A.A., Starkey, E.E., and Hansen, D.E. (1995). Wildlife diseases in national park ecosystems. *Wildlife Society Bulletin*, **23**, 415–9.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, **50**, 179–211.

Ajzen, I. and Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice Hall, Englewood Cliffs, New Jersey.

Alexander, S.M. and Quinn, M.S. (2011). Coyote (*Canis latrans*) interactions with humans and pets reported in the Canadian print media (1995-2010). *Human Dimensions of Wildlife*, **16**, 345–59.

Antos, M.J., Ehmke, G.C., Tzaros, C.L., and Weston, M.A. (2007). Unauthorised human use of an urban coastal wetland sanctuary: current and future patterns. *Landscape and Urban Planning*, **80**, 173–83.

Arnberger, A. and Eder, R. (2008). Assessing user interactions on shared recreational trails by long-term video monitoring. *Managing Leisure*, **13**, 36–51.

Arnberger, A. and Hinterberger, B. (2003). Visitor monitoring methods for managing public use pressures in the Donau-Auen National Park, Austria. *Journal for Nature Conservation*, **11**, 260–7.

Baker, S., Singleton, G., and Smith, R. (2007). The nature of the beast: Using biological processes in vertebrate pest management. In D.W.Macdonald and K. Service, Eds., *Key Topics in Conservation Biology*. Blackwell Publishing, Malden, USA, pp. 173–85.

Ballard, G. and Fleming, P.J.S. (2010). Are we barking up the wrong tree? Observations on community co-management of wild dogs in NSW, Australia. *23rd Australasian Wildlife Management Society Annual Conference*, 1-December 3, 2010.

Banks, P.B. and Bryant, J.V. (2007). Four-legged friend or foe? Dog walking displaces native birds from natural areas. *Biology Letters*, **3**, 611–3.

Bekoff, M. and Meaney, C.A. (1997). Interactions among dogs, people, and the environment in Boulder, Colorado: A case study. *Anthrozoos*, **10**, 23–31.

Bergman, D., Breck, S., and Bender, S. (2009). Dogs gone wild: Feral dog damage in the United States. In J.R. Boulanger, Ed., *Proceedings of the 13th Wildlife Damage Management Conference*. Saratoga Springs, NY, pp. 177–83.

Breton, F., Clapes, J., Marques, A., and Priestley, G.K. (1996). The recreational use of beaches and consequences for the development of new trends in management: The case of the beaches of the Metropolitan Region of Barcelona (Catalonia, Spain). *Ocean and Coastal Management*, **32**, 153–80.

Bridson, L. (2000). *Minimising Visitor Impacts on Threatened Shorebirds and their Habitats*. Department of Conservation, Wellington, New Zealand.

Bruskotter, J.T., Vaske, J.J., and Schmidt, R.H. (2009). Social and cognitive correlates of Utah residents' acceptance of the lethal control of wolves. *Human Dimensions of Wildlife*, **14**, 119–32.

Bruskotter, J.T and Shelby, L.B. (2010). Human dimensions of large carnivore conservation and management: Introduction to the special issue. *Human Dimensions of Wildlife*, **15**, 311–4.

Burger, J., Jeitner, C., Clark, K., and Niles, L.J. (2004). The effect of human activities on migrant shorebirds: successful adaptive management. *Environmental Conservation*, **31**, 283–8.

Burns, G.L. and Howard, P. (2003). When wildlife tourism goes wrong: A case study of stakeholder and management issues regarding Dingoes on Fraser Island, Australia. *Tourism Management*, **24**, 699–712.

Chase L.C., Siemer, W.F., and Decker, D.J. (1999). Suburban deer management: A case study in the village of Cayuga Heights, New York. *Human Dimensions of Wildlife*, **4**, 59–60.

Chase L.C., Siemer, W.F., and Decker, D.J. (2002). Designing stakeholder involvement strategies to resolve wildlife management controversies. *Wildlife Society Bulletin*, **30**, 937–950.

Chitwood, M.C., Peterson, M.N., and Deperno, C.S. (2011). Assessing dog hunter identity in coastal North Carolina. *Human Dimensions of Wildlife*, **16**, 128–41.

Christie, B.A., Miller, K.K., and Weston, M.A. (2010). *Western Port welcomes waterbirds: A study of the human dimensions of waterbird conservation in Western Port Bay, Australia*. Deakin University, Burwood.

Clutton-Brock, J. (1995). Origin of the dog: Domestication and early history. In J. Serpell, Ed., *The Domestic Dog: Its Evolution, Behaviour and Interaction with People*. Cambridge University Press, Cambridge, pp. 7–20.

Collier, G. (2011). When's enough enough? Understanding norms. *Water Materials Energy Magazine*, **Dec**., 35–6.

DeCaro, D., and Stokes, M. (2008). Social-psychological principles of community-based conservation and conservancy motivation: Attaining goals within an autonomy-supportive environment. *Conservation Biology*, **22**, 1443–51.

Decker, D.J., Brown, T.L., and Siemer, W.F. (2001). *Human Dimensions of Wildlife Management in North America*. The Wildlife Society, Bethesda, MD.

Decker, D.J. and Purdy, K.G. (1988). Toward a concept of wildlife acceptance capacity in wildlife management. *Wildlife Society Bulletin*, **16**, 58–62.

Decker, D.J., Riley, S.J., and Siemer, W.F. (2012). *Human Dimensions of Wildlife Management*. 2nd edn. The Johns Hopkins University Press, Baltimore.

Dowling, B. and Weston, M.A. (1999). Managing a breeding population of the Hooded Plover *Thinornis rubricollis* in a high-use recreational environment. *Bird Conservation International*, **9**, 255–70.

Enck, J.W. and Decker, D.J. (1997). Examining assumptions in wildlife management: A contribution of human dimensions inquiry. *Human Dimensions of Wildlife*, **2**, 56–72.

Fleming, P., Corbett, L., Harden, R., and Thomson, P. (2001). *Managing the Impacts of Dingoes and Wild Dogs*. Commonwealth of Australia, Canberra.

Frey, S., Conover, M., Borgo, J., and Messmer, T. (2003). Factors influencing pheasant hunter harvest and satisfaction. *Human Dimensions of Wildlife*, **8**, 277–86.

Fulton, D.C., Manfredo, M.J., and Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife*, **1**, 24–47.

Gehring, T.M., VerCauteren, K.C., and Landry, J.M. (2010). Livestock protection dogs in the 21st century: Is an ancient tool relevant to modern conservation challenges? *BioScience*, **60**, 299–308.

Glover, H.K., Weston, M.A., Maguire, G.S., Miller, K.K., and Christie, B.A. (2011). Towards ecologically meaningful and socially acceptable buffers: Response distances of shorebirds in Victoria, Australia, to human disturbance. *Landscape and Urban Planning*, **103**, 326–34.

Green, J.S. and Gipson, P.S. (1994). Feral dogs. In S.E. Hygnstrom, R.M. Timm, and G.E. Larson, Eds., *The Handbook: Prevention and Control of Wildlife Damage*. University of Nebraska, Lincoln, pp. 1–7.

Harding, R., Hendriks, C.M., and Faruqi, M. (2009). *Environmental Decision-Making: Exploring Complexity and Context*. Federation Press, Leichhardt, NSW.

Ioja, C.I., Rozylowicz, L., Patroescu, M., Nita, M.R., and Vanau, G.O. (2011). Dog walkers' vs. other park visitors' perceptions: The importance of planning sustainable urban parks in Bucharest, Romania. *Landscape and Urban Planning*, **103**, 74–82.

Jenkinson, S., Hale, J., and Harrop, P. (2009). Influencing walkers with dogs: Three years of progress. *Countryside Recreation*, **17**, 18–22.

Jenkinson, S. (2011). Promoting fitness and fun with your best friend. *Society for Companion Animal Studies Journal*, **Summer**, 12–17.

Kahan, D.M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L.L., Braman, D., and Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, **2**, 732–5.

Kean, K. (2011). *Human dimensions of dingo and wild dog management in Victoria*. Unpublished Honours Thesis, Deakin University, Melbourne.

Kellert, S.R. (1991). Public views of wolf restoration in Michigan. *Transactions of the North American Wildlife and Natural Resources Conference*, **56**, 152–61.

Kellert, S.R. (1996). *The Value of Life: Biological Diversity and Human Society*. Island Press, Washington, DC.

Le Corre, N., Gelinaud, G., and Brigand, L. (2009). Bird disturbance on conservation sites in Britanny (France): The standpoint of geographers. *Journal of Coastal Conservation*, **13**, 109–18.

Letnic, M., Ritchie, E.G., and Dickman, C.R. (2012). Top predators as biodiversity regulators: The dingo *Canis lupus dingo* as a case study. *Biological Reviews*, **87**, 390–413.

Loker, C.A., Decker, D.J., and Chase, L.C. (1998). Ballot initiatives-antithesis of human dimensions approaches or catalyst for change? *Human Dimensions of Wildlife*, **3**, 8–20.

Loveridge, A.J., Reynolds, J.C., and Milner-Gulland, E.J. (2007). Does sport hunting benefit conservation? In D.W. Macdonald, and K. Service, Eds., *Key Topics in Conservation Biology*. Blackwell Publishing, Malden, USA, pp. 222–38.

Lukasik, V.M. and Alexander, S.M. (2011). Human–coyote interactions in Calgary, Alberta. *Human Dimensions of Wildlife*, **16**, 114–27.

Maguire, G.S. (2008). *A practical guide for managing beach-nesting birds in Australia*. BirdLife Australia, Melbourne.

Maguire, G.S., Miller, K.K., Weston, M.A., and Young, K. (2011). Being beside the seaside: Beach use and preferences among coastal residents of south-eastern Australia. *Ocean and Coastal Management*, **54**, 781–8.

Manfredo, M.J. and Dayer, A.A. (2004). Concepts for exploring the social aspects of human-wildlife conflict in a global context. *Human Dimensions of Wildlife*, **9**, 1–20.

Manfredo, M.J., Vaske, J.J., Brown, P.J., Decker, D.J., and Duke, E.A. (Eds.) (2009). *Wildlife and Society: The Science of Human Dimensions*. Island Press, Washington, DC.

Marks, S.A. (1991). *Southern Hunting in Black and White: Nature, History, and Ritual in a Carolina Community*. Princeton University Press, Princeton, NJ.

McIntosh, R. (1995). The history and multi-purpose management of Kielder Forest. *Forest Ecology and Management*, **79**, 1–11.

McKenzie-Mohr, D. (2011). *Fostering Sustainable Behavior: An Introduction To Community-Based Social Marketing*. 3rd edn. New Society Publishers, Gabriola Island, Canada.

McKnight, J. and Sutton, J. (1994). *Social Psychology*. Prentice Hall, Sydney, Australia.

McLaren G., Bonacic, C., and Rowan, A. (2007). Animal welfare and conservation: Measuring stress in the wild. In D.W. Macdonald, and K. Service, Eds., *Key Topics in Conservation Biology*. Blackwell Publishing, Malden, USA, pp. 220–33.

McLeod, R. (2004). *Counting the Cost: Impact of Invasive Animals in Australia 2004*. Cooperative Research Centre for Pest Animal Control, Canberra.

Meadow, R., Reading, R.P., Phillips, M., Mehringer, M., and Miller, B. (2005). The influence of persuasive arguments on public attitudes toward a proposed wolf restoration in the southern Rockies. *Wildlife Society Bulletin*, **33**, 154–63.

Miller, K.K. (2009). Human dimensions of wildlife population management in Australasia: History, approaches and directions. *Wildlife Research*, **36**, 48–56.

Miller, K.K and Jones, D.N. (2005). Wildlife management in Australasia: Perceptions of objectives and priorities. *Wildlife Research*, **32**, 265–72.

Miller, K.K. and Weston, M.A. (2009). Towards a set of priorities for bird conservation and research in Australia: The perceptions of ornithologists. *Emu*, **109**, 67–74.

Miller, R. and Howell, G.V.J. (2008). Regulating consumption with bite: Building a contemporary framework for urban dog management. *Journal of Business Research*, **61**, 525–31.

Morgan, R. (1999). Preferences and priorities of recreational beach users in Wales, UK. *Journal of Coastal Research*, **15**, 653–67.

Naughton-Treves, L., Grossberg, R., and Treves, R. (2003). Paying for tolerance: Rural citizens' attitudes toward wolf depredation and compensation. *Conservation Biology*, **17**, 1500–11.

Napierala, H., and Uerpmann, H-P. (2012). A "new" Palaeolithic dog from Central Europe. *International Journal of Osteoarchaeology*, **22**, 127–37.

Nimmo, D.G., Miller, K.K., and Adams, R.A. (2007). Managing feral horses in Victoria: A study of community attitudes and perceptions. *Ecological Management & Restoration*, **8**, 237–41.

O'Connell-Rodwell, C.E., Rodwell, T., Rice, M., and Hart, L.A. (2000). Living with the modern conservation paradigm: Can agricultural communities co-exist with elephants? A five-year case study in East Caprivi, Namibia. *Biological Conservation*, **93**, 381–91.

Ormsby, A.A. and Forys, E.A. (2010). The effects of an education campaign on beach user perceptions of beach-nesting birds in Pinellas County, Florida. *Human Dimensions of Wildlife*, **15**, 119–28.

Ortolani, A., Vernooij, H., and Coppinger, R. (2009). Ethiopian village dogs: Behavioural responses to a stranger's approach. *Applied Animal Behaviour Science*, **119**, 210–18.

Ovodov, N.D., Crockford, S.J., Kuzmin, Y.V., Higham, T.F.G., Hodgins G.W.L., and van der Plicht, J. (2011). A 33,000-year-old incipient dog from the Altai Mountains of Siberia: Evidence of the earliest domestication disrupted by the Last Glacial Maximum. *PLoS ONE*, **6**: e22821. doi:10.1371/journal.pone.0022821

Paquet-Durand, I., Hernandez, J., Dolz, G., Romero Zuniga, J.J., Schnieder, T., and Epe, C. (2007). Prevalence of *Toxocara* spp., *Toxascaris leonine* and Ancylostomidae in public parks and beaches in different climate zones of Costa Rica. *ActaTropica*, **104**, 30–7.

Pelletier, F. (2006). Effects of tourist activities on ungulate behaviour in a mountain protected area, *Journal of Mountain Ecology*, **8**, 15–19.

Peter, J. (2012). In dog we trust, *Australian Birdlife*, **1**, 36–9.

Poole, L. (2010). Guardian dogs look after penguins, *ABC Rural*, June 22, 2010, <http://www.abc.net.au/site-archive/rural/content/2010/s2933996.htm>.

Potgieter, C. (2011). *The effectiveness of livestock guarding dogs for livestock production and conservation in Namibia*. Masters Thesis, Nelson Mandela Metropolitan University, South Africa.

Reed, S.E. and Merenlender, A.M. (2011). Effects of management of domestic dogs and recreation on carnivores in protected areas in Northern California. *Conservation Biology*, **25**, 504–13.

Riley, S., Siemer, W., Decker, D., Carpenter, L., Organ, J., and Berchielli, L. (2003). Adaptive impact management: An integrative approach to wildlife management. *Human Dimensions of Wildlife*, **8**, 81–95.

Ritchie, E.G. and Johnson, C.N. (2009). Predator interactions, mesopredator release and biodiversity conservation. *Ecology Letters*, **12**, 982–98.

Ritchie E.G., Elmhagen, B., Glen, A.S., Letnic, M., Ludwig, G., and McDonald, R.A. (2012). Ecosystem restoration with teeth: What role for predators? *Trends in Ecology and Evolution*, **27**, 265–71.

Rokeach, M. (1973). *The Nature of Human Values*. The Free Press: New York.

Sastre, P., Ponce, C., Palacín, C., Martín, C.A., and Alonso, J.C. (2009). Disturbances to great bustards (*Otis tarda*) in central Spain: Human activities, bird responses and management implications. *European Journal of Wildlife Research*, **55**, 425–32.

Schultz, P.W. (2011). Conservation means behavior. *Conservation Biology*, **25**, 1080–3.

Semken, M., Miller, K.K., and James, K. (2011). The value of oral history in natural resource management: the Balcombe Estuary Reserve, Mount Martha, Victoria. *Australasian Journal of Environmental Management*, **18**, 109–22.

Shindler, B. and Cheek, K.A. (1999). Integrating citizens in adaptive management: a propositional analysis. *Conservation Ecology*, **3**, 9.

Sillero-Zubiri, C. (2009). Family Canidae (Dogs). In D.E. Wilson, and R.A. Mittermeier, Eds., *Handbook of the Mammals of the World*. *Vol 1. Carnivores*. Lynx Edicions, Barcelona, pp. 352–411.

Sterl, P., Brandenburg, C., and Arnberger, A. (2008). Visitors' awareness and assessment of recreational disturbance of wildlife in the Donau-Auen National Park. *Journal for Nature Conservation*, **16**, 135–45.

Thomas, I. and Murfitt, P. (2011). *Environmental Management: Processes and Practices for Australia*. 2nd edn. The Federation Press, Sydney.

Thompson, J., Shirreffs, L., and McPhail, I. (2003). Dingoes on Fraser Island-Tourism Dream or management nightmare? *Human Dimensions of Wildlife*, **8**, 37–47.

Torres, P.C. and Prado, P.I. (2010). Domestic dogs in a fragmented landscape in the Brazilian Atlantic Forest: Abundance, habitat use and caring by owners. *Brazilian Journal of Biology*, **70**, 987–94.

Underhill-Day J.C. and Liley, D. (2007). Visitor patterns on southern heaths: A review of visitor access patterns to heathlands in the UK and the relevance to Annex I bird species. *Ibis*, **149** (Suppl.1), 112–9.

Van Bommel, L. and Johnson, C. (2012). Good dog! Using livestock guardian dogs to protect livestock from predators in Australia's extensive grazing systems. *Wildlife Research*, **39**, 220–29.

Weston, M.A., Antos, M.J., and Glover, H.K. (2009). Birds, buffers and bicycles: A review and case study of wetland buffers. *The Victorian Naturalist*, **126**, 79–86.

Weston, M.A., Dodge, F., Bunce, A., Nimmo, D.G., and Miller, K.K. (2012). Do temporary beach closures assist in the conservation of breeding shorebirds on recreational beaches?*Pacific Conservation Biology*, **18**, 47–55.

Weston, M.A., Ehmke, G.C., and Maguire, G.S. (2011). Nest return times in response to static versus mobile human disturbance. *Journal of Wildlife Management*, **75**, 252–55.

White, P.C.L., Newton-Cross, G.A., Moberly, R.L., Smart, J.C.R., Baker, P.J., and Harris, S. (2003). The current and future management of wild mammals hunted with dogs in England and Wales. *Journal of Environmental Management*, **67**, 187–97.

Whiting, A. and Miller, K. (2008). Examining the living with possums policy in Victoria, Australia: Community knowledge, support and compliance. *Pacific Conservation Biology*, **14**, 169–76.

Williams, K.J.H., Weston, M.A., Henry, S., and Maguire, G.S. (2009). Birds and beaches, dogs and leashes: Dog owners' sense of obligation to leash dogs on beaches in Victoria, Australia. *Human Dimensions of Wildlife*, **14**, 89–101.

Wilson, E.O. (1984). *Biophilia*. Harvard University Press, Cambridge.

Wittmann, K., Vaske, J.J., Zinn, H.C., and Manfredo, M.J. (1998). Standards for lethal response to problem urban wildlife. *Human Dimensions of Wildlife*, **3**, 29–48.

Woodroffe, R. and Ginsberg, J.R. (1998). Edge effects and the extinction of populations inside protected areas. *Science*, **280**, 2126–8.