
WCS Americas Program

Using multiple agency perspectives to improve communication strategies for bat recovery from WNS



FINAL REPORT TO THE WILDLIFE MANAGEMENT INSTITUTE

May 2017

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Suggested Citation

Kretser, H.E. 2017. Using multiple agency perspectives to improve communication strategies for bat recovery from WNS. Final Report to the Wildlife Management Institute. Wildlife Conservation Society: Americas Program.

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<http://www.cbc.ca/news/technology/bats-nearly-wiped-out-by-white-nose-syndrome-in-eastern-canada-1.2814088>

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Acknowledgements

This project was made possible through the support provided by the US Fish and Wildlife Service and administered through the Wildlife Management Institute Small Grants Program. The content and opinions expressed herein are those of the author and do not necessarily reflect the position or the policy of the US Fish and Wildlife Service or the Wildlife Management Institute and no official endorsement should be inferred.

We would like to gratefully acknowledge the time and contributions of all interviewees who participated in this research, the collaborations of T. Bruce Lauber of the Human Dimensions Research Unit, Cornell University and Katherine McComas of the Communications Department, Cornell University for extensive consultations on the design and execution of the project as well as review of the draft report, and to the members of the WNS National Communications Working Group under the direction of Catherine Hibbard for continued support on this work to improve the effectiveness of our collective communications efforts about white-nose syndrome on behalf of bats.

Executive Summary

White-nose syndrome (WNS) is a devastating disease caused by the fungus *Pseudogymnoascus destructans* (Pd), which is responsible for killing more than 6 million bats in 32 states and 5 provinces. Fortunately some bats can survive the disease and are showing evidence of reproduction. To encourage recovery of bat populations and to limit spread of this deadly disease, we need effective communication efforts that successfully encourage landowners and the general public to take actions that benefit bats. However, bats pose a disease risk as carriers of rabies and have some social stigmas in popular culture. These existing associations and messaging related to those issues may obfuscate efforts to communicate the benefits of bats and the need for appropriate conservation actions to landowners and the general public. Public health agencies issue press releases on rabies and the steps necessary to protect human health and safety around bats while wildlife agencies and conservation organizations issue communications promoting the benefits of bats and how to protect them. This report shares the findings of a project that is part of a larger effort of the Wildlife Conservation Society (WCS) to facilitate conservation and recovery of bats affected by WNS by determining how the public reacts to inconsistent messages about bats from wildlife and public health agencies and recommending communication strategies to meet diverse agency mandates. The goal of this project is to understand multiple organizational perspectives on communication strategies about bats and identify messages that can both promote bat conservation and protect public health. To achieve this, we conducted work to:

- 1) Determine objectives of current bat-related communication by wildlife and public health agencies and other organizations, including behaviors being encouraged or discouraged in target audiences;
- 2) Identify messages that attempt to influence landowner behavior around bats and assess compatibility of desired behaviors across multiple messages;
- 3) Engage a team of public health, wildlife health, wildlife agency, and private practice individuals who can serve in an informal advisory capacity to guide the development of a landowner survey, message testing and ultimate crafting of conservation messages.

We conducted interviews with 39 individuals from federal, state, provincial, tribal and private agencies and organizations whose work and communications relate to bats. The respondents represented a large geographic region of 2 countries, 8 states, 3 provinces, and 2 tribal territories with some areas experiencing high impacts from WNS and some areas where the fungus has not yet been identified. We also implemented a follow-up web-based survey with those individuals to collect additional information and clarify themes expressed in the interviews.

We identified objectives of each organization and collated those as either conservation objectives, human health objectives or objectives that span both areas. In all cases, organizations with objectives that include both conservation and human health elements were higher-level federal, state, or provincial organizations.

We summarized the important communications messages related to bats provided by interviewees and then had them rank the messages in the online survey. The highest ranked conservation messages included: 1) Bats provide economic benefits to humans, 2) Bats face many threats, and 3) Bats provide important ecosystem services. The highest ranked public health messages included: 1) Call a health care provider if you have direct contact with a bat, 2) Respect bats, do not handle them, and 3) Direct contact with a bat is a rabies risk.

Participants provided over 100 actions that the public can do to either protect bats or protect human health. The top five types of actions included: 1) Land management actions to benefit bats, 2)

Contacting authorities if a direct contact with a bat occurs, 3) Actions that promote learning about bats, 3) Safe and correct ways to install bat boxes, and 4) Safe and correct ways to remove bats from buildings.

We explored the interactions individuals have with different organizations for obtaining information about bats to inform communications messages and for collaborating generally with other organizations. We found that the federal, state, and provincial wildlife agencies tend to be the most frequent resources of information to include in communication messages, with conservation NGOs being an important source. Respondents also seek information from federal, state, and provincial health organizations, but to a lesser degree than the wildlife and conservation organizations. Interactions most frequently occur across the federal, state, and provincial wildlife organizations, followed by internal communications that link federal and state to county, district or tribal entities within the silos of wildlife organizations or public health organizations. Very limited interactions occur between private wildlife control operators and county or district public health staff, the two groups that most frequently field initial phone calls from the public about bats.

Opportunities exist to facilitate interactions and the flow of information between wildlife and health organizations, in fact, several areas where WNS is having a higher impact these collaborations are already occurring successfully. Relationship building and generally devoting time to reaching out to individuals within other agencies seems to be an important component of these nascent successes. Staff from state, district or county public health seem very open to the idea of working together although unsure how to make it happen.

Finally, we sought to understand any real or perceived impediments to collaborations among wildlife and public health organizations by having interviewees provide barriers and then rank the barriers in the online survey. The top barriers included: 1) Once messages need review from multiple agencies the process slows down, 2) Limited staff time for broader collaboration, 3) Lack of funding to work across agencies, and 4) Lack of leadership for working across agencies.

Given the findings in this study, we recommend the following steps be taken to begin the process of aligning messages from wildlife and health organizations that communicate about bats:

- **Issue joint wildlife and public health agency press releases.**
- **Invite health professionals to participate in WNS working groups.**
- **Structure opportunities for collaborations and timely review of communication materials among wildlife and health agencies.**
- **Strengthen internal communication systems to ensure information being generated and shared among federal, state and provincial wildlife and health organizations reaches the individuals in those organizations or closely related organizations who are most frequently in contact with the public: private wildlife control operators, county and district public health agencies, and tribal agencies.**
- **Facilitate communication or the sharing of information and messages among individuals who most frequently interact with the public but who work in different organizations: health and wildlife professionals working in private wildlife control, district and county public health agencies or tribal agencies.**
- **Determine what sources the public uses for information, how individuals interpret messages and whether the messages actually lead to action.**

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Introduction

White-nose syndrome has been confirmed in 29 states, with the fungus detected in an additional 3 states, and 5 provinces, and has killed more than 6 million bats since it was first discovered in New York (NY) in 2006. State and federal agencies, wildlife veterinarians, and others in the conservation community have been seeking (and have focused research dollars on) an understanding of the epizootic traits of *Pseudogymnoascus destructans* (*Pd*): its spread, how to contain that spread, and how to promote recovery of affected bat populations (whitenosesyndrome.org 2015). Fortunately, we are learning that some bats are surviving and reproducing despite infection (Coleman and Reichard, 2014, Dobony 2014, Dobony et al. 2011). We now know that bat survivorship in the two weeks post hibernation (when they migrate to roosts and begin roosting) may be a critical time (Fuller et al. 2014). Much of this time period for bats may be spent on private lands – foraging for food and exploring trees and buildings for suitable roosts (Fujita and Kunz 1984, Caceres and Barclay 2000, Best and Jennings 1997, Thompson 1982). In 2005, a landowner survey in northern NY indicated that 1,245 out of 1,440 landowners had experienced interactions with bats on their private property (Kretser et al. 2009). Thus landowners could play a significant role in recovery by using bat-friendly land-use practices and securing roost sites.

In conservation recovery efforts, communication plays a vital role in influencing human behavior that might exacerbate or ameliorate impacts. Any effective communication conducted as part of a disease management effort must be based, in part, on an understanding of associated human dimensions (Decker et al. 2006). However, there are challenges of promoting public support for wildlife conservation in contexts in which people have concerns about the disease risks associated with wildlife (Decker et al. 2010 and 2012). Bats carry rabies, and their accumulated excrement in buildings used by humans can create conditions favorable for other pathogens that are harmful to humans. Bats also have a social stigma as vampires and have received negative media attention related the 2014 Ebola outbreak linked to fruit bats. The public may receive conservation messages from wildlife officials that are inconsistent with or contradict messages in the media or from public health agencies. In fact through a study of agency press releases and newspapers in eight states between 2006-2013, Kretser et al. (In review) confirmed that public health agencies and wildlife agencies provided disparate messages in press releases that were also prevalent in newspaper coverage in the same regions. Public health agencies focused on the risks bat rabies posed to humans and how humans should protect themselves from bats, while state wildlife agencies emphasized the need to take action to protect bats.

Given the potential signs of some bat species ability to survive WNS, wildlife managers and other conservation practitioners must take advantage of any opportunities to increase survivorship. Homeowners frequently interact with bats; thus communicating with homeowners to encourage particular behaviors will ultimately aid in long-term conservation and recovery. However, the cautionary content of public health messages about human-bat interactions may conflict with conservation-related messages; these conflicting messages could undermine long-term recovery efforts. Future bat management requires a communication strategy that is designed from an understanding of agency communication objectives, homeowners' perceptions about bats, their knowledge of WNS and its effects, and the potential conflicting messages from public health agencies concerned with rabies.

The Wildlife Conservation Society (WCS) seeks to facilitate conservation and recovery of bats affected by WNS by determining how the public reacts to inconsistent messages about bats from wildlife and public health agencies and recommending communication strategies to meet diverse agency mandates. With

support from the Wildlife Management Institute we completed the first step of developing strategies to solve this critical conservation communication challenge. We conducted structured interviews and a follow-up web survey with federal, state, provincial, tribal and private entities that provide communications about bats to understand underlying objectives of these messages and seek mutual areas of interest that can formulate the basis for recovery work that engages landowners.

The goal of our work is to understand multiple organizational perspectives on communication strategies about bats and identify messages that resonate across potential differences. The specific objectives are:

- 1) Determine objectives of current bat-related communication by wildlife and public health agencies and other organizations, including behaviors being encouraged or discouraged in target audiences;
- 2) Identify messages that attempt to influence landowner behavior around bats and assess compatibility of desired behaviors across multiple messages;
- 3) Engage a team of public health, wildlife health, wildlife agency, and private practice individuals who can serve in an informal advisory capacity to guide the development of a landowner survey, message testing and ultimate crafting of conservation messages.

Methods

We used interviews and a follow-up web-based survey to collect information from a diversity of individuals representing federal, state, provincial, tribal and private agencies and organizations whose work and communications relate to bats. The research methods, interview guide, and survey instrument were approved by the WCS internal review board on human subjects. Building off a content analysis of agency press releases and newspaper coverage of bats (Kretser et al, *In review*), we targeted individuals working across diverse landscapes that have been affected to different degrees by WNS. Initially, we focused on 6 states representing three situations: areas in which WNS has been present for some time and recovery may be evident (e.g., New York and Vermont), areas in which it has arrived more recently and the devastating effects are still underway or just beginning (e.g., Kentucky and Tennessee), and areas where it has not arrived but is likely to spread (e.g., New Mexico and Colorado). When individuals from those states were unavailable we invited individuals from neighboring states to participate. We targeted the following distribution of interviewees:

- One state wildlife agency official in six states representing different levels of WNS impact from severely impacted to not present. We targeted the bat coordinator in each state or identified the person responsible for bat and WNS communication
- One state health agency official in six states representing different levels of WNS impact from severely impacted to not present. We identified individuals responsible for communication about rabies.
- Officials with national organizations doing WNS-related outreach. We targeted individuals participating in the national working group for communication about WNS.
- Officials with national organizations doing public health outreach. We attempted to identify individuals in the Center for Disease Control and the U.S. Department of Health and Human Services that work on rabies.
- Staff of other organizations demonstrating evidence of communication about bats, WNS, rabies, and/or bat removal in online materials; these organizations included tribal wildlife agencies where appropriate, conservation groups, states where wildlife and health agencies are already working together on messaging, or individuals working as private wildlife control operators.

As part of the interview process we determined a need to expand our original pool of interviewees. First we expanded the geography to include perspectives from Canada. Following a similar pattern to the U.S. based interviews, we focused on provinces that have experienced severe impacts from WNS (Quebec and Nova Scotia) as well as a province with no evidence of WNS (British Columbia). We also expanded representation from the health-related field to include county or district public health offices that are often the first responders to incidents of human contact with bats. For county and district public health offices, we targeted counties in each of the six states from the original study. Within those states where WNS is present, we prioritized individuals from counties that had confirmed incidences of WNS with populations between 60,000 and 80,000 people. Within those states where WNS is not present, we prioritized counties that had confirmed bat breeding locations and human populations between 60,000 and 80,000.

To determine what messages wildlife and public health agencies and other organizations seek to communicate, we interviewed individuals responsible for bat-related outreach, including both WNS-related outreach and public health outreach. We conducted interviews with individuals who represent a cross-section of organizations or interests engaged in communication about bats. We developed an interview guide of 15 questions as a starting point for the discussions and asked follow-up prompts as needed (Appendix A).

The interviews were conducted over the phone between January 2016 and March 2016. We audio-recorded the interviews on a small hand-held device. The files were transcribed and coded (i.e., break the data into segments and assign segments to descriptive categories) for recurring themes. The interview data analysis assessed organizations' communication objectives, identified target behaviors being promoted, determined the compatibility of targeted behaviors across organizations, and provided insight on how homeowner behaviors might integrate into a recovery plan. We documented primary communication strategies used by the different organizations and assessed barriers and opportunities for working across organizations to develop more comprehensive messages about bats.

We conducted a short follow-up web-based survey of the individuals interviewed to collect standardized information (Appendix B). We designed the survey in Survey Gizmo and asked participants at the end of the phone interviews whether they would be willing to participate in an online survey. We solicited respondents to participate in the survey by email using the standard four-wave contact to ensure higher response rates (Dillman 2014).

In the online survey, we asked respondents to indicate the importance of communication messages related to public health and conservation identified in the interviews as well as to provide a separate ranking of public health and conservation messages (Appendix B). To assess patterns of interaction among organizations, the survey instrument included questions to determine how frequently individuals interact with other types of organizations to exchange information related to bats. We also had respondents rank the most important barriers for working across agencies.

Given that we engaged a diverse set of audiences for this portion of our overall project, we made a preliminary request of a subset of interested individuals to serve in an informal capacity advising on the anticipated landowner survey, message testing, and ultimate crafting of communication messages that meet multiple needs. We will finalize this group upon securing additional funds for future work.

Results

We conducted a total of 37 interviews where one interview included 3 people for a total of 39 individuals (Table 1 and Appendix C). Interviewees included 19 men and 20 women who worked at a variety of institutions across a large geographic area covering 2 countries, 8 states, 3 provinces, and 2 tribal territories. The geographic diversity captured perspectives from individuals working in places that have experienced severe impacts from WNS to places where WNS has not yet been detected. For the online survey, 27 of 39 (69%) individuals contacted responded.

Table 1. Numbers of individuals representing wildlife/conservation or health organizations.

Wildlife Organizations		Health Organizations	
U.S. federal wildlife agencies	3	U.S. federal health agencies	1
Canada federal wildlife agencies	3	Canada federal health agencies	0
State wildlife agencies	6	State health agencies	6
Provincial wildlife agencies	3	Provincial health agencies	1
Tribal wildlife agencies	2	Tribal health agencies	1
Conservation NGOs	4	Health NGOs	1
Private Wildlife Control Operators	3	County or District Health Agencies	5
Subtotal	25	Subtotal	14

Objectives

We asked interviewees to share the objectives of their communication efforts related to bats. We were interested in the extent to which wildlife agencies prioritized health related objectives and as well as the extent to which health agencies prioritized wildlife or conservation related objectives. Unsurprisingly, individuals representing health organizations tended to have objectives related to protecting human health and the prevention of rabies; and individuals representing wildlife organizations prioritized conservation related messages. However a handful of agencies indicated having objectives that spanned human health and conservation issues.

Health Objectives

Communication from individuals representing health agencies had clear and direct objectives that were relatively consistent across the organizations. These objectives included preventing exposure to rabies and limiting contact between bats and humans or domestic animals:

The main objective is to prevent people being exposed to rabies in bats.

~Health NGO

To prevent... cases of human rabies and cases in domestic pets.

~State Public Health Agency

To prevent rabies.

~District or County Public Health

What we want is for people and bats to never come in contact with each other. You know that would be the...perfect world.

~State Public Health Agency

In some cases the individuals representing health organizations clearly delineated the extent of their objectives, indicating when they would redirect someone to another agency or collaborate with another agency to ensure a different perspective is available, such as giving talks as a team of experts that includes public health and wildlife experts:

If somebody called for a request, like 'can you talk about the white nose syndrome?' ... that really wouldn't be something that we would do unless we went with Fish and Wildlife [staff] to talk about rabies.

~District or County Public Health

Conservation Objectives

The objectives from individuals representing wildlife and wildlife organizations tended to be more diverse than the objectives from health agencies, addressing a range of issues. Several organizations working at a national level indicated an objective to promote funding for the WNS community:

To inform people about White Nose Syndrome... [and]...to take actions in terms of either supporting White Nose Syndrome or funding White Nose Syndrome research.

~U.S. Federal Wildlife Agency

Those organizations often had an additional objective or sub-objective related to fostering communication across individuals and groups working on bats:

Ensure that people working on bat conservation are communicating with each other and are aware of what each other is doing....get a common understanding of threats...and...gather information and share information from people with expertise in bat conservation.

~ Canada Federal Wildlife Agency

Other objectives focused more on changing actions and behaviors. These ranged from limiting disturbance of bats from all types of human activities and development:

One of the major messages that we've tried to convey is refraining from disturbing bats while they're in hibernation...protecting bats while they're above ground... outside of the hibernation season...if someone is going to apply for a permit to do pretty much anything... whether it's an air quality or water quality or something like that, they get examined for potential impacts to [bats] as well.

~State Wildlife Agency

To reducing perceived fears towards bats in target audiences:

Reduce some of the public fear of bats...an increased appreciation of bats in the state...just transmitting basic information about bats and appreciation of their role in the ecology of our state is probably my main focus.

~State Wildlife Agency

To protecting bats on private land:

The primary objective is to promote the conservation of bats...on private land.

~Conservation NGO

Finally, the objectives often had either a focused educational message such as promoting the economic and environmental benefits of bats:

Having appropriate messages about bats to the general public...communicate about the importance of bats and the ecosystem and the biodiversity and the economic benefits that bats have to people...communicate research and monitoring and surveillance and conservation activities to our internal audiences ... communicate about white nose syndrome as an unprecedented North American wildlife disease event that has devastating consequences at an alarming rate of spread.

~ Canada Federal Wildlife Agency

Or simply, general objectives to educate the public about bats:

I think just getting the public to understand the importance of bats and what they can do to help protect them is my main objective.

~State Wildlife Agency

The benefits of bats and to promote again the benefits. I can't stress that enough and that they're not, they're not harming anything [when] they're at the house.

~Wildlife Control Operator

My primary objective is to protect the bats....educating people you know just about bats.

~Wildlife Control Operator

Objectives representing human health and conservation

Some individuals explicitly recognized objectives covering both conservation and human health messaging. These individuals came from both the wildlife agencies and the health agencies and nearly all of the individuals speaking about the objectives encompassing dual health/human safety and conservation messages represented higher level government agencies, as opposed to local or district offices. More specifically, these individuals tended to be wildlife veterinarians who work at the interface of human health, wildlife, and disease:

Trying to walk the fine line of making sure people are aware that they are a risk for rabies and other zoonotic diseases but that the incidence is very, very low and that [bats are an] important component of the ecology and we want bats there but if there is contact with a bat or suspected contact with a bat, it does need to be addressed by a public health professional...we're a public health agency...[we] focus on... the disease risk that bats present or the rabies risk that bats present while trying to put into perspective the transmission of rabies from bats to humans is rare but extremely significant when it happens.

~Federal Public Health Agency

We felt an obligation to educate the public that there is this possibility that they could come into contact with bats... we wanted to be careful from our end to...not scare people about bats...and the possibility of rabies that we just wanted to communicate to them the possibility of coming into contact because of this disease...and kind of a very close second message... was that bats are good for the ecosystem and the environment. We wanted to find that balance.

~State Wildlife Agency

Protection of public health and overall making sure people understand there are lots of positive values of bats as there are to various other aspects of biodiversity. But I guess our first priority is health and safety of the public. And that's mostly why my program gets drawn into it because our entry into this is around human-wildlife conflict.

~Provincial Wildlife Agency

Well we're a health department so our primary objective is to make certain people do not get rabies and since we are also bat conservationists we are interested in minimizing the impact on the bat populations... by primarily exclusion. Educating the public that you know if bats get into your house there's a reason for that as most likely there's a structural deficit in the house that needs to be addressed.

~State Public Health Agency

Messages

In the interviews we asked respondents to provide the top 3 messages everyone should know about bats. Nearly all interviewees provided 3 messages, some interviewees limited their responses to 2 messages. We extracted and combined similar messages from the transcripts and then included several questions in the follow up survey to rank the summarized messages (Tables 2 and 3).

Table 2. Summarized messages about bats extracted from interviews and sorted alphabetically.

Direct contact between bats and humans or pets is a rabies risk.

Bats and humans share many diseases, do not directly touch bats.

Bats are cool.

Bats are imperiled by white-nose syndrome and need special consideration.

Bats are smart flying mammals, not insects or rodents.

Bats are the #1 nighttime predator of insects.

Bats carry rabies.

Bats face many threats such as white-nose syndrome.

Bats live 20-30 years and reproduce slowly.

Bats provide economic benefits to humans for pest control, fertilizer, and pollination.

Bats provide important ecosystem services like eating insects and pollinating plants.

Bats, like all wildlife, can carry disease.

Call a health care provider if you have direct contact with a bat.

Disease risk from bats is small, but bats should not be handled.

Do not fear bats.

Landowners can help bats, especially if there is a maternity roost on their property.

People need to be careful around bats.

Report unusual behavior such as being able to touch a bat or finding a bat in the livable space of your home.

Respect bats, do not handle them.

Stay out of caves and mines when bats are present.

The average person can do many things to help bats.

Table 3. Top 3 conservation and health messages identified by interviewees in the follow-up survey.

Conservation Messages	Health Messages
1) Bats provide economic benefits to humans for pest control, fertilizer, and pollination.	1) Call a health care provider if you have direct contact with a bat.
2) Bats face many threats such as white-nose syndrome.	2) Respect bats, do not handle them.
3) Bats provide important ecosystem services liking eating insects and pollinating plants.	3) Direct contact between bats and humans or pets is a rabies risk.

Actions

Thirty-four respondents offered over 100 suggestions of specific actions that they ask of the public with regard to bats (Figure 1). We extracted and summarized the actions discussed by interviewees into 14 actions that broadly fit into two categories: 1) actions that protect human health (20 respondents), and actions that protect bats (31 respondents). While actions such as leave bats alone or learn more about bats could technically exist in both categories, we coded these specific to the broader category. For example, in all cases where individuals mentioned learn more about bats, the intent based on the broader context of the interview, was to encourage actions that would protect bats. Within the broad category of actions to protect bats, actions such as “install bat gardens” and “install bat houses” were discreet actions from the more general “conduct land management to benefit bats”.

Only 8 individuals recommended both actions that benefit bats and actions that protect human health in their interviews. Those individuals included 3 state and 2 provincial wildlife agencies all in WNS high impact zones, one state public health agency in a WNS high impact zone, one U.S. federal agency, and one private wildlife control operator in a WNS free area.

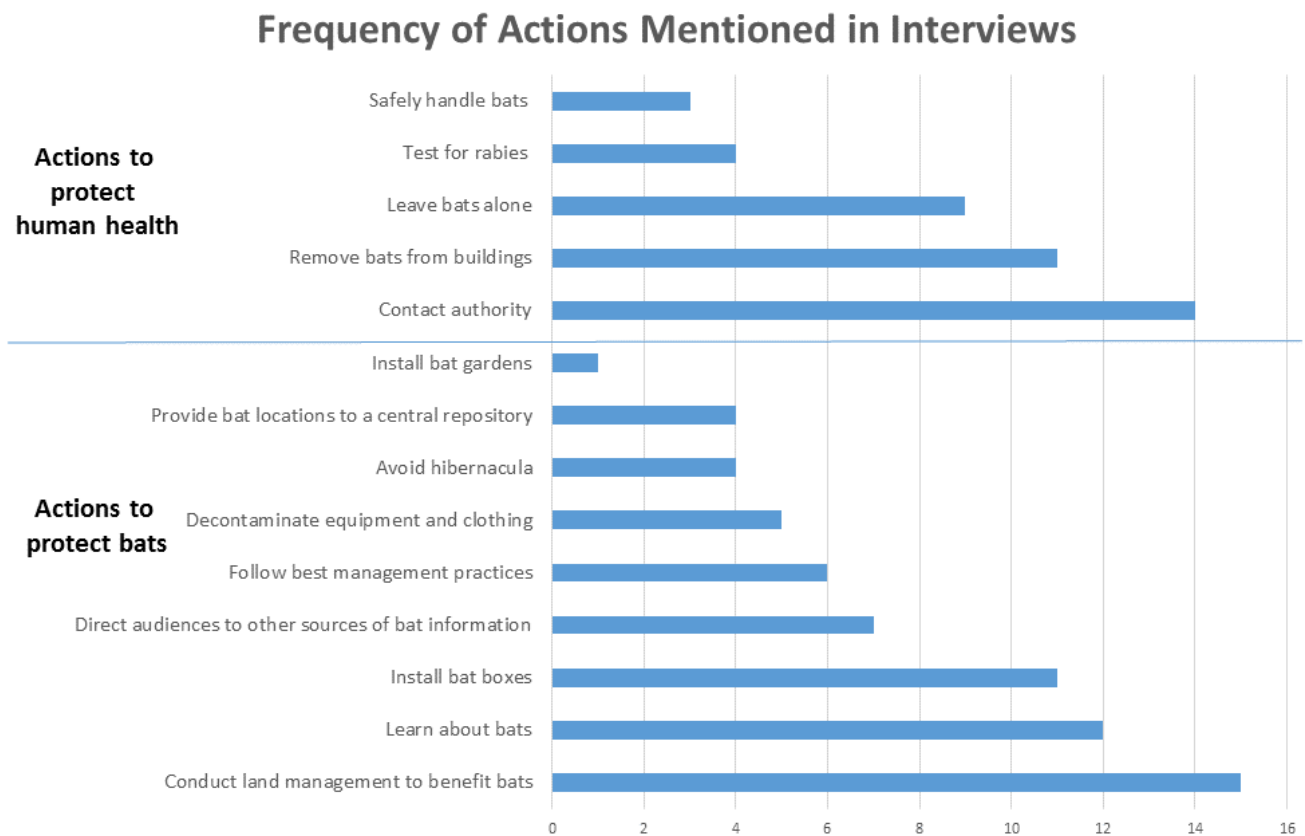


Figure 1. The frequency of summarized actions mentioned by interviews and delineated broadly as actions protect human health and actions to protect of bats.

Similar to the pattern found in the messages, health agencies tended to have a relatively small number of consistent actions that they request of the public, i.e. leave bats alone, do not touch them, and if a contact has occurred contact an authority. Some health agencies emphasized their role in ensuring vaccinations are completed for pets:

Do not touch or handle the bats.

~State Public Health Agency

Basically we just make sure, you know if it's a dog or cat whether if they've been vaccinated

~District or County Public Health

I pretty much don't give them a choice either, I'll say okay so you need to go take the [post rabies exposure] shots and I want you to call me as soon as you get in and get them started. And I'll just keep calling them back and harassing them until I know that they've started the series.

~District or County Public Health

Individuals representing wildlife organizations offered a variety of potential actions given the larger remit for managing wildlife, conservation activities, and responding to human-wildlife conflicts as well as providing permits for forestry, development or energy extraction activities. Some of the actions were compiled in guidelines for forest management, building or infrastructure development and renewable and non-renewable energy extraction:

We...have a number of official guidelines...forestry, mining and wind turbines and pest control.

~Canada Federal Wildlife Agency

Many groups had specific recommendations on how to safely remove bats from houses to minimize negative effects on bats:

We when it comes to bats in buildings we have some kind of standard advice...If [people] choose to take action we provide them with guidance on how best to go about doing that...and in particular avoiding trying to take those steps during the time when the young of the year, the pups, are unable to fly because that is more harmful to the bat and also causes more problems for the homeowners as well.

~State Wildlife Agency

Although less common, several groups encouraged individuals to participate in citizen science activities about bats:

We are asking people that have bats roosting on their property to volunteer... during an 8-week period during the summer, they go out and count the number of bats that are exiting that roost from 8-12 nights within that period.

~State Wildlife Agency

Finally, many of the requested actions involved improvements or management on private land to benefit bat habitat:

I would say bat houses are the most popular thing that [we ask] people do but we've seen more and more lately people putting in bat gardens [in response to our recommendations].

~Conservation NGO

We provide quite a bit of forest management advice to...private forest owners and commercial ...organizations...and all of that advice and guidance ... has been influenced by the wildlife folks ... to promote wildlife in general and bats in particular. So for example ... leaving standing dead trees as part of the forest management process ... changing the time of year when they do their tree harvesting to avoid the possible impacts to bats for example.

~State Wildlife Agency

Collaborations

In the interviews, respondents indicated consulting existing materials from multiple organizations to create new communication and outreach messages. Respondents also indicated they had interactions with individuals from other organizations when working on these materials. We explored the influence of communications materials and interactions across organizations more systemically in the follow-up web survey. Figure 2 represents a conceptual model of the relative influence and interactions among organizations communicating about bats.

In the follow-up web survey, we asked respondents to indicate which organization's materials they consulted to develop communication messages (Figure 2). The size of the circle represents the relative influence of each group's communication messages based on the number of respondents who indicated they used that group's materials in their own messages (Appendix B, Question 4). Respondents used information from federal, state, provincial, and tribal wildlife agencies for communication messages most frequently, with conservation NGOs being the second most frequently mentioned source. Respondents also indicated frequent use of information from federal and state health agencies. Although not depicted in the model, federal agencies and conservation NGOs noted in the write-in options using academics and/or peer reviewed journals as an important source of information for communication messages.

We also asked people to indicate the frequency with which they interacted with groups about bats and communication related to bats each year (Appendix B, Question 5). The double arrow lines connecting the circles in Figure 2 depict the relative frequency of connections and interactions among these groups based on summing all interactions between each pair of organizations. The federal, state, provincial and tribal wildlife agencies are strongly connected to the conservation NGO, private wildlife control operators and to a lesser extent the higher level health agencies. Aside from the strong relationship with state and federal wildlife agencies, the health agencies, including the county or district public health agencies seemed to have fewer interactions outside of the health field.

Less frequent interactions occur between federal, state, provincial, tribal wildlife agency and district and county public health agencies. Infrequent interactions occur between groups like the private wildlife control operators and the federal, state, provincial and tribal health agencies. Interactions generally tend to be more frequent in a hierarchical or vertical way, with the wildlife organizations tending to communicate with other wildlife organizations and health organizations communicating with other health organizations. Communication across wildlife and health agencies tends to occur disproportionately at the state and federal agency level, rather than frequently crossing the wildlife/health divide at levels where the individuals who might be more apt to speak with landowners directly coordinating on actual messages.

Notably according to the survey responses, private wildlife control operators and county or district health professionals do not interact with each other despite both groups indicating in the interviews that they often frequently interact with landowners or when the public has a concern about bats. Often the private wildlife control operators and county or district health professionals are the first groups called:

So certainly when summer begins... we are involved in...receiving phone calls from ... potential exposures...we tend to get quite busy. You know just a lot of just phone calls...asking for information on bats, bat exposure...
~District or County Public Health

I'm a wildlife operator so I deal...with the landowners directly. Typically what happens is they call up and they tell me they've got an issue, whatever it is, ...and ... depending on what way the conversation goes...it's either just get it out of here or what do we need to do to clean this up and some of them... just want it out. They don't want or need information, they just want it gone and others have a thousand questions.

~Private Wildlife Control Operator

Relative Influence of and Interactions among Organizations

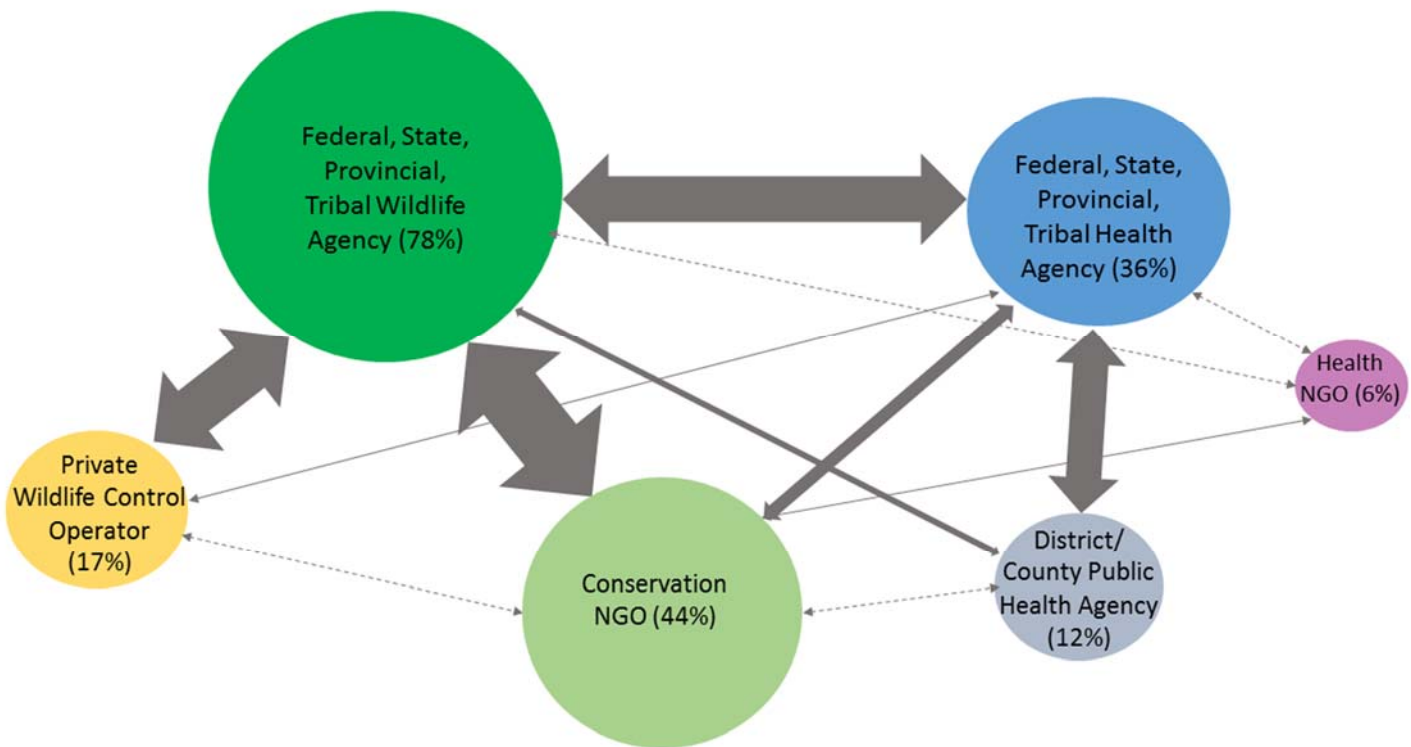


Figure 2. Influence and interactions among organizations on the development and sharing of communication messages related to bats. Circles represent the relative influence of each group's communication messages based on the percentage of respondents naming an organization as a source of information; larger circles indicate that more groups said they go to this organization for information. The thickness of the lines represent the relative frequency of connections and interactions among these groups, thicker lines indicate more frequent interactions per year whereas dotted lines indicate very infrequent interactions.

Opportunities

We asked interviewees to provide opportunities available for communicating messages that include risk and conservation elements as well as the opportunities for working across multiple agencies to align these messages. We analyzed the responses for actual opportunities happening already and perceptions about the potential opportunities. Many of the respondents initially responded to the question by providing examples of past efforts and opportunities related to incorporating dual messages in different types of communications materials. Some indicated a more passive approach in the past where opportunities for simultaneously communicating information about risks from bats and the benefits of bats may not have necessarily been evident:

I guess I would say in today's digital world...you can utilize Facebook and Twitter; you can utilize the social media aspects that people are on...to convey that message.

~State Wildlife Agency

Sometimes the opportunity doesn't present itself. In other words if we're asked to comment on a particular issue or something often we'll largely limit our comments to whatever we're asked. When we have the opportunity we include a broader, more integrate view of bat conservation and wildlife conservation in general whenever we're talking to you know to the public.

~State Wildlife Agency

Well I mean anytime...we can comment on bats whether it's in a publication or through communications piece we ... always try to include both perspectives when we would say something about rabies in bats. I mean there's no barriers to us working with ...another federal agency or state agency to provide messaging, it's just a matter of when the opportunities arise and what we're asked to do... but it could happen anytime for any reason. We're here to provide technical expertise in the public health aspect to...anybody who really wants to partner.

~ State Public Health Agency

After some discussion, interviewees provided ideas on how to collaborate across agencies in the future. They offered ideas about expanding existing collaborations to include development and communication of messages to the public. These opportunities included general media campaigns:

I guess working with organizations like [Conservation NGOs]...partnering and media campaigns or opportunities to partnership [sic] with public health with messaging.

~District or County Public Health

The possible collaborations also included specific processes and steps to take for communicating joint messages to the public in a strategic way:

A [Public Service Announcement] or whatever it could be...something like that, it's not prepared by me, it's prepared by somebody else. It's been vetted by our organization, and something like that we could all send out to the partners that we work with. Like somebody might send it to all the primary care physicians. Somebody might send it to all the school nurses, somebody might send it to... all the child care providers.

~District or County Public Health

We have, we set up a partnership in [two states] to have the bats that are submitted for rabies testing also tested for white nose... that has ... spearheaded some additional collaborations around bat messaging in those states.

~U.S. Federal Wildlife Agency

Respondents also suggested opportunities for collaborations on a particular topic, such as the decontamination protocols:

[The public health agency is] helping us to assess our decontamination protocol and make sure that the recommendations we make in there...are both well from our perspective...effective in killing PD and from their perspective are also safe to be used by the people... but we haven't involved them in any of these public messages but I would say that it's a very good idea and I would, now that I think of it I would like to explore opportunities that are there.

~Canada Federal Wildlife Agency

Possible collaborative opportunities also exist with building stronger outreach to targeted groups, such as tribes, that often have limited resources:

We have very limited staff ... we often collaborate with the ... management and inventory monitoring side of agencies at the state level but we don't often necessarily collaborate with the education and

outreach specialists that many states have so making those linkages I think for tribes in general...would be really beneficial.

~Tribal Wildlife Agency

Or groups that work frequently with landowners, like private wildlife control operators:

[A Conservation NGO representative] spoke at our conference, Structural Pest Management Association ...everyone who is licensed...has to go to these conferences...and we got credit for listening to her, everybody...they've really enjoyed her talk but she spoke to the whole association so we're singing the same tune and spreading the same message.

~Private Wildlife Control Operator

As part of the interview process, several respondents recognized the potential for joint press releases as a means of working together:

Probably some better coordination with...the health department to make sure that if they're doing a press release that...they can get some of the conservation measures in there and make sure that...we're not saying anything we shouldn't be saying, especially in regards to the disease risks.

~State Wildlife Agency

A common theme among respondents from organizations charged with thinking about communication at a larger geographic level suggested conducting research on what messages are effective to yield the desired outcome of the public engaging in the actions requested by the communication effort:

A lot of this...can be facilitated...by... a little bit more research around what is effective, having an interesting message around bats increase [sic] the utility of that public health message and so the more ... research that we have showing the benefits of this balanced message, the better uptake and usage of it by public health agencies I think we'll see.

~U.S. Federal Wildlife Agency

You know if we could have more evaluation of public health messages and more research to show what really does work... it would be a huge first step.

~U.S. Federal Wildlife Agency

We really need to expand more and combine with research on ... how people react to risk, how people communicate about risk and wildlife and...what is the best kind of conservation messaging.

~Conservation NGO

The interviewees from public health related agencies and organizations clearly indicated a willingness to engage but did not really know how best facilitate these opportunities:

Um yes I'm sure that there [are]. I don't know that I could specify what they were [sic] but...we are definitely open to communication from other agencies and joint messaging.

~State Public Health

I'm sure there is [sic] opportunities somewhere, but uh...

~District or County Public Health

Several individuals have been quite proactive in building relationships between wildlife and public health agencies. This is particularly prevalent among state agencies in places that have experienced a lot of impacts from WNS. A common theme in the existing efforts to work across agencies is the importance of building relationships with individuals from different organizations:

The guy that used to be the head of the Department of Health, all he knew about bats is that people get rabies from them...then after my wife and I started hanging out with him and talking to him after a while all of a sudden he started really like bats ...and it kind of changed the way that he thought

about a lot of the animals which made his message to the public change which was very cool.

~Private Wildlife Control Operator

I think the sky can be the limit somewhat; it's just a matter of reaching out to different agencies...that's kind of what we did with our State Department of Health. We reached out to them and asked if they were willing to sit down and discuss this topic and they willingly accepted...and we created a nice partnership...through reaching out to them and I think if you see an opportunity to work with another agency that would be beneficial, it's kind of just a matter of reaching out and asking if they're willing to work together.

~State Wildlife Agency

I think just having open communication. [The State Wildlife Agency] knows that we get a lot of these bat calls and they have talked with us about what messaging we use and whether calls should go directly to them or to us and same with [The State Public Health Agency]..Just having that kind of synchronized approach so that no one is giving conflicting information.

~Federal Wildlife Agency

Barriers

We asked about barriers to collaboration and then in the follow-up web survey had respondents rank all of the barriers. In the interviews, respondents, particularly individuals from the public health agencies, were more likely to suggest that no barriers existed and were generally more optimistic about the possibilities:

[No barriers] in our state I don't think. We work really well with... wildlife...they haven't approached us about doing [joint messages] I think that if they did then we, we wouldn't have any trouble working with them.

~State Public Health Agency

I don't think there should be [any barriers] and I really think you know there should be ways of getting around these problems if they do exist.

~Public Health NGO

I don't think there should be any barriers...historically we haven't done a lot of things together with organizations such as [Conservation NGOs] or the forest service, or department of wildlife, or things like that. So it would be mainly just building new relationships, I guess.

~State Public Health Agency

Even with this optimism, many barriers were suggested within the interviews and in some cases the lack of perceived barriers came from individuals who have not tried cross agency collaborations. The suggestions for barriers came from individuals who have been involved in various projects with multiple agencies. Some pointed to minimizing the length of public messages as hindering the possibility of adding more content to the messages:

Our public health training in dogma is keep it short and simple and to the point and that is a huge barrier because it prevents adding any secondary message that might actually improve the opportunity of our message.

~Federal Wildlife Agency

Others worried that agencies need to adhere closely to their own missions when messaging the public:

Each agency has its own... mission and so sometimes they are at odds a bit with you know with each other. Not so much directly at odds but you know just that there's a tendency to focus on you know your own agency's mission and sometimes it's easy to lose site of the larger picture.

~Federal Wildlife Agency

Many people indicated the challenge of slowing down the review process once multiple agencies need to approve messages:

You know it's somewhat a timing piece that you know to pull together some of this information to include other agencies you include just that much more time of review.

~State Wildlife Agency

The whole process of developing a bat poster it took us maybe three or four months, it really took us a long time because each agency once you get an iteration... you have to get that approved. If every time you change a sentence around and that goes to each agency's approval it's very slow, and can be very time consuming...so...work towards a final draft version prior to getting approval helps tremendously.

~State Public Health Agency

Others pointed to a general lack of funding and resources for finding the time to work cooperatively with other agencies:

The main... roadblock for interagency cooperation and is the funding streams, lack of funding streams.

~State Public Health Agency

Finally, some offered hope that although it is difficult to necessarily see the immediate connection and opportunity to collaborate on message development, it can happen:

The barrier is that ...at the beginning we did all have different messages and there was no interest or mandate [for] communicating the others' messages and then we realized that...I was saying to the health authority, I will help you communicate the message of don't touch bats so you're not having to give all these people shots. And I'd like you to communicate the message that if you're not handling bats there is [sic] no health risks or there are...very low health risks of them... just come from each other's perspectives and be consistent in messaging.

~Conservation NGO

Once presented with a list of potential barriers in the web-survey, only 8.7% agreed that no barriers exist to working across agencies to develop messages. The barrier *extra review time slows down the proces*" followed by several barriers that are fairly standard when we look at the literature of collaboration more broadly – *limited staff time, lack of funding, and the lack of leadership* (Wondelleck and Yaffee 2000). Responses on the survey also highlighted the general challenges related to adhering to missions, doing only the specific tasks assigned or asked of you, and not being perceived as trying to take over another individual or agency's responsibility.

Table 4. Barriers ranked highest to lowest by combined responses for agree and strongly agree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Once messages need review from multiple agencies the process slows down.	0	4.3	13.	56.5	26.1
Limited staff time for broader collaboration.	0	13	8.7	34.8	43.5
Lack of funding to work across agencies.	4.3	17.4	17.4	34.8	26.1
Lack of leadership for working across agencies.	0	17.4	26.1	39.1	17.4
Everyone has turf; some people do not want to work outside their turf and some do not want others working on their turf.	0	4.3	43.5	47.8	4.3
What one group can say or do another group cannot, making it difficult to work together.	0	39.1	13.0	39.1	8.7
Focusing on agency missions results in losing sight of the bigger picture.	0	17.4	39.1	43.5	0
People tend to stay in their lane, talking only about topics on which they are experts.	4.3	13.0	39.1	43.5	0
Working across agencies is not inherent in government structure.	4.3	17.4	39.1	21.7	17.4
Ego gets in the way, some individual/agencies think they know everything.	0	34.8	26.1	34.8	4.3
Difficulty assigning who has responsibility for various roles.	4.3	17.4	39.1	39.1	0
Unable to determine who is responsible for funding message delivery.	4.3	30.4	34.8	26.1	4.3

Discussion

Compilation of objectives, important messages and specific actions from wildlife and health agencies indicate potential opportunities for the development of communication efforts that meet multiple agency mandates. Central to these opportunities is building relationships and facilitating collaboration among the agencies providing messages about bats. Some individuals, usually in places where white-nose syndrome has severely impacted bats and often the wildlife veterinarians or epidemiologists working either in a wildlife or public health agency, have pro-actively begun to facilitate opportunities for interaction and increase communication across wildlife and health agencies. While barriers exist to making these interactions work seamlessly, most involved in such arrangements have clearly been able to better integrate communication materials and provide more consistent messages to the public. As WNS continues to spread across North America, we have the opportunity to shape future messages that can serve the dual purpose of protecting human health and promoting actions that help conserve bats. Collectively, the information compiled in this part of the project will provide the basis for development and design of a survey instrument and message testing that can be used with individuals that might inadvertently spread *Pd* or landowners who can enhance bat habitat on their properties.

Recommendations

The results of this project lead to several important recommendations for those working on bat-related communications in wildlife and public health agencies given the risk concerns about bats as carriers of rabies and the conservation crisis facing bats in North America due to white-nose syndrome.

Issue joint wildlife and public health agency press releases

Wildlife agencies are doing press releases and while they might mention human health issues or provide a brief reminder of the potential disease risk, they note that health oriented press releases come from the health agencies. One opportunity is to collaborate on joint press releases that emphasize both conservation and health issues. Such an approach could minimize confusion with the public consuming multiple message and would require closer collaboration across agencies.

“In every communication that we have,...like...a press release, it’s to inform the public about white nose syndrome, the surveillance ... we always have a little information about ‘don’t touch a bat, there’s rabies’...there’s always a short reminder...We always put the information about public health but we don’t do any specific communication about it like a [full] press release...it’s more in the health department... but we’re more making sure that if we’re doing some conservation there’s something about health at the same time.

~Provincial wildlife agency

Invite health professionals to participate in WNS working groups

A first clear step in building more consistent messaging across diverse agencies is to build the relationships by reaching out to individuals and inviting them to participate in discussions about bats and bat communication. This is specifically relevant to the WNS working groups that are actively bringing together diverse organizations to set the agenda for research and outreach related to addressing white-nose syndrome.

“We talked about ways to get that message out. It was decided that that [inviting public health agency officials to the discussions] would be a good avenue to use... in part because we felt like...in general when people call to report a bat and for the general public their concern is usually rabies ...

usually their first source of contact is the county health department.”

~State Wildlife Agency

Structure opportunities for collaborations and timely review of communication materials among wildlife and health agencies

Strong agreement around the notion that additional review time once multiple agencies are involved slows down the process for getting messages out to the public indicates a barrier that needs to be addressed. Several steps could be taken to minimize this real or perceived burden. Agencies and organizations can structure clear expectations for collaboration on communication materials and in that structure include guidelines for completing reviews within a certain timeframe.

“I think the sky can be the limit somewhat [for opportunities to work across agencies to develop messages]; it’s just a matter of reaching out to different agencies... that’s kind of what we did with our State Department of Health. We reached out to them and asked if they were willing to sit down and discuss this topic and they willingly accepted ... and we created a nice partnership... through reaching out to them and I think if you see an opportunity to work with another agency that would be beneficial, it’s kind of just a matter of reaching out and asking if they’re willing to work together.”

~State wildlife agency

Strengthen internal communication systems to ensure information being generated and shared among federal, state and provincial wildlife and health organizations reaches the individuals in those organizations or closely related organizations who are most frequently in contact with the public: private wildlife control operators, county and district public health agencies, and tribal agencies.

Relatively frequent occur among individuals working in the central offices of federal, state, and provincial wildlife and public health agencies. The apparent challenge is ensuring information exchanged and decisions about messaging or approaches are clearly communicated within those agencies to the more distal locations in County or District offices.

From a U.S. state where officials knew WNS would imminently arrive, the state wildlife agency identified the general public as their audience. Rather than going directly to the public they collaborated with the State Department of Health. The State Department of Health veterinarian

“then disseminated the information to the county health departments... we provided [the County Public Health staff contact] with a short PowerPoint presentation... [and they] added slides to [the] overall presentation about... different kind [sic] of diseases that were on the horizon and informed their personnel that way.”

~State Public Health Agency

Facilitate communication or the sharing of information and messages among individuals who most frequently interact with the public but who work in different organizations: health and wildlife professionals working in private wildlife control, district and county public health agencies or tribal agencies.

Although different requirements exist in states and provinces for training of private wildlife control operators or district/county public health staff, some national training programs exist (e.g. Public Health Learning Network nnphi.org/phln, National Wildlife Control Training Program wildlifecontroltraining.com). These programs could be asked to emphasize the importance of public health or wildlife control operators working in the same area having contact information for each other and maintaining regular communication given the interconnectedness of wildlife and human diseases and the increasing likelihood that humans come in contact with wildlife.

Determine what sources the public uses for information, how individuals interpret messages and whether the messages actually lead to action.

Myriad educational, conservation and public health messages about bats exist for the public to consume from a variety of sources. Additionally, bats may have diverse cultural meanings depending upon what audiences have consumed from popular culture. Part of the challenge of developing effective communication strategies will be understanding how the public reacts to messages and whether the public acts upon messages intended to generate specific actions. To obtain this information we need accurate data about what target audiences know about bats, what attitudes they hold towards bats, and how they react to a variety of messages about bats.

“A great follow-up study to this...is to study the receiving end of our messages ... to identify if our messaging is effective, how it is interpreted ...If both the messengers and the receivers are studied, I think we can truly improve the effectiveness of our outreach about bats.”

~Canadian conservation NGO

Conclusion

Conservation challenges are inherently social challenges. Effective communication can be used to engage individuals, modify behaviors, and lead to conservation outcomes. Success of communication efforts may depend on how people perceive the communications and a myriad of factors such as past experiences, societal influences, knowledge and attitudes may affect those perceptions. The path to successful communication requires an understanding of what is being communicated, by whom and with what desired outcome. With a risk-laden species such as bats, that are known to carry diseases that are fatal to humans, the public may view communications about actions targeting conservation of bats as inconsistent with what they have previously heard, confusing, or even suspicious.

This project aimed to clarify the various objectives that diverse agencies and organizations hope to achieve through communication about bats and establish some areas of opportunity for wildlife and public health agencies to work collaboratively on developing messages that meet both conservation and human health outcomes. While several specific steps can be taken to strengthen collaborations across diverse agencies and facilitate improved communication within agencies and between entities that work directly with individuals that come in contact with bats, work remains to be done. Effective communications requires understanding the audience and that entails social research that examines what sources the target audience uses for information, how the audience interprets the messages, and whether specific messages elicit intentions to engage in actions that will ultimately benefit bats.

Long-term conservation of bats in North America requires containing the spread of WNS and ensuring that remaining bats have safe and secure habitats. To that end, individuals who could inadvertently transfer *Pd* spores (e.g. cavers or other recreationists frequenting places with bats) and landowners that can manage their homes and land for bats need to be engaged and ready to act on behalf of bats. The overall objectives, clarity on important messages, and calls for specific actions determined through this project will provide important context for the development of a social survey that can target several audiences who will be indispensable in long-term bat conservation and recovery in North America. Results from such an endeavor will improve collective communication efforts from wildlife and health officials and ultimately promote human safety and long-term recovery and conservation of bats.

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APPENDIX A

Interview Guide

Preamble: Thank you again for agreeing to participate in the interview this morning. As a reminder we are interested in how your agency determines what message to communicate about bats and what opportunities might exist to craft messages for multiple purposes. I (am/am not) recording the interview per our first conversation.

1. What is your role or involvement in communicating about bats?
2. With whom do you work to develop communication messages about bats?
3. Who is your target audience?
4. What are your primary modes of communication?
5. What are the primary objectives in your communication efforts?
6. How does your organization determine what to communicate on materials available to the public?
7. How does your messaging involve communicating risks from bats?
8. How does your messaging involve communicating benefits from bats?
9. How does your messaging involve communicating conservation topics related to bats?
10. What actions does your messaging about bats ask of the general public?
11. Given the arrival of white-nose syndrome, how has your messaging about bats changed?
12. What are the three most important points that every person should know about bats?
13. What opportunities exist to simultaneously communicate risk and conservation messages about bats?
14. What opportunities exist to work across agencies to develop messages for multiple purposes?
15. What barriers exist to work across agencies to develop messages for multiple purposes?

Follow-up:

Would you be willing to participate in an On-line survey?

What is the best email address for the online survey?

APPENDIX B
Online Survey

Communication about bats

1) Choose the option that best describes your employment.

- Federal or state/provincial wildlife agency
- Federal or state/provincial public health agency
- County public health agency
- Conservation/wildlife non-governmental organization (NGO)
- Public health non-governmental organization (NGO)
- Private wildlife control operator
- Other - Write In: _____

2) In which country is your primary target audience for bat or bat-related issues?

- United States
- Canada

3) With which gender do you identify?

- Male
 - Female
 - Other
-

4) In the past year, please indicate which groups' communication materials (e.g., websites, brochures, posters, etc.) you have used to develop messages about bats. Please check all that apply.

- Federal or state/provincial wildlife agency
- Federal of state/provincial public health agency
- County public health agency
- Conservation/wildlife NGO
- Public health NGO
- Private wildlife control operator

Other - write in: _____

I did not use materials from any other group

5) In the past year, please indicate how frequently you have directly interacted with individuals from the following groups to develop or share messages about bats.

	Never	Once	2-3 times	4-6 times	7-11 times	12 or more times
Federal or state/provincial wildlife agency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Federal of state/provincial public health agency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
County public health agency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conservation/wildlife NGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public health NGO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Private wildlife control operator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6) In the interview, we asked you to indicate three items every person should know about bats. A condensed list of these items from all participants is below. Please indicate the importance of each message by checking one box for each statement.

	Not important	Slightly important	Somewhat important	Very important
Direct contact between bats and humans or pets is a rabies risk.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats carry rabies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People need to be careful around bats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The average person can do many things to help bats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Disease risk from bats is small, but bats should not be handled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats live 20-30 years and reproduce slowly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats are cool.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Call a health care provider if you have direct contact with a bat.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats face many threats such as white-nose syndrome.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landowners can help bats, especially if there is a maternity roost on their property.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats are smart flying mammals, not insects or rodents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats provide economic benefits to humans for pest control, fertilizer, and pollination.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats, like all wildlife, can carry disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do not fear bats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats are the #1 nighttime predator of insects.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats and humans share many diseases, do not directly touch bats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats provide important ecosystem services like eating insects and pollinating plants.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bats are imperiled by white-nose syndrome and need special consideration.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stay out of caves and mines when bats are present.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Report unusual behavior such as being able to touch a bat or finding a bat in the livable space of your home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Respect bats, do not handle them.	()	()	()	()
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Comments:

7) Below please find the list of condensed messages from question 6 that relate only to conservation and benefits of bats. Please indicate the three most important points every person should know in this category (1=most important).*

- _____ Bats provide economic benefits to humans for pest control, fertilizer, and pollination.
- _____ Landowners can help bats, especially if there is a maternity roost on their property.
- _____ Bats are imperiled by white-nose syndrome and need special consideration.
- _____ Bats provide important ecosystem services like eating insects and pollinating plants.
- _____ Stay out of caves and mines when bats are present.
- _____ Bats are smart flying mammals, not insects or rodents.
- _____ Bats are cool.
- _____ Bats are the #1 nighttime predator of insects.
- _____ The average person can do many things to help bats.
- _____ Bats live 20-30 years and reproduce slowly.
- _____ Bats face many threats such as white-nose syndrome.
- _____ Do not fear bats.

Comments:

8) Below please find the list of condensed messages from question 6 that relate only to human health and disease. Please indicate the three most important points every person should know in this category (1=most important).*

- _____ People need to be careful around bats.
- _____ Bats, like all wildlife, can carry disease.
- _____ Disease risk from bats is small, but bats should not be handled.
- _____ Bats and humans share many diseases, do not directly touch bats.
- _____ Report unusual behavior such as being able to touch a bat or finding a bat in the livable space of your home.
- _____ Bats carry rabies.
- _____ Direct contact between bats and humans or pets is a rabies risk.
- _____ Call a health care provider if you have direct contact with a bat.

_____ Respect bats, do not handle them.

Comments:

9) In the interview, we asked what barriers exist for working across agencies to develop messages for multiple purposes (i.e., protecting human health vs. protecting wildlife), a condensed list of these barriers is below. Please indicate your level of agreement with each of the following statements as barriers to working across agencies to develop messages.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Unable to determine who is responsible for funding message delivery.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty assigning who has responsibility for various roles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
People tend to stay in their lane, talking only about topics on which they are experts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Focusing on agency missions results in losing sight of the bigger picture.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Working across agencies is not inherent in government structure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limited staff time for broader collaboration.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Everyone has turf; some people do not want to work outside their turf and some do not want others working on their turf.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
What one group can say or do another group cannot, making it difficult to work together.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Once messages need review from multiple agencies the process slows down.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Ego gets in the way, some individual/agencies think they know everything.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of leadership for working across agencies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of funding to work across agencies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are no barriers for working across agencies to develop messages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

10) Please use this space to add any additional comments about communication related to bat conservation and human health. We are especially interested in any communication messages you may have thought about which are not represented in questions 6-8.

Thank You!

APPENDIX C

TABLE C1. List of organizations represented in the interviews

Federal Agencies

U.S. Fish and Wildlife Service
National Parks Service
Center for Disease Control

State Health Agencies

New York Public Health
Vermont Rabies Hotline
Kentucky Public Health
Tennessee Public Health
Colorado Public Health
Texas Public Health

Local Public Health Counties or Districts

Sullivan County, New York
Blount County, Tennessee
Garfield County, Colorado
Rutland County, Vermont
Pulaski, Kentucky
Lea, New Mexico

State Fish and Wildlife Agencies

Vermont Department of Fish and Wildlife
NY Department of Fish and Wildlife
Tennessee Wildlife Resources Agency
Colorado Division of Fish and Game
Indiana Department of Natural Resources
New Mexico Department of Game and Fish

Tribal Agencies

Cherokee Department of Natural Resources
Pueblo of Laguna Environmental and Natural Resources
Department
Cherokee Public Health

Canadian National and Provincial Agencies

Canadian Wildlife Service, Environment Canada
Government of New Brunswick, Wildlife Health
Government of Quebec, Wildlife
Government of Nova Scotia, Wildlife
Government of Nova Scotia, Health and Wellness

Private Wildlife Control Operators

Bats in the Belfry
Cranbrook Pest Control, BC
Urban Wildlife Rescue

Non-governmental Organizations

Organization for Bat Conservation
Bats Conservation International
Global Alliance for Rabies Control
The Nature Conservancy
Kootenai Bat Association

