

WILDLIFE HEALTH AND PUBLIC TRUST RESPONSIBILITIES FOR WILDLIFE RESOURCES

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ABSTRACT: A significant development in wildlife management is the mounting concern of wildlife professionals and the public about wildlife health and diseases. Concurrently, the wildlife profession is reexamining implications of managing wildlife populations as a public trust and the concomitant obligation to ensure the quality (i.e., health) and sustainability of wildlife. It is an opportune time to emphasize the importance of wildlife health, specifically to advocate for comprehensive and consistent integration of wildlife health in wildlife management. We summarize application of public trust ideas in wildlife population management in the US. We argue that wildlife health is essential to fulfilling public trust administration responsibilities with respect to wildlife, due to the central responsibility of trustees for ensuring the well-being of wildlife species (i.e., the core resources of the trust). Because both health of wildlife and risk perceptions regarding threats posed by wildlife disease to humans and domestic animals are issues of growing concern, managing wildlife disease and risk communication vis-à-vis wildlife health is critical to wildlife trust administration. We conclude that wildlife health professionals play a critical role in protecting the wildlife trust and that current conditions provide opportunities for important contributions by wildlife health professionals in wildlife management.

Key words: Public trust, risk communication, wildlife health, wildlife trust administration.

INTRODUCTION

In light of the attention currently being paid to wildlife diseases, it seems evident that wildlife health would be a vitally important aspect of wildlife population management (Buttke et al. 2015), but this was not always the case. For most of the 20th century, disease normally was not considered to be significant in wildlife management because it was believed that disease did not have population-level effects. This conventional perspective has been nullified (Wobeser 2006), and mounting examples to the contrary have emerged: white-nose syndrome in bats, chytrid fungus in amphibians, chronic wasting disease in cervids, mycoplasmal conjunctivitis in songbirds, West Nile virus in corvids, viral hemorrhagic septicemia in fish, etc. Most wildlife managers now realize that wildlife

diseases demand specific consideration. This situation undoubtedly will continue given the trends in many of the main drivers of the disease surge: climate change, increasing human population encroachment into natural areas, global travel, and introduction of exotic animals, contaminants, and pathogens into native habitats in the US (Binder et al. 1999; Daszak and Cunningham 2000; Jones et al. 2008, 2013).

Although disease is a large component of wildlife health management activity, the concept of wildlife health we use herein is broader, consistent with that proposed by Craig Stephen (2014, pp. 429–430):

A modern definition of wildlife health should emphasize that 1) health is the result of interacting biologic, social, and environmental determinants that interact to affect capacity to cope with change; 2)

health cannot be measured solely by what is absent but rather by characteristics of the animals and their ecosystem that affect their vulnerability and resilience; and 3) wildlife health is not a biologic state but rather a dynamic social construct based on human expectations and knowledge.

This definition reflects a sociocultural-ecological-systems perspective increasingly embraced in contemporary wildlife resource^a management.

Here we describe the role of wildlife health management from the standpoint of fulfilling public trust responsibilities of government. We assert that condition or health of wildlife matters fundamentally in wildlife trust administration. Trust administration responsibilities arise from the legal understanding that wildlife are a valued public resource to be managed by government for the benefit of the general public. The public entrusts protection and management of wildlife resources to state and federal agencies (Organ et al. 2014). Wildlife health and mitigation of wildlife disease are part of the administration of this public trust and deserve attention from the responsible agencies (Decker et al. in press). Our underlying premise is that wildlife health professionals should be cognizant of the argument for wildlife health being essential in wildlife trust administration. It is an opportune time to articulate the role of wildlife health in wildlife management because of the salience of wildlife health and disease^b in the public mind and professional wildlife managers' conservation agenda.

We briefly summarize current thinking about public trust ideas for wildlife management in the US (e.g., Public Trust Doctrine). We then share a definition of wildlife

management that emphasizes a focus on benefits and consequences associated with human-wildlife coexistence (Riley et al. 2002; Decker et al. 2012a, 2013b, 2014). We assert that both health of wildlife and risk perceptions of humans regarding threats posed by wildlife disease to themselves, their families, and domestic animals are issues of growing concern for conservation. We argue that managing risk communication vis-à-vis wildlife health and wildlife disease is a critical aspect of administration of wildlife as a public trust resource. We conclude that current attention to public trust obligations of wildlife agencies provides an opportunity to communicate the state of health of wildlife and their ecosystems as an essential component of conservation and the pivotal role of wildlife health professionals in wildlife management.

Public trust thinking—The foundation of wildlife management

Society's expression of the fundamental value of natural resources such as wildlife is reflected in common law, referred to as the Public Trust Doctrine (Sax 1970). According to prevailing interpretations of this legal doctrine (e.g., Horner 2000; Batcheller et al. 2010), wildlife in the US are managed by state (primarily) and federal governments as public trust resources for the benefit of current and future generations (Organ and Batcheller 2009). State and federal laws further clarify trust responsibilities of government for wildlife resources (Musgrave and Stein 1993; Bean and Rowland 1997).

The wildlife management community (public and private practitioners, academics, and wildlife agencies) in the US has been examining what it means to manage wildlife as a public trust resource in the 21st century; agencies have been reaffirming their commitments and obligations (Batcheller et al. 2010; Decker et al. 2013a). The attention to public trust thinking (i.e., longstanding ideas about public ownership of natural resources that include but are broader than those normally articulated as the Public Trust Doctrine; Hare and Blosssey 2014) is important during this time when transformation of state wildlife

^a The concept of *wildlife resources* includes habitat as well as the wildlife species using that habitat.

^b Although we emphasize wildlife health, we do not mean to imply that all aspects of disease are deleterious; the value of natural disease in population, multispecies, and ecosystems dynamics and the importance of disease in ecological and evolutionary processes have been well established (Vander Wal et al. 2014). Understanding and protecting these processes when natural are also a responsibility of wildlife management.

agencies from a focus on a narrow set of stakeholder interests to more inclusive public interests has been encouraged (Jacobson and Decker 2008; Jacobson et al. 2010; AFWA 2016). Public trust thinking can have a steadying effect as wildlife agencies deal with the uncertainties associated with change; that is, specific agency objectives and processes may be adjusted, but the higher-order purposes of conservation and deeper philosophy of the government-citizen relationship expressed in public trust thinking endure. Principles for governance of wildlife based on public trust thinking and norms of good governance have been proposed recently with the thought that these principles can guide agencies, their partners, specific stakeholders, and citizen beneficiaries in general to effect wildlife management consistent with public trust ideals (Decker et al. 2016).

Principles of trusteeship (e.g., Organ et al. 2014) and descriptions of the roles of various participants in the administration of public wildlife resources (Smith 2011) have emphasized that a responsibility of special concern to trust administrators is assurance of intergenerational fairness (i.e., keeping options open for future generations). Scott (1999) asserts that the Public Trust Doctrine obligates the present generation to regularly review current scientific knowledge in relation to threats to or enhancement of “natural capital” for future generations. We interpret this as the mandate to protect and enhance wildlife populations (including their health) and the complex environments in which they live.

Attention to the condition of the wildlife resources within the public wildlife trust was recently highlighted by Organ et al. (2014). They articulate three key functions that public wildlife managers fulfill under Public Trust Doctrine: sustaining trust assets, developing trust assets, and distributing trust benefits. For the first function, “sustaining trust assets—protective custody,” Organ et al. (2014, p. 411) assert the following:

At minimum, the core function of wildlife trust administration is protection of the corpus of the trust (i.e., the wildlife resource). One reason for the centrality

of this function is that in the absence of a resource of value, there is no need for a trust. Protection of the corpus in wildlife conservation does not simply involve being an attentive custodian of the trust for the current generation of citizens; an intergenerational responsibility in perpetuity is expected. Emerging from this situation, discussions about wildlife trust administration usually refer to applying the precautionary principle (Kriebel et al. 2001). As we have alluded to previously, functionally this results in risk aversion. This means risks need to be identified, better yet anticipated, so trust managers can mitigate negative effects to the extent possible and adjust and bound beneficiaries’ expectations of benefits they will receive.

In the context of wildlife health and disease management, this suggests that risk to the wildlife resource be minimized and protective measures taken even if some cause-and-effect relationships impacting health are not fully understood.

Wildlife management defined

The scope of wildlife management in the US has evolved with respect to the breadth of species managed, the diversity of stakeholder interests served, the enormity of the threats compared to the opportunities for conservation, and the magnitude of positive and negative impacts experienced by human communities interacting with wildlife. One contemporary definition of wildlife management reflects public trust thinking by adopting the position that wildlife management is motivated by society’s desire for valued outcomes or benefits that can be produced from managing public wildlife resources (Decker et al. 2012a). Expectations for such outcomes give rise to management typically aimed at 1) sustaining biodiversity and related ecological services, 2) providing renewable use and enjoyment of wildlife, and 3) minimizing negative consequences of human-wildlife interactions on both humans and wildlife (Decker et al. in press).

Human experiences with wildlife arise from many kinds of interactions between people and wildlife and among people because of wildlife. Experiences with wildlife can be of many kinds (direct or vicarious), vary in intensity and duration, and occur across different scales (temporal, geospatial, jurisdictional) and at multiple levels (local, regional, statewide, multi-state, continental, etc.). Outcomes or effects of wildlife experiences can be positive or negative and may take many forms (e.g., economic benefits or costs, threats to or enhancement of human health and safety, ecological services provided by wildlife and their habitats, and physical, mental, and social benefits produced by recreational enjoyment of wildlife). From this perspective, wildlife management can be defined as the guidance of decision-making processes and implementation of practices that influence interactions between people, wildlife, and wildlife habitats, and among people about wildlife, to benefit wildlife and add value to people's lives (adapted from Decker et al. 2012a).

This definition of wildlife management is consistent with the Public Trust Doctrine, whereby wildlife management agencies are expected to deliver benefits for society, that is, to produce impacts valued by the public (Decker et al. 2014). Although tradeoffs producing winners and losers are often inevitable in wildlife management, in aggregate, management actions are expected to result in higher net positive outcomes for society than would occur in the absence of management intervention. Consequently, in practice this is operationalized as two broad categories of actions: those that create positive effects (e.g., improving health of wildlife populations) and those that reduce or eliminate negative effects (e.g., avoid anthropogenic disease transmission to unaffected populations of wildlife). Thus, wildlife managers attempt to enhance, regulate, or prohibit various experiences that people might have with wildlife for the purpose of influencing the nature and magnitude of positive and negative outcomes. Depending on the need, management actions are aimed at individual wild animals, wildlife populations,

wildlife habitats, domestic animals, and people. Accordingly, wildlife management programs often focus on protection or manipulation of wildlife populations and habitats, as well as on regulation of wildlife use (e.g., hunting, trapping) and other human-wildlife interactions (e.g., feeding or viewing wildlife). However, wildlife management is evolving to include a broader array of activities, including increasing efforts to improve wildlife health.

Wildlife health and disease management in a public trust context

Wildlife health and disease management is an important aspect of responsible public wildlife trust administration because wildlife disease and poor wildlife health can increase mortality and decrease reproduction, thereby diminishing wildlife managers' effectiveness in sustaining or restoring wildlife resources. When poor wildlife health impedes fulfillment of public trust responsibilities to current and future generations, wildlife managers typically address two challenges: 1) *health risks* posed to wildlife populations or humans and domestic animals and 2) *public perceptions of risks* posed to wildlife, humans, and domestic animals. Addressing public risk perceptions can be just as consequential for wildlife trust administration as addressing direct effects of disease on wildlife populations. For example, if people cease participation in wildlife-dependent recreation out of excessive concern about risks of contracting disease from wildlife, the benefits of the public wildlife resource are lessened. Even decisions about whether or not and how to manage wildlife risks are affected by risk perceptions. For example, conflict over management actions taken to manage risk of brucellosis transfer from bison (*Bison bison*) to livestock can be rooted in differences in risk perception between stakeholders (Bidwell 2009).

Management for wildlife health therefore contributes in at least two ways to wildlife resource management as a public trust activity: 1) preserving the quality and quantity of the trust assets (wildlife resources) for future generations (keeping options open for

future benefits) and 2) delivering benefits from trust management, including reduction of negative impacts associated with wildlife (perceived or real risk of disease transmission).

These elements of public trust administration are consistent with the core philosophy of animal health professionals. The philosophical connectivity of wildlife health to wildlife conservation is made explicit in the strategic plan of the American Association of Wildlife Veterinarians, which identifies objectives that include enhancing the contribution of veterinary medicine to the welfare of the wildlife resource, promoting animal management and preventative medicine as it relates to free-ranging species, and recognizing disease syndromes in their broadest sense as potentially influenced by habitat conditions (AAVW 2007). This ideology, encompassing the well-being of populations and communities, is in the tradition of “One Health” (Zinsstag et al. 2011) rather than the traditional role of providing individualized health care to domestic animals.

Many state and federal agencies, the entities primarily responsible for wildlife trust administration, have added wildlife health expertise to their staff. Most have access to wildlife veterinarians and have established relationships with veterinary diagnostic laboratories (Siemer et al. 2012). These agencies are incorporating wildlife health and disease more explicitly in their scope of effort. For example, the Florida Fish and Wildlife Conservation Commission (FWC) has a mission that reflects public trust thinking: “managing fish and wildlife resources for their long-term well-being and the benefit of people” (FWC 2016, p. 1). Some FWC activities include surveillance, detection, and monitoring of disease and other factors that impact wildlife health (e.g., water quality and quantity, habitat changes, harmful algal blooms), as well as an understanding of disease impacts on wildlife populations and potential subsequent impacts on ecosystem health and public health. The National Park Service, with its mission to preserve natural and cultural resources unimpaired for current and future

generations, approaches wildlife health differently through its Wildlife Health Program. The National Park Service does not specifically manage for the health of individual species but instead seeks to maintain healthy ecosystems (National Park Service 2006). Consistent with the future generational outlook of public trust administration, both of these wildlife health programs are concerned about the long-term impacts of introduced pathogens and nonnative species on native wildlife populations and ecosystems.

Managing wildlife health can be the most cost-effective method to prevent disease outbreaks, aligning with expectations for efficient use of funding for wildlife trust administration. Eradicating an already-invaded pathogen of wildlife is likely infeasible and extremely costly (Wobeser 2002; Horan and Fenichel 2007). For instance, multiple agencies in Wisconsin together spent over \$32 million during the first five years of the chronic wasting disease (CWD) outbreak in that state’s wild white-tailed deer (*Odocoileus virginianus*) herd with the Wisconsin Department of Natural Resources contributing 83% of these funds (Stuiber et al. 2006). The response to this single outbreak in an isolated portion of the state caused redirection of limited financial and personnel resources from other wildlife and environmental programs. Despite these efforts, CWD increased in prevalence and geographic distribution (WDNR 2016), and opposition to further CWD management grew (Vaske et al. 2004).

Broad recognition of wildlife health concerns and public expectations of wildlife management: Risk perception and communication

Growing concern about effects of wildlife health and disease in wildlife conservation is not limited to conservation insiders. Wildlife disease is a well-established category of concern in wildlife management (Riley et al. 2002) and has become more prevalent in studies of human-wildlife interactions. Generally, concern deepens as perceived risks to self, significant others, and domestic animals heighten. Studies documenting such concern have been conducted with different kinds of

stakeholders (e.g., hunters, farmers, urban residents) in a variety of disease transmission contexts ([Dorn and Mertig 2005](#); [Vaske et al. 2009](#); [Vaske 2010](#)).

Thus, wildlife disease presents two different, serious challenges to management of wildlife as public trust resources. The most obvious is the direct effect of diseases on wildlife populations. Disease outbreaks strain efforts to maintain the quality and sustainability of the basic trust assets: wildlife populations and habitats. The second challenge, the effects of risk perception among members of the public, may be less obvious. Social amplification of risk ([Kasperson and Kasperson 1996](#)) can occur as individuals, organizations, and government agencies communicate with the public about disease issues that affect livestock production and wildlife-related recreation or tourism ([Bidwell 2009](#)). Social amplification of risk, per se, is not a bad thing. In the event of a true risk, amplification (replication or expanding the range of the message) is important. Over-inflated risk perceptions, however, can lead to exaggerated public concerns and over-reaction and therefore have potential to interfere with wildlife trust administration.

Public perception of wildlife health is affected by first-hand observations and second-hand reports of wildlife condition. Observation of sick animals and massive die-offs sway public perception and often elicit a visceral response followed by increased public expectations of “it’s the wildlife agency’s responsibility to keep wildlife alive and healthy.” In some cases, such as very small populations (e.g., endangered species or isolated populations), health concerns are of a genetic nature, with some of the manifestations of genetic problems quite visible to the public (e.g., the kinked tail of the Florida panther [*Puma concolor coryi*]; [Hedrick 1995](#); [Land and Lacy 2000](#)).

Exaggerated risk perceptions about wildlife health and wildlife disease, especially when they involve zoonotic agents, can diminish public receipt of benefits of wildlife by decreasing enjoyment of wildlife presence in the environment. If the public benefits of

wildlife diminish, then essentially the value of the wildlife trust diminishes, which is antithetical to expectations of wildlife trust administration. Examples abound. Hunter reluctance to handle and consume deer in areas where CWD has been detected ([Gigliotti 2004](#); [Brown et al. 2006](#)) could markedly reduce benefits derived from hunting, especially as prevalence of infected animals increases ([Vaske 2010](#)). A 2004 survey revealed that a majority of respondents from states with high incidence of reported cases of Lyme disease had reduced their use of wooded and grassy areas as a means to reduce their exposure to tick bites ([Herrington 2004](#)); parents restricting opportunities for their children to experience the outdoors because of perceived risks of wildlife-associated disease obviates benefits of wildlife inhabiting nearby natural areas and may reduce families’ appreciation of such areas. Family concerns about exposure of beloved companion animals to Lyme disease or other wildlife-associated diseases may have similar effects. Concerns about spread of disease from wildlife to other domesticated animals, for example, farmer concerns about transmission of bovine tuberculosis from elk (*Cervus elaphus*) in a national park to adjacent livestock ([Brook and McLachlan 2006](#)), also augurs poorly for strong public support of wildlife conservation. Some wildlife professionals have speculated that the cumulative effect of risk perceptions could be lack of support for conservation (e.g., resistance to habitat preservation adjacent to human residential areas; intolerance of wildlife in human neighborhoods; opposition to restoration of species known to be associated with diseases of concern) and intolerance of wildlife ([Decker et al. 2012b](#)). These responses deplete the yield of current benefits from public wildlife resources and fundamentally threaten the sustainability of such resources, which in turn threatens options for future generations.

Communication challenges

When wildlife disease is considered a major risk by the public, and negative impacts

manifest as outlined above, wildlife managers will often find that the usual tools for influencing size and distribution of a wildlife population are inappropriate, insufficient, or unacceptable. Furthermore, misguided public calls for reducing negative impacts by depleting the wildlife resource may be contradictory to public trust administration obligations (e.g., to future generations). Often the response of wildlife management agencies to inflated risk perceptions among lay people has been to simply provide the public with more information. Such responses are based on a cognitive deficit (or knowledge gap) model ([Hansen et al. 2003](#)). A cognitive deficit approach assumes that giving people information about an issue will lead to increases in knowledge, leading to change in attitudes and beliefs, which in turn will motivate behavior changes desired by the communicator. Unfortunately, research and practical experience across a range of issues demonstrate that mere exposure to facts is unlikely to cause much societal change in beliefs, attitudes, and behaviors ([Stern 1999](#); [Kollmuss and Agyman 2002](#); [Brown 2009](#)). To be effective, risk communication strategies need to consider the dynamic system of social, psychological, and situational factors that can mediate attitude, belief, and behavior change ([Hansen et al. 2003](#)).

Moreover, communication about wildlife health and disease is difficult from the perspective of maintaining public support for wildlife conservation ([Decker et al. 2010, 2011, 2012b](#); [Evensen et al. 2012](#)). For example, if people need to modify behaviors to reduce risk associated with wildlife disease, how do wildlife managers inform and motivate them in a way that results in protective behaviors but avoids public backlash against wildlife? It seems timely to be expanding wildlife health professionals' roles in educating and working with human health professionals on coordinated public communication, particularly when the message may be coming primarily from the public health arena.

The complicated nature of zoonotic and some nonzoonotic disease events in wildlife can make communicating with the public challenging ([Rickard et al. 2013](#)). These

situations require concise communication strategies and familiarity with effective social messaging, yet agency capacity for dealing with risk communication about wildlife diseases is limited ([Siemer et al. 2012](#)). Fortunately, communication researchers (e.g., [Roh et al. 2015](#), [Lu et al. 2016](#)) recently have shown that carefully crafted messages regarding wildlife disease can increase conservation intent and avoid negative reaction to wildlife disease risk communication. Message testing may be required to accomplish this positive outcome, but the potential to obviate backlash against conservation of wildlife and their habitats argues strongly in favor of the investment. Therefore, effective risk communication is a valuable tool for discharging public trust responsibility and should be in the wildlife resource manager's toolkit.

CONCLUSIONS

Wildlife health professionals can play important, often pivotal, roles in wildlife management, conservation, and public health messaging concerning zoonotic diseases in wildlife. The confluence of several trends may together set the course for wildlife health considerations in wildlife management for decades to come. Those trends are 1) broadening concept of wildlife health to be more than absence of disease, 2) activism among wildlife health professionals to become more mainstream in wildlife management, 3) incidence of novel pathogens causing unprecedented mortality and threatening persistence of numerous wildlife species, 4) emergence of zoonotic disease originating in wildlife populations, 5) rising public expectations that wildlife management will include attention to wildlife-associated disease, 6) growing concern about decline in wildlife-focused/nature-based outdoor activity, and 7) revival of public trust thinking in state and federal wildlife management agencies.

Some things must change to take advantage of what wildlife health professionals can bring to public wildlife trust administration. For example, historically most wildlife health

activities were reactive rather than proactive. However, it is generally easier to prevent new diseases than control or eradicate existing ones. To protect wildlife assets effectively, we need to focus effort on avoiding potential health risks of all kinds rather than on mitigating them reactively (often at great expense and with poor results). Traditional human and domestic animal disease solutions, such as vaccination and biosecurity, are costly and often not practical for wildlife (Wobeser 2002). Attempts to control or eradicate disease through culling require careful analysis to ensure that the response is not more harmful to the wildlife resource than is the disease and thus contrary to public trust obligations. Conversely, redirecting energies to wildlife and ecosystem health and disease prevention is consistent with effective wildlife trust administration. Ironically, however, the exertions of wildlife health professionals to participate more fully in mainstream wildlife management have not emerged from a prevention perspective. They are fueled by wildlife conservationists' and public wildlife managers' concern about the increasing rate of zoonotic disease and their growing recognition that public perceptions of wildlife health and disease are adversely affecting people's behavior and creating expectations for management attention that may not be beneficial to wildlife or humans.

The paradigm shift from fixing wildlife disease to producing wildlife health is in an early stage. This change is occurring simultaneously with attentiveness of wildlife agencies to public trust principles (Decker et al. 2016), where preserving the integrity of the core assets of the wildlife trust and production of multiple benefits from it are imperatives. This confluence presents an opportunity for wildlife health professionals to provide expertise and guidance that will firmly embed wildlife health as a key component of sound wildlife trust administration and an imperative in wildlife management.

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