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Transactions of the Eighty-Fourth North American Wildlife and Natural Resources Conference

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appreciates and respectfully acknowledges the special
assistance and cooperation of these partners.

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84th North American Wildlife and Natural Resources Conference

Welcome to Colorado

Jeff Ver Steeg
Colorado Parks & Wildlife
Denver, Colorado

It's my privilege to welcome you to the 84th North American Wildlife and Natural Resources Conference. It may be a little risky, but I want to start with a very brief bit of history about this conference that some of you may know, but many of you may not. This is really the 105th assembly of this body. The precursor to the Wildlife Management Institute was the American Game Protective and Propagation Association, and it began hosting a national game conference in 1915. In 1931, the conference was retitled the American Game Conference; and five years later, in 1936, it was renamed as it's known today—and its numbering started anew. That's why your program says this is the 84th, when in reality it's the 105th.

I also want to welcome you—and it's my pleasure to do that—to the great state of Colorado. We typically have more than 300 days of sunshine a year (and I can tell you, having come from the Midwest years ago, I actually missed the cloudy weather for the first year or so, but now I couldn't go back—I love the sunshine). This is the time of year when, for many of you, your thoughts start turning to spring, which is officially a couple weeks away. Maybe you're getting your fishing tackle organized or you're inventorying your turkey hunting gear, and others of you, the especially lucky ones, are planning to visit your secret patch of delicious morels. But I know many of you in the northern states are suffering an unusual winter, and perhaps spring is a little further from your mind than it would be normally. But in Colorado, this is normal. Our snowiest month of the year is March; our second snowiest month is April. So spring is often late to Colorado, and that's why some of us who like to get out in the field in the spring go somewhere else for a while. In fact, if any of you traveled on the weekend, you may have heard we had three to four feet of snow over the weekend in our northern and central mountains; in fact, we had an avalanche that closed Interstate 70 near Copper Mountain on Sunday afternoon. The point being: if you like snow sports, stick around—we've got plenty of snow. And we're really excited about that because that means plenty of water for our reservoirs, which is really important here in the West.

Speaking of sticking around, I wanted to let you know (and some of you will probably figure this out), it takes about four days for short-term altitude acclimatization. And it takes almost three weeks or more to fully acclimate to this altitude. So, while you're here, health experts recommend four things: drink plenty of water; eat more carbs, especially whole grain carbs; avoid alcohol; and take it easy and try to get plenty of rest. My advice to you is pick one—drink more water.

Let me tell you a little bit about Colorado. We are a state that's in a state of change. We're the seventh-fastest growing state in the country. Our population today is roughly five-and-a-half million people. But in 30 years, we're likely to reach eight million people. Today, one-third of our population is minorities; and in 2050, that is expected to rise to about 50%. So, our state is changing rapidly in many ways that have direct effects on what we do as a natural resource agency. And you might guess, we in Colorado love our outdoors.

In fact, based on a recent survey, 92% of our population recreates in the outdoors at least once every few weeks—that could be in municipal parks, federal lands, or state parks. The point is: Coloradans love to get outside. Some of you from heavily private land states might find this statistic interesting: 40% of our state is owned by the federal government. That's a big reason people come here—because of the public lands that are available to recreate in whatever fashion they want. But I do want to say, most of you, not all of you, are American taxpayers, so we in Colorado thank you for that bounty of public land.

As I said, as more people move here and stay here for the great outdoors, we have more impacts on the resources, our infrastructure, and our economy, and I would say the natural resources are the cornerstone of all of this outdoor recreation. And when it comes to wildlife, we are especially blessed. We have the largest elk herd in North America; we have one of the largest mule deer herds in the West; and unlike many of our colleagues in the Northeast and Upper Midwest, we have a robust moose population that's actually growing every year. And we're especially proud of our 41 state parks. They can be found all around the state, and they offer some of the best scenery, hiking, camping, fishing, boating, and wildlife viewing around. But if your conference schedule doesn't allow you to visit one of our parks or get away from the Front Range, I hope you can find a little time to explore and enjoy the Mile High City here in Denver.

Denver has more than 200 parks just in the metro area and a number of mountain parks, as well. And we're home to seven professional sports teams—and I want to name those for you because the names speak to Colorado and the West: the Broncos, the Rockies, the Nuggets, the Avalanche, the Outlaws, the Rapids, and the Raptors. You see, our sports teams reflect our state and the West.

So, if you can't get out to Denver parks and you can't get out to state parks and you can't enjoy the federal lands while you're here, I hope you at least enjoy some of the fine establishments—restaurants and so forth—just in walking distance of this hotel; and please take advantage of whatever the Denver community can offer. If you need assistance from us, we'd like to help you in any way we can; and we at Colorado Parks & Wildlife welcome you again and wish you an enjoyable and productive conference.

Opening Address

Steve Williams
Wildlife Management Institute
Gardners, Pennsylvania

I also want to welcome you to the 84th North American Wildlife and Natural Resources Conference—and again, thank you, Jeff, for the welcome to Colorado. We all know that everybody has busy schedules and time commitments; I want to thank you all for taking time out of your busy schedules and offer special thanks to all the state agencies, federal agencies, nongovernmental organizations (NGOs), business industries, and exhibitors that participate in this conference and help make the conference successful. I also want to recognize those folks who serve as special session chairs and those involved in the workshops and to welcome the National Military Fish & Wildlife Association that attends this meeting in concert with us. Thank you, all, for your efforts to make this conference successful so that we may have meaningful dialogue on the numerous conservation challenges that face our nation today.

On the national legislative front, we have a lot to be thankful for—after years of effort by many groups sitting in this room, the Land & Water Conservation Fund (LWCF) was reauthorized by Congress and now will provide permanent funding for land conservation at both the federal and state level. That's something that all of us have been working on for a long time. Along with that passage, 3% of LWCF funds have been directed to open land-locked federal lands by providing public access through private property; this will allow hunters, anglers, and outdoor enthusiasts to enjoy millions of acres of public lands that are currently inaccessible. I know many organizations worked on this legislation, and I'm sure this is a mistake, but I'd like to recognize one in particular—I think it's fitting that we recognize the Congressional Sportsmen's Foundation for their longstanding commitment to this access issue, so thank you.

Also, on a legislative front, the Recovering America's Wildlife Act (RAWA) has been reintroduced in Congress and enjoys a level of bipartisan support. The Alliance for America's Fish & Wildlife has developed the campaign to shepherd this bill through Congress. There is a very impressive array of organizations, industries, and businesses that support this effort and support that campaign. This unprecedented level and breadth of support, as we all know, will be needed to assure passage of the RAWA bill. We all recognize it will require tremendous effort to convince Congress that $1.3 billion a year is a wise investment that no doubt would pay tremendous dividends for the American public. This is not just about fish and wildlife; it's about clean air, clean water, healthy habitats, outdoor recreation, and most importantly, it's about Americans' quality of life.

Another bill that is of interest to all of us here is the Pittman-Robertson (P-R) Fund Modernization Act, which is also being reintroduced—although it passed the House last year, it didn't pass the Senate. Again, there are numerous organizations working tirelessly to pass this bill that would allow state agencies flexibility to use a portion of their P-R funds to advance hunter recruitment and provide safe and modern shooting ranges for recreational shooters. In addition, the Multistate Conservation Grant Program would receive additional funding that could be used to actively encourage more participation in hunting and shooting sports. We all realize declining participation threatens the financial lifeblood of many state agencies. Passage of this bill would allow for innovative programs to enhance participation in a similar manner that angling and boating enjoy today.

Obviously, Congress is in a state of flux, to be diplomatic. The change in House leadership, in new committee makeup, may complicate advancing these legislative proposals. A politically divided government presents challenges and opportunities. It's more important now, than at any time in the past, for our community to work together to demonstrate to Congress that conservation is a long-term endeavor that pays benefits to people of all political stripes. Conservation cannot and should not be a partisan issue. Our work is relevant to all of society, not just to our valued and traditional partners or hunters and anglers.

To that end, the Blue Ribbon Panel of Relevancy working group has labored during the past year or so to develop a roadmap to relevancy. This effort is critical for our future. It's not only a practical effort; it's a necessary effort to serve as public stewards of our natural resources. We manage the public trust for all beneficiaries of that trust, all Americans.

I'm proud to mention that Wildlife Management Institute (WMI) has been at the forefront of this effort, particularly through this conference, for more than 10 years now. This conference has provided the forum and crucible to promote conservation relevancy. Tony Wasley and I express our sincere appreciation for the work of some 60 individuals representing federal and state agencies, NGOs, and the private sector who have done extremely difficult and important work for the past few months.

WMI continues its efforts to serve the conservation community. In addition to the work on the relevancy working group, we're involved in more than 30 national, regional, and state level conservation efforts. Since this conference's last meeting in Spokane, WMI assisted state agencies in reviewing and evaluating programs, rules, and regulations and provided limited-term employees who work on agency projects that couldn't be completed by full-time agency staff. Our work spans issues such as chronic wasting disease; the harvest information program; monarch butterfly conservation; national and state level R3 efforts; improving agency/industry relations; development of early successional forests, particularly in the East; the North American Waterfowl Management Plan; big game migration corridors; wildlife poaching and trafficking; and I could go on.

I name these efforts as a tribute to the knowledge and the skills of a small cadre of WMI staff who have devoted their careers to enhance the scientific management of wildlife in its habitat. We may be a small outfit, but we play big.

The last thing I want to do before I introduce our speakers is recognize someone who undoubtedly everybody here knows—this fellow has had an illustrious career, a long career involved with the U.S. Fish & Wildlife Service and every aspect of the organization. He's retiring this year after rising to the level of director of the U.S. Fish & Wildlife Service. He left that position and, after a short retirement, went to Ducks Unlimited (DU), became the CEO of DU, and has continued to accomplish great successes with DU—I would like to recognize Dale Hall. If you'd stand, Dale—we recognize you for years and years of service and thank you very much.

This morning, we're going to hear from two important speakers. First, is Tony Wasley, who's the director of the Nevada Department of Wildlife; Tony will explain the goals and accomplishments of the roadmap to relevancy working group—as I mentioned, this work promises to provide conservation organizations with a roadmap to enhance their relevancy and to engage and serve a broader range of the public. Following Tony, David Bernhardt, the acting U.S. Secretary of the Interior, will discuss the department's efforts to improve federal and state agency cooperation and coordination, and perhaps he'll talk a bit about very important secretarial orders, particularly those orders that revolve around big game migration corridors—real work, real success on the ground—and also recognize the importance of hunting and angling. The president has announced his intention to nominate David to the post of U.S. Secretary of the Interior, and I'm sure I speak for all of us here when I say: we are eager to hear David's plans and welcome his thoughts on this critical conservation partnership between states and the federal government, as well as the NGOs.

Finally, and as always, I thank you for participating in this conference—and I thank you for your dedication to fish and wildlife conservation. Thank you very much.

The Road to Relevance

Tony Wasley
Nevada Department of Wildlife
Reno, Nevada

I'm very glad to have this opportunity to share about an exciting effort regarding relevancy that's currently underway. My entire life I've been challenged by the perceived indifference to nature—living things and habitats. From Dr. Seuss' *Lorax* to Aldo Leopold's *A Sand County Almanac*, these were the stories that captured my interest and my passions. Five years ago, when I attended the National Conservation Leadership Institute, we were tasked with bringing a challenge into that effort—the challenge I identified (naively, I'll admit) was to elevate the societal core value for wildlife. I was laughed at by the human-dimensions folks; they said: "Tony, Tony. We don't change people's core values. Core values are established early in life, when people are three and four years old. What we change are their attitudes and their behaviors."

This effort is about addressing people's attitudes and behaviors. It was six years ago that I attended this very meeting, and during the plenary session, I sat near the rear of the room listening to a speaker, and I looked over the room and contemplated the future of conservation as I noticed what I thought was a crowd that lacked diversity—diversity in age, diversity in gender, ethnic diversity. I joked to myself that, as a matter of fact, the only thing more numerous than empty chairs were the bald or balding heads of white men. I know, I should look in the mirror. But as I look around this room today, it's truly impressive, not only the number of people, but the diversity of people—the diversity in age, the diversity in gender, and the growing diversity in ethnicity.

Around that same time, five or six years ago, I was preparing for a cabinet meeting. I was fairly excited and confident that I had something of significance to report to the governor on this fine day—a discovery of a new invasive species in a popular waterway. As unfortunate as the discovery was, it was an issue that could raise the relevance of conservation in the eyes of my boss, the governor. It was one of those double-edged swords—we all want to be relevant for what we do, our passion, but we don't want to be relevant for a bad thing.

So, I sat in that cabinet meeting. I listened to the woeful reports from the department of education director in a state that typically ranks 49th or 50th in most metrics of educational quality. I listened to health and human services talk about the challenges in feeding single mothers and school-aged children with before-school food programs. I listened to the department of corrections talk about lack of beds and mental health issues of prisoners. And I quickly realized the challenges of somehow making the discovery of New Zealand mud snails relevant.

Also, around that same time, I began to hear and be part of a more and more frequent conversation regarding conservation relevance. The topic of relevance has been part of the plenary and the broader program at the North American for at least seven or eight years; we just heard Steve Williams say probably a decade or more. What do we mean when we say relevance? What is relevance? If we go to the dictionary, the strict definition is: something that's pertinent, germane, connected, important, significant, and useful. Those are six pretty powerful words. What does it mean to *not* be relevant? What's the opposite of relevant? It's not that people disagree or dislike what you do or what you stand for; it means that you are unknown, that you're disconnected, you're unimportant, you're insignificant, or you're useless.

I used to coach baseball with a guy who frequently used the phrase "the sounds of the game." Anytime he heard something from a parent in the stands, he would use it as an opportunity to learn about a player's weakness or vulnerability. If there was a player at bat, a parent might say: "Don't swing at the high pitch, lay off the high pitch, Johnny. Watch out for the change-up." He would look at me and he would smile and say: "Sounds of the game." He'd call a high pitch or he'd call a change-up and exploit that weakness. I like to play the sounds of the game with conservation-related conversations. Flying across the country last summer, I was coming back to Reno, Nevada, from a trip back East, and I

overheard a conversation on the plane between two passengers. We were flying in over Nevada where we've had significant fire issues the last couple fire seasons—we've burned more than a million acres in each of the last two years, 90% of which is priority habitat management area for sage grouse. And I heard these two passengers talking—huge plumes of smoke billowing up from a 432,000-acre fire—I'm feeling pretty down about the loss, and I hear one passenger tell the other passenger: "It's ok. There's nothing there. Nothing lives there." I thought, holy cow. The passenger says: "It's just a bunch of sage brush." I wanted to climb over the seat and let him know that there's more than 350 species that depend on that habitat and that imperiled ecosystem. But I didn't. Instead, I thought about how it is that people don't know these things that we all hold self-evident. How can we make our business, our purpose in conservation more relevant to a broader constituency? I could share a dozen examples of conversations, overheard or otherwise, that are filled with the sounds of the game, that indicate the challenges we face with respect to relevance.

As you might have guessed, I think entirely too much about the relevance of conservation. How do we create it? How do we maintain it? What makes one issue more relevant than another?

I want to share a couple of the realizations I've made. Relevance is directly proportional to urgency. A map is pretty darn relevant to a person who's lost. If you have a boat in a flood situation, you're pretty damn relevant. Almost by default, urgency creates a ripeness for relevancy. If you're on the eve of a potential Endangered Species Act listing decision, chances are the conservation around that species is going to be pretty darn relevant. Just like proactive conservation to keep common species common, proactive measures to keep conservation relevant—or *make* conservation more relevant—is a more difficult task, especially when competing with the tyranny of the urgent.

On the continuum of relevancy, issues go from urgent relevance to everyday mundane relevance—from a boat in a flood, or if you're the guy with a fire extinguisher and there's a fire, you're going to be pretty relevant. On the other end of that continuum—this occurred to me this morning while I was brushing my teeth—is my toothbrush, something I use every day. There's no urgency around it, but I use it every day. It's relevant. It's relevant to all of us (well, it should be, anyway—at least once a day). Those things have totally different kinds of relevancy. As you look around the country, there are some states where it's an urgent situation, where the change has happened so fast, we need to be able to adapt and adjust. Other states, maybe they don't share that urgency. So where are we in the broader discussion around relevance? And how did we get here, specifically with respect to this roadmap to relevance?

First, I want to describe how we got here. The Blue Ribbon Panel was assembled in September 2014; many members of that panel are here in this room today. It was through the Association of Fish & Wildlife Agencies; that effort was cochaired by former Wyoming governor Dave Freudenthal and Bass Pro Shops CEO and founder Johnny Morris. It was a unique assemblage of individuals representing industry, academics; it was a little bit different than past efforts. They looked at several different models, and they brought forward two recommendations. One recommendation was for Congress to dedicate funding for conservation—dedicated, predictable funding for conservation—up to $1.3 billion annually. From that recommendation, the Alliance for America's Fish & Wildlife was born and ultimately the Recovering America's Wildlife Act that we heard Steve reference earlier.

However, there was a second recommendation from the Blue Ribbon Panel and that pertains to the relevancy piece, and I want to read that recommendation: "The Blue Ribbon Panel will examine the impact of societal changes on the relevancy of fish and wildlife conservation and make recommendations on how programs and agencies can transform to engage and serve broader constituencies." There's one piece of that, in particular, I want to expound on, and that's the "societal change" piece. Societal changes—what societal changes? To understand why this is important, or some of the specific aspects of that change, we need look no further than the America's Wildlife Values survey, for which the national report was released this past winter (subsequent state reports have now been released). What that report looked at was wildlife value orientations using a well substantiated, well supported method of testing and categorizing individuals into one of four different wildlife value orientation types: traditionalists (also known as utilitarians), mutualists, pluralists, and those who are distanced. I'm not a human-dimensions expert, so those of you who are, please be patient with me, but the traditionalist or utilitarian believes in

management of species for the benefit of humans dominioned over. The mutualists see animals as part of their extended social network; they anthropomorphize them, oftentimes give them names, human personas. Pluralists share some of both aspects; they have a high regard for those animals, but they're also willing to use them (food sources, furs, etc.). And then distanced, as the name suggests, give very little thought to conservation or wildlife, in general.

If we look at the results from the wildlife value survey and the orientations across the U.S., presently, 28% of the country identifies as traditionalists—their wildlife value orientation is traditionalists; 35% are mutualists; 21% plurarlists; and 15% distanced. It's kind of encouraging that only 15% of the people really classify as somewhat thoughtless relative to conservation. But there are some trends. This report, for the western states, was a second look at a report for the same survey conducted 15 years prior, and as we look at the western states, there are some concerning trends. The western states experienced a 5.7% decrease in the traditionalists and simultaneously a 4.7% increase in mutualists. Why is that? The authors of the report (though possibly somewhat speculatively) believe that trend is driven by modernization of society as people move into cities and towns; become more urbanized, become more educated; and have higher earnings. Through that whole process of modernization, they move towards mutualism. States with higher levels of mutualists experience lower levels of trust in their state wildlife agency. So although mutualists by definition are more supportive of environmental stewardship, they have less trust in us to fulfill our mission in their trust.

Another interesting observation was that the composition of a state's public seems to have little impact on the value composition of agencies. As you look at those states that participated, look at a cross section of the public, 34% of the public in the participating states identified as mutualists; however, only 8% of mutualists were in the state wildlife agencies. It's probably not a surprise, but it does speak to some of the gaps in communication, the gaps in values, how we communicate—do we communicate in what are values to us? Understanding others' values will help make communication more effective.

In December 2017, the Blue Ribbon Panel, the relevancy work group cochaired by Steve Williams and myself, met at the AFWA headquarters and discussed the concept of a toolkit from which willing states could learn from one another's successes and failures and also learn from a compilation of the published literature on the subject, if they desired. Significant work in outlining possible approaches and strategies was conducted in preparation for a planning meeting that was held right here in Denver late July 2018. State and federal partners along with Wildlife Management Institute and AFWA staff began to define barriers and place those barriers into specific category bins. Results of that initial planning effort were shared with state wildlife agency directors at the directors' forum in Tampa in September 2018 at the annual AFWA meeting. As a result of sharing that draft and that concept, the Association of Fish & Wildlife Agencies passed a resolution in support of "assembling a diverse team of individuals to develop a draft roadmap by March of 2019 that would help member organizations share successful strategies and help identify and breakdown barriers to engaging and serving all constituents."

Subsequent to that annual meeting, diverse teams were assembled—you heard Steve Williams say there have been more than 60 individuals; I know many of the folks involved in that effort are present here today. I know from the director ranks, many of your staff have been involved in this effort. It really has been an unprecedented effort. There were clear expectations put forward in terms of the time commitment from staff—I know everybody has a full plate, and given the tyranny of the urgent, it was really quite an undertaking to get people to carve out significant chunks of time to dedicate to this.

There were 26 different barriers to relevancy that were identified and organized according to five different bins, including: agency culture, agency capacity, constituent culture, constituent capacity, and political constraints. Each of those five bins had a team leader identified, and then a diverse team of experts in each of those fields was assigned. Logic chains were developed for the ultimate purpose—there are five words that describe the purpose of this effort: "Enhanced conservation through broader engagement." That doesn't make for a very good acronym, but it certainly clarifies the purpose—enhanced conservation through broader engagement.

We present this update to you today as a draft, nonprescriptive, voluntary toolkit and we are putting it forward, seeking some input, again working through the proper leadership channels, through

executive committees, directors' forums, engaging diverse stakeholders from NGO communities, some industry reps, federal partners, state partners, human-dimensions experts, and others. Once that input was received and incorporated relative to these five bins and 26 barriers, the draft strategies were developed for those 26 barriers; what's next is the formulation of specific tactics, and subsequent to this meeting, we'll begin to develop those specific tactics with a goal to have a final product to present for possible approval at the September 2019 AFWA meeting. Again, truly an exciting opportunity; the effort—as we indicated, the notion of relevance—has been part of the plenary, part of the North American; the conversations have been more and more frequent, more and more productive, and this is truly a unique opportunity to provide a valuable tool. Fifty states, a number of provinces, and everybody's going to have a different perception on the urgency and relevancy in their neck of the woods, but here's a toolkit people can voluntarily go to and draw from.

Federal/State Relations

David Bernhardt
U.S. Department of the Interior
Washington, District of Columbia

It's a humbling privilege to be asked by the president to serve as the acting Secretary of the Interior. I'm deeply appreciative of the chance to serve in this role because I love the varied missions of the Department of the Interior (DOI) and believe in them. I also fundamentally believe in the common sense policy vision that the president has laid out. It's important for all of you to understand that our priorities do not change in a transition between Secretaries of the Interior. Our priorities are the president's priorities. They have been from day one in the administration and they will continue to be.

Shortly after I was confirmed as deputy secretary in 2017, I spoke to some of you at the 107th annual meeting for AFWA. I think that was the first public speech I gave as deputy secretary, and at that time, I outlined the administration's vision and conservation priorities. I gave you a prospective of how I hoped we would engage in cooperative conservation stewardship with the states. Today, I'd like to share my perspective of our experience during the last 19 months, and I will visit with you about a few things that are still to come.

But first, before I do, let me congratulate all of you on something you worked very hard for—the finalization of the recent lands package that ultimately should end up on the president's desk. Due to the work of many folks in this room, there's obviously a lot to be excited about, and many of the provisions within the bill were priority projects for the department that we've been working on for the last couple years, too. For example, reauthorizing the Land and Water Conservation Fund, transporting bows across park land, clarifying that public lands were open unless closed, a new 21st Century Conservation Service Corps Act, the Every Kid Outdoors Act, and there is so much more. But here's the point I'd like to get across to you, we obviously have a limited time in the rest of our term and it's really helpful for us to understand your priorities as we begin to implement that act, so reach out to us and communicate with us. I look forward to working with you as it becomes law.

It's my view that a commitment to listening to the states starts at the top. A couple of weekends ago, I had the good fortune to spend a good amount of time with the nation's governors because they were in town for the National Governor Conference. I was asked to go to a formal dinner at the White House. It was the first time I'd gotten to do one of those things, so I was pretty excited—pretty swanky if you're from Rifle, Colorado, and my wife was really happy, so that was great. The president was there; he gave a great speech, he talked to a lot of folks, and I thought that was great. Then on my schedule the next day was another meeting with all the governors for a breakfast (and no, I don't only eat in DC, even though it sounds like it)—but I go to the breakfast, and the president is there, just talking to folks, and I was thinking: "He's spending a lot of time with these governors." So I said to a friend of mine who works in the White House: "Hey, this is unbelievable." And he gave me a very interesting fact—now, I can't verify this fact, so you're just going to have to go with it, but here it is: the fact was that the president has met with governors more often at this point in his presidency than any other president in modern history, including Ronald Reagan, and that was a factoid that surprised me. Now, I've also had a lot of governors tell me that they regularly receive calls from the president, and I believe them because the big difference between being acting secretary and being deputy secretary is you actually get those calls, too. I'm still a little discombobulated by it—you know, when you get the call that says, "Hey, the president's on the phone," I'm a little surprised every time it happens—but the bottom line is that cooperating with state and local partners to effectively implement conservation stewardship efforts has been and will be a priority for the administration.

From my perspective, the most obvious determination in Interior of our commitment to respecting states can be seen in our selection of leadership at the department. I'm a big believer that people are policy. The reality is that within our ranks in Interior, many of our folks have served in state and local government. Susan Combs, who is exercising the authority of the assistant secretary for policy,

management, and budget, held several important positions within the state of Texas; Joe Balash, who's our assistant secretary of land and minerals management, was the commissioner of the department of natural resources in Alaska; Doug Domenech, who serves as our assistant secretary for insular and international affairs (his title just keeps growing), he was the head of natural resources for the state of Virginia; most recently, we were able to steal Margaret Everson from Ducks Unlimited, she was general counsel at the Kentucky Department of Fish & Wildlife Resources; Andrea Travnicek, who serves as acting assistant secretary for fish, wildlife and parks, worked for the governor of North Dakota; and also perhaps most relevant to this audience, is every one of those people know the difference between a Remington Model 870 and 1100—and if they didn't, I wouldn't have let them have the job. Personally, I served on the Virginia Board of Game and Inland Fisheries; that was a wonderful experience. It gave me a real perspective on and appreciation for both the depth of knowledge and expertise that rests at the state level.

We are working closely with many of you on a host of issues, and on a personal level, I thought it might be best to talk about an issue I've spent a significant amount of my time on since I got to Interior as maybe an explanation for how we look forward to working with states and others—and that's the issue of the greater sage grouse management plans for Bureau of Land Management (BLM).

I spent my entire career, both my first time at Interior and in private practice, trying to avoid the issue of sage grouse. I viewed it as a thorny issue I didn't need to be involved with at all. So I was a little disturbed on my first day as deputy secretary when, at my very first meeting with the secretary, he says: "Hey, I really need you to deal with the sage grouse." I thought: you have to be kidding. But I asked him what his goal was and he said: "Look, I want to address some of the issues these states have, if they're addressable." I said okay.

What I did was I looked at the seven states that have most of the sage grouse and I said I'd talk to their governors and their folks—and here's the way it worked. I basically said to them: "Governor, do you like your plan—and our plan? And if the answer's yes, we'll keep our plan. If the answer's no, then in that case, let's talk about the changes that could be made, but while you're thinking about those changes that you would like to see, please think carefully about the impact the changes you're asking for might have on your neighbors." And if you want to have confidence as a group in the effectiveness of governors to thoughtfully examine issues and come to a good resolution, I would encourage you, when we roll out the sage grouse plans in a couple of weeks, to spend some time reading through the records of decision. When you do, you will see that what occurred in that effort is a sanding of rough edges that were really troubling governors; but the plans are not ripped out by their roots. The reality is these governors recognized that you and many others and they had invested a tremendous amount of time in the greater sage grouse, and they didn't want the bird to be listed. We ended up, with the governors' help, in a pretty good place.

And for those of you who have not worked with me on an issue like that, let me ask you to do one thing: talk to your colleagues who did. I think they will tell you the following:

1) When we meet, I'm prepared to be engaged in a full discussion. I respect your time and I will have tried to do my homework before I walk in the door. I owe that to you. I'm not here to waste your time.
2) I hope they say that under my leadership, our folks listen and try to understand your perspective, even if it diverges from ours.
3) I'll give you an honest assessment of where I stand.
4) I will be transparent with my intention and my goal.
5) This is perhaps the most important one for you to understand—when I make a commitment, it will happen.

Now, you don't need to take my word for that. Talk to the folks who worked on the sage grouse plan. They will acknowledge that the interaction between the states and DOI has been honest and respectful. I'm hopeful that they will now say that when we say something like, "You can take it to the

bank," we mean it. There's good and bad with that. If I'm going to tell you something that's going to happen that you don't like, that might not be good, but you need to understand from my perspective, it probably will happen.

No planning process is bump free, and certainly the sage grouse process wasn't either. That's why we need to build trust in our relationships based on mutual respect and transparent communication. In my career, I've learned that miscommunication and a reluctance to raise issues early often creates far bigger problems later. That's why if you have something that's bothering you at the department, pick up the phone and call us. We might tell you you're out of luck, but we're much more likely to say: "Let's see how we can resolve the situation in a way that actually works for you."

Like many of you, I grew up fishing and hunting on public lands. Rifle is a little town on the Western Slope about 140 miles from here and is virtually surrounded by BLM and Forest Service lands. What does this mean? It means I appreciate the importance of recreation and sporting opportunities on public lands, and I know how critical of a component it plays in the balance we need on our public lands and for local economies.

Under President Trump, one of the first things Secretary Zinke did was sign a secretarial order to support sportsmen and enhance wildlife conservation. A lot of the folks in this room were there for that signing, and our bureaus have worked hard to implement that order. Since its existence, we've opened or expanded hunting and fishing opportunities on more than 381,000 acres of refuge lands at more than 30 different refuges. At the same time, BLM has restored more than 689,000 acres of sagebrush habitat that's vital to many game species, and we've made it a priority, as we modify our management plans, to incorporate hunting and fishing information in them.

Some of you are also familiar with another order Zinke signed that was intended to improve the habitat quality of migration corridors in winter range for antelope, elk, and mule deer in Western states. In the first year of implementing that order, we have provided about $8 million to support priority state research, mapping, and habitat improvement projects. The distribution of funding has been roughly equal, split between science and conservation, with about $4 million for research and mapping and about $4 million for on-the-ground enhancement. Last fall, the secretary issued a memo to all of his bureaus emphasizing the fact that the states are leaders in wildlife management, and it sought to ensure that our bureaus were harmonizing our policies with state policies to the extent practicable under the law.

At the same time, after he issued that order, I sent a letter to every state asking if they had issues with our regulations and, if so, to share them with us. We received a varied response—Alaska sent about a 45-page letter (it's actually 40, I don't want to overstate it); we had eight states, in total, respond (seven states plus Alaska). The silence, in a way, was deafening.

Since the order has taken effect, U.S. Fish & Wildlife Service has removed a host of regulatory challenges that they have to more closely match hunting and fishing regulations in states—and I think that's a pretty big deal. The past two years have been pretty busy, when you get right down to it, and I want to give you a heads up on a couple more things that are coming.

Either early next week or perhaps even later this week, the U.S. Fish & Wildlife Service will send the Federal Register a rule proposing to delist the gray wolf. Like you, many of our experts believe that the wolf no longer needs the protections of the Endangered Species Act. We'll send that rule out there and we hope you comment on it.

In addition, today, I will be signing two secretarial orders this evening: one will build upon our prior effort to enhance big game conservation and the other will be focused on enhancing access. The first one is basically a directive that requires that BLM, whenever they're thinking about disposing of property, acquiring it, or exchanging it, thinks very carefully about the impact that decision will have on access for additional hunting and fishing opportunities and other recreation. Essentially, it says: if things are important for access, we're probably not going to be in the disposal business. Even though generally we're opposed to large-scale transfer of federal lands, our planning process has a requirement that we go through identifying parcels for disposal. A lot of times, these are in holdings; sometimes they're surrounded by three pieces of property that are owned privately; sometimes they're lots in the middle of Clark County, Nevada, which looks like Las Vegas. So, not everything is required to stay in federal

hands, but anything that's going to be disposed of, thought about as disposed of, thought about for acquiring, or thought about for exchanging will now have to go through this additional test.

The second order I'll sign today will build upon the work that's been done on the migration corridor winter range plan. During the last year, Casey Stemler has done a great job with that program, and last week, I received a video clip from Montana Fish, Wildlife & Parks highlighting the research they were doing on pronghorn in Madison Valley, and it's a great little video. So while the Zinke order applied to mule deer, Rocky Mountain elk, and pronghorn, the new order will be expanded to incorporate moose and big horn sheep and now will also include summer range. That is a good thing and will be very important.

We all revere the North American Model of Wildlife Conservation. But I'm a little concerned about some of the challenges that continue to mount. I'm going to raise one today, and I don't have any answers, but I sure would like to work with you on it—I'm just really beginning to appreciate the need for us to be really thoughtful together on working to address chronic wasting disease. I don't pretend to have an answer. But when I was here 20 years ago, it seemed like we were doing a lot to invest in the program, and we're doing far less today than we did then at the department. I want to explore avenues in which Interior can be helpful, both in its role as a large land manager and as a department with a strong science program. We want to engage in a helpful way that is beneficial and respectful to the role of the states. That is something I really look forward to working with you on.

I don't want to bore you to death, so here's what I'll say: thank you for giving us the opportunity to work with you for the last 19 months. We look forward to working with you and continuing to build positive relationships going forward, and I really appreciate your time today.

Special Session One.
America's Shifting Wildlife Values Are Affecting the Trajectory of Wildlife Management in the U.S.

Opening Remarks

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Introduction and Purpose

Managers of fish and wildlife in the U.S. face a changing world. The signs of change are increasingly obvious and concerning. Perhaps the most prominent concern is the national percentage decline of hunters and anglers. Since the inception of the wildlife profession in the early 20th century, hunters and anglers have been the primary partners for wildlife conservation and the main source of funding for state fish and wildlife agencies. Should the decline continue, the effect on agency revenues could be crippling. Another important concern is that traditional management practices are under increasing scrutiny, and social conflict is far more frequent. Practices once widely accepted can now be highly divisive.

In response to these challenges, the wildlife profession has recently advanced efforts such as the Recovering America's Wildlife Act (H.R. 4647), which would use taxes from energy exploration to fund wildlife management. The profession has also initiated R3, a program intended to recruit, retain, and reactivate hunters. Further, the Relevancy Roadmap is a program intended to identify best practices for engaging new audiences in wildlife conservation efforts.

The purpose of this session was to deliver the findings of the America's Wildlife Values (AWV) project, a research initiative intended to provide basic understanding of the cultural shift unfolding in America and the effect it is having on wildlife management. During a 20-plus-year period, we have been building and testing a theory of modernization-induced value shift that has changed human relationships with wildlife (Fulton, Manfredo, and Lipscomb 1996; Manfredo, Teel, and Bright 2003; Manfredo 2008; Manfredo, Teel, and Henry 2009; Teel and Manfredo 2009; Dietsch, Teel, and Manfredo 2016; Bruskotter et al. 2017; Manfredo et al. 2018). Our collection of papers tied to this session presents findings that: describe the study methods; demonstrate the importance of values in affecting issues important to wildlife management; provide evidence of the effect of modernization on value shift; and describe the culture of state fish and wildlife agencies in the context of public values.

Defining Values

There are many definitions and uses of the term "values." It is important, therefore, to clarify our use of this concept (Manfredo et al. 2017a). Values are fundamental motivational goals that guide people in evaluating whether actions, events, and people are desirable or undesirable. Research by Schwartz (2006) suggests that values are few in number but broad in their effect on human thinking. They guide what people attend to, what they perceive, and how they interpret and process information. Values are ideas held in the mind, but they are embedded in the cultural context around us, such as in our stories, language, and religious practices, as well as in our beliefs, material culture, institutions and organizations, norms, laws, etc. Values are established early in one's life, principally through associative learning, and

reinforced over time through semantic learning. Given the nature of their formation and presence in our lives, it is easy to see why values change little over one's lifetime. Yet, values *do* change at broader levels of the social system, as they serve a critical role in adapting people to their social-ecological environment (Kitayama et al. 2010). As that environment changes, new innovations evolve and are adopted when they enhance functioning and survival. It is important to note that broad-based value shift lags behind social-ecological change. Value shift is not a process of thoughtful and deliberate change by humans but rather a cultural process that happens without human ability to control it.

Finally, it is important to note how attitudes differ from values. Attitudes are evaluations that immediately precede behavior. Attitudes guide basic approach or avoidance behavior in humans. Some attitudes are formed through thoughtful deliberation, but, more often, attitudes arise through simple heuristics (e.g., I know Joe thinks x is good, so I think it is good). Attitude formation is a fluid and dynamic process. We hold many attitudes in memory that we can draw upon, and we form and forget a great many more on a daily basis. Attitudes range from general to specific, and research has shown that behavioral prediction is best achieved by very specific attitude assessment. Attitudes are conceptualized to be rooted in values, and a popularly used approach in attitude research stems from the values-attitudes-behavior model (Maio, Haddock, and Verplanken 2018).

Wildlife Value Dimensions

Throughout a series of past research efforts, we have identified two key dimensions—domination and mutualism—and the survey items for measuring them that describe people's values toward wildlife in the U.S. (Fulton, Manfredo, and Lipscomb 1996; Manfredo, Teel, and Henry 2009; Teel and Manfredo 2009). These dimensions are not a comprehensive set of all the detailed ways that people think about wildlife, and they are not intended to be. Instead, they are intended to reflect the broad orientations in societal thought about animals and wildlife. They capture opposing conceptualizations of where wildlife are placed in our social lives and guide ethical judgments about what is right or wrong and what is acceptable in treatment of animals.

Domination is an orientation that embraces the notion that wildlife is subordinate and should be used in ways that benefit humans. Using animals in research and hunting are two ways that these benefits accrue. A person with a domination orientation, for example, would endorse killing wildlife if it posed a threat to their life or property. Those with strong domination values respond positively to a vision where there are abundant populations of fish and wildlife for hunting and fishing. A domination orientation toward wildlife, and toward the natural environment more generally, has been traced to the Reformation and is obvious in biblical quotes such as Genesis 1:26: "…let [humans] have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." *Mutualism*, in contrast, is an orientation that embraces wildlife as part of a person's extended social network. Those with strong mutualism values see animals as family or companions, caring for them as they might for other humans, and as deserving of rights like humans. These individuals respond positively to a vision of humans and wildlife living side by side without fear. As people see animals as more human-like in this scenario, they extend human considerations to them.

It is worth emphasizing that the difference between these value positions is not just a difference between those who hunt and those who do not; in reality, there is much more nuance to how these values are exhibited by different groups of people. There are, in fact, some hunters who hold strong mutualism values (Manfredo et al. 2018). Our previous research showed that mutualism correlated positively with support for management actions emphasizing environmental education and restricting humans to benefit wildlife, while domination was positively associated with support for lethal management techniques. In addition, mutualism correlated positively with concerns about habitat protection and declines in wildlife populations, while domination was positively associated with concerns about a healthy economy, public access, and private property rights (Manfredo, Teel, and Dietsch 2016).

Wildlife Value Types

In the research we report, we have classified people into one of four value types (Teel and Manfredo 2009). We do this for the sake of parsimonious description and, in the process, acknowledge within-group variation. To facilitate description of the wide diversity of scoring on the domination and mutualism measurement scales, we have identified the following groups of people:

- Traditionalists (or utilitarians)—score above the midpoint on domination and below the midpoint on mutualism; i.e., they are the most extreme in beliefs that wildlife should be used for the benefit of people.
- Mutualists—score above the midpoint on mutualism and below the midpoint on domination; i.e., they are the most extreme in seeing wildlife as part of their extended social network.
- Pluralists—score above the midpoint on both mutualism and domination scales; i.e., different situations result in this group emphasizing one orientation over the other.
- Distanced—score below the midpoint on both mutualism and domination scales; i.e., they exhibit low levels of thought about and interest in wildlife.

It is also worth noting that we find strong associations in predicting the direction of values, but the strength of values is more likely driven by more individually unique factors unrelated to modernization. This is an important point, as we find support for a proposal that a transition in wildlife values is related to modernization, but this does not explain the difference between a strong and weak value type.

The Central Thesis

Our theory proposes that the economic growth and modernization following World War II changed the day-to-day lives of humans in a way that fostered a shift in wildlife values from domination to mutualism (Figure 1). The effects of modernization on value shift more broadly was advanced by Inglehart (2018) who has longitudinal data that show a shift from materialistic subsistence values to self-expressive and belongingness values. We contend that many of the same processes that fostered the shift he revealed were forces affecting wildlife value shift. However, the changes of a modern lifestyle alone would not be sufficient to create a shift in wildlife values. We contend that, with modernized life, people were removed from direct experience with wildlife. This experience was replaced with exposure to animals through more indirect means, such as media outlets, that depicted animals as more human-like, which expanded anthropomorphized thought. Anthropomorphic thinking is a human universal shaped largely by cultural learning (Urquiza-Haas and Kotrschal 2015). Repeated exposure to depictions of animals, including wildlife, as having similar characteristics to humans prompted the slow adoption of mutualism values. This was accelerated by the growth of belongingness needs and the expansion of urban life, which has been associated with loss of community and social isolation.

As individual change occurred and grew, it emerged up through society, resulting in social group formation around new values and active efforts to affect wildlife management policy. As the social environment changed, it was less conducive to participation in traditional activities like hunting and fishing; i.e., there was declining encouragement from family, fewer friends who shared hunting/fishing interests, lack of interest among one's children to participate in traditional activities, and a general lack of social acceptance. In short, hunting and fishing have been important to participants because these activities are vitally important expressions of cultural values. However, as values shifted, so too did engagement in these activities. With the acceleration of the values transition in the late 1990s, there has been an increasing tendency to "fight back" among more traditional audiences who felt left behind in the modernization process, giving rise to a cultural backlash against efforts of people with new value positions (Manfredo et al. 2017b).

At the state level, broad-based value shift accelerated in more modernized states. Value shift occurred intergenerationally and also through the immigration of people with similar values into the states. As values shifted, state-level attitudes of opposition toward the traditional practices of wildlife management became more common. And, while public values have changed, the strong and cohesive culture of those in state fish and wildlife agencies has remained relatively constant, which has caused a gap between agencies and the publics they serve.

In sum, our approach advances a multilevel model of value shift that shows how broad cultural-level shift provided feedback to individual-level value shift, which, in turn, emerged up through the sociocultural system bringing about broad-based change (Figure 1). Given the cultural-level nature of our theory, most of the analysis we report is state-level analysis.

Implications

The indicators of change that wildlife agencies have experienced are a reflection of fundamental alterations in human society and human motivation. This cultural change is remarkable in the speed with which it has occurred and is unprecedented in human history. Agencies must find ways to adapt to this change, not only for the sake of serving their constituency, but also for the sake of wildlife conservation. The threats that gave birth to the wildlife profession—i.e., market hunting and species loss—pale in comparison to the contemporary crises of climate change, development, drought, introduction of exotic species, etc.

Findings from the AWV project can be used to assist with this adaptation and to inform strategies for dealing with a new and uncertain future. Findings can be useful to construct scenarios of different future conditions that can help judge the effectiveness of strategies taken now in reaching desired ends. More immediately, by understanding the value composition of a state, managers have the tools to anticipate public response to new policies and issues before they surface. Values information can further guide managers on communication efforts and on constructing strategies for reaching collaboration on critical issues. But, perhaps most important, this information can focus agencies' attention on the growing agency-public values gap and aid in considering ways to embrace new constituents. Convincing new audiences that traditional practices are positive will be less effective than learning about new audiences and incorporating their interests into wildlife management.

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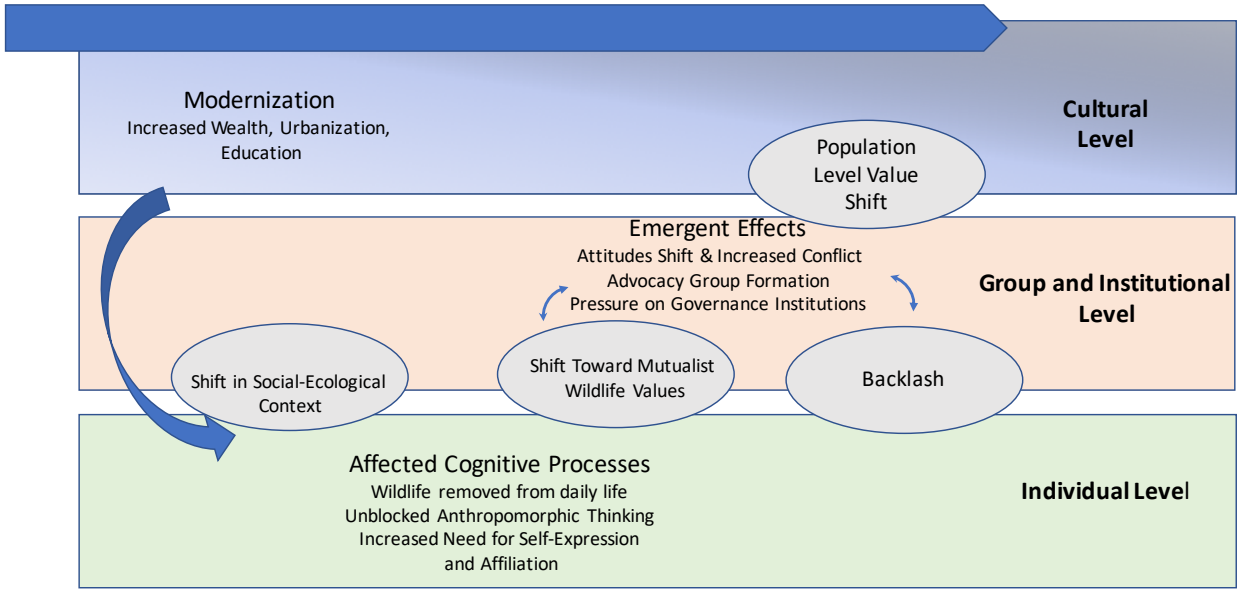
Figure 1. Cross-Level Model of The Effect of Social Change on Wildlife Management



Data Sources and Methods for the America's Wildlife Values Study

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Introduction

The America's Wildlife Values project (AWV) is an effort to enhance our understanding of the social context of fish and wildlife management in the United States. AWV builds upon and expands our team's previous research focused on public values toward wildlife in the American West. Most notably, the Wildlife Values in the West project (WVW) provided a baseline assessment of wildlife value orientations for the 19 western states (Teel et al. 2005; Manfredo 2008). Results of WVW indicated a linkage between forces of modernization (e.g., increased income, education, urbanization) and a shift in public wildlife value orientations (Manfredo, Teel, and Henry 2009; Manfredo and Teel earlier in this volume). AWV expanded the geographic scope of our previous studies to include wildlife values assessments for all 50 U.S. states. Additionally, replication of wildlife value orientation measures in the western states provided an opportunity to assess change/stability of wildlife values in that region over a 14-year time horizon.

Methodological Considerations

Our baseline data on wildlife value orientations in the western U.S. were obtained through the administration of a mail-back survey instrument in 2004. In the years since this effort was undertaken, several authors have noted significant changes to the survey research landscape. Chief among these has been the well-documented decline in response rates to surveys implemented via traditional methods such as mail and telephone (Connelly, Brown, and Decker 2003; Keeter et al. 2017). Response rate decline has affected a broad range of research efforts across academic, government, and commercial domains (Groves and Couper 1998; Johansson, Effland, and Coble 2017). Research programs aimed at understanding the human dimensions of fish and wildlife management have not been immune from the effects of response rate decline (Stedman et al. 2019).

The growth of survey nonresponse has led to increased discourse about how well samples obtained via traditional methods represent populations of interest (Meyer et al. 2015). While some have argued that low response rate studies may be more prone to biased population estimates, others have suggested that response rate alone is not an automatic indicator of poor representation of public sentiment in a sample (Groves 2006; Yeager et al. 2011). For example, in an examination of declining response rates to telephone surveys, Pew Research Group provided evidence that proper weighting of survey samples (e.g., using population demographic characteristics established by the U.S. Census Bureau) can result in accurate representation even in cases where response rates are less than 10% (Kohut et al. 2012).

Debate over the impact of low response rates notwithstanding, the trend of declining survey response has run parallel with the rapid growth in the use of the Internet for social exchange in modern society. Ryan and Lewis (2017) reported that nearly 80% of U.S. households had a computer and Internet service as of 2015. Mobile phone use for Internet browsing and email communication is now a ubiquitous facet of American life. These technological advancements present new opportunities for the online

administration of survey instruments, and the use of Internet-based survey techniques has grown substantially in recent decades (Dillman, Smyth, and Christian 2014). Integration of online surveys into research designs varies widely to include mixed-mode designs (option for Internet-based response); direct email recruitment (e.g., for a specialized study population with known email addresses); and online panels (a panel of willing respondents with known demographic and lifestyle characteristics who are incentivized for survey participation).

Study Approach

Consideration of the survey research challenges and opportunities identified above set the context for discussions about methodology for the AWV study. Ultimately, we employed a pilot study to test alternate data collection methods to determine the most appropriate strategy for collecting baseline data in the eastern U.S. and exploring trends in the wildlife value composition of western states. The pilot study also allowed us to estimate response rates and pretest the survey instrument. The pilot study involved the administration of the survey instrument independently via mail, telephone, and email panel. South Dakota was selected for the pilot study due to the availability of results from prior assessments of wildlife value orientations that were conducted by mail (Teel et al. 2005; Gigliotti 2012).

Using standard survey administration procedures, we implemented data collection with identical survey instruments for each method in South Dakota in 2016. Key measures of interest included domination and mutualism wildlife value orientations (see Teel and Manfredo 2009 for a description of measurement procedures) as well as demographic (age, gender) and wildlife-related behaviors (hunting/angling participation). The survey instrument, participant recruitment materials, and data collection protocols were reviewed and approved for use with human subjects by the Colorado State University Institutional Review Board (protocol #49-17H).

A sample size of approximately 200 respondents per survey method was targeted. We obtained a random sample of South Dakota households for the mail survey from a commercial sampling firm. Potential telephone respondents were identified through a Triple Frame Sampling approach that includes listed landlines and random-digit dialing to reach unlisted and cell phone numbers (Guterbock 2011). We obtained email panel responses from a commercial research firm that aggregates online panels to obtain a respondent pool that matches demographic characteristics of the population of interest.

We compared selected demographic and behavioral characteristics of samples obtained from each survey method against external sources (U.S. Census Bureau American Community Survey; U.S. Fish & Wildlife Service's 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Results of these comparisons were used to determine where data weighting would be applied to align samples with the characteristics of the South Dakota population. Following data weighting, we used a one-way analysis of variance to compare the mean scores for domination and mutualist wildlife value orientations in South Dakota across the three survey methods. We used multiple linear regression to test for an effect of survey method on domination and mutualism scores while controlling for the effect of demographics and fish/wildlife recreation participation. The linear regression analysis was repeated on our national-level data to determine if there was a method effect between the two survey methods that were ultimately used in the full, 50 state data collection.

Results

South Dakota Pilot Study

Response rates and sample sizes from the South Dakota pilot study are listed by survey method in Table 1. We compared the extent to which unweighted sample proportions for respondent gender and age group mirrored the proportions for South Dakota reported by the U.S. Census Bureau. Results indicated that the mail survey and the telephone survey underestimated younger respondents. The mail survey also underestimated females. All survey methods overestimated the proportion of the South Dakota population that participate in hunting or angling when compared to results of the 2011 National Survey of Fishing,

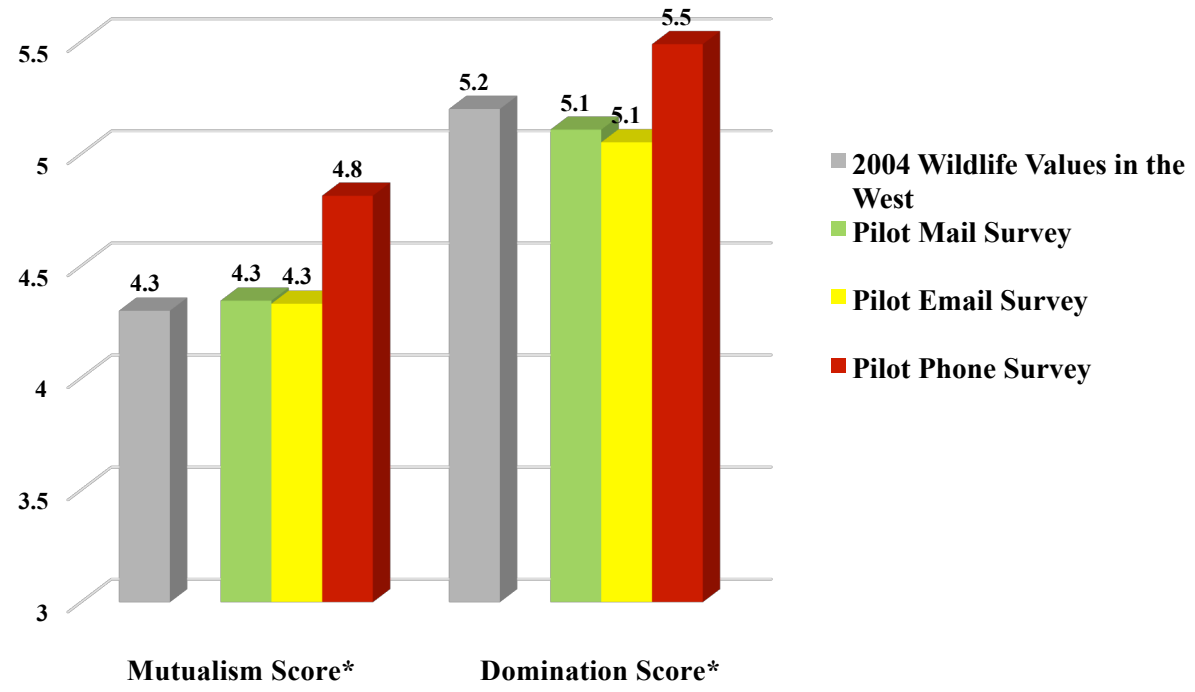
Hunting, and Wildlife-Associated Recreation. Based on these results, we developed weighting factors for all three samples to align them with characteristics of the South Dakota population as indicated by the external data sources (Table 1).

Table 1. Response rate, sample size, and weighting variables for phone, mail, and email panel samples of South Dakota residents.

Survey Method	Response Rate	Sample Size	Weighting
Phone	19%	n=244	-Hunt/fish participation -Age
Mail	20%	n=397	-Hunt/fish participation -Age -Gender
Email Panel	N/A	n=200	-Hunt/fish participation

The mail and email panel surveys provided similar estimates of mutualism and domination value orientations in South Dakota (Figure 1). Results from these two survey methods also mirrored the baseline results from the 2004 mail survey (Teel et al. 2005). The telephone survey yielded higher estimates of mean mutualism ($F = 11.00$, $p < .001$) and domination ($F = 12.92$, $p < .001$) value orientation scores when compared to the mail and email panel samples (Figure 1). The effect-size associated with these differences were in the *minimal* to *typical* range (Eta = .16 and .18; Vaske 2008).

Figure 1. Comparison of mean mutualism and domination wildlife value orientation scores for South Dakota residents by survey method.



*Scale ranges from 1–7.

A collection of predictors including demographic variables, hunting/angling participation, and survey method explained 11% of the variance in the mutualism value orientation scores of South Dakota respondents (Figure 2). The results indicated that, while controlling for the effect of other predictors, the telephone survey method explained 2% of the variance in mutualism scores. The same analysis applied to the domination value orientation scores explained 19% of the variance. In this model, the phone survey method independently explained 3% of the variance in domination (Figure 3). Survey method was not a statistically significant predictor of mutualism or domination scores in South Dakota once phone survey respondents were removed from the analysis (i.e., we did not detect a method effect when comparing mail survey vs. email panel survey responses).

Figure 2. Relative effect (percent of variance explained) of demographics, hunting/angling participation, and phone survey method on mutualism wildlife value orientation among South Dakota respondents.

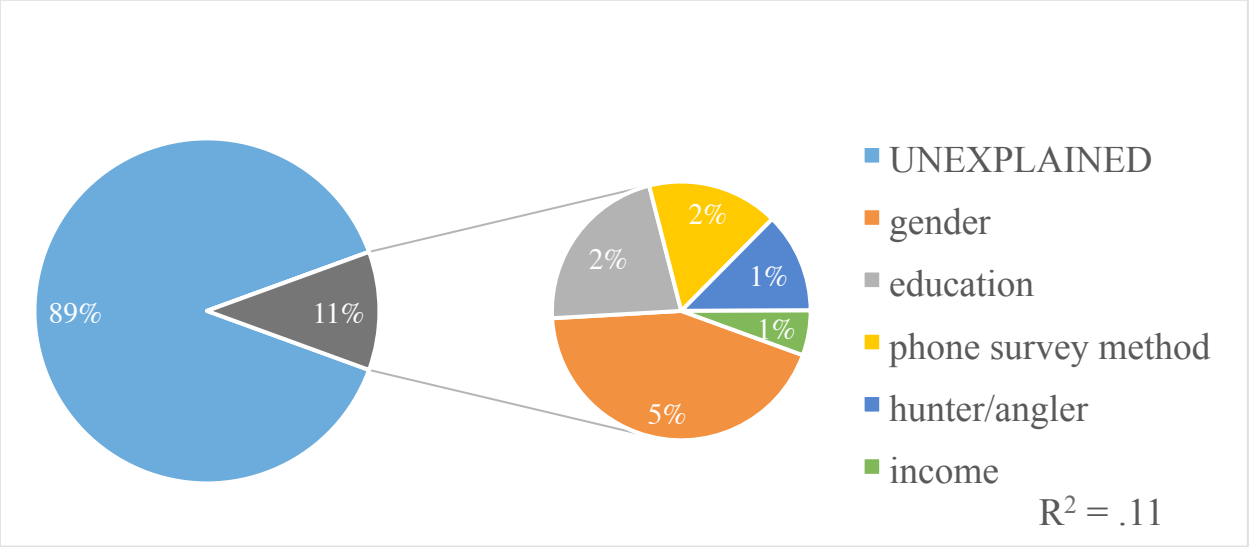
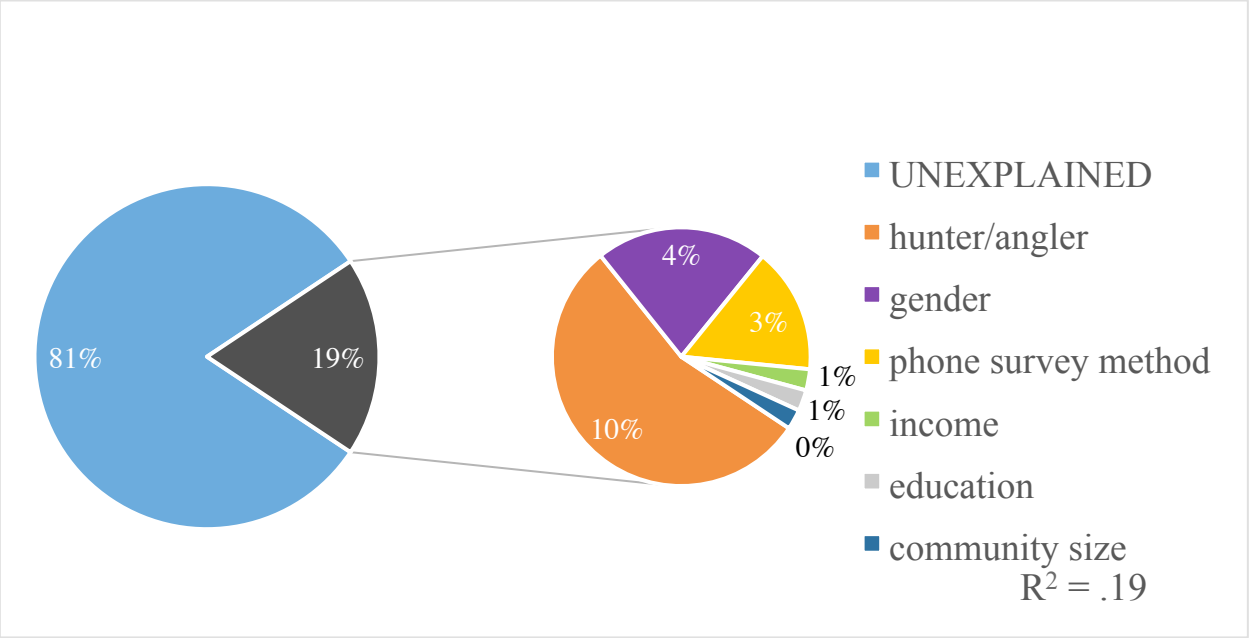


Figure 3. Relative effect (percent of variance explained) of demographics, hunting/angling participation, and phone survey method on domination wildlife value orientation among South Dakota respondents.



National-Level Mixed-Method Sample

Following the completion of the South Dakota pilot study, we launched nationwide data collection via mail survey. The overall response rate was 10%, yielding a sample size of 26,748 mail respondents. Each state was resampled via email panel to collect an additional 300 respondents (that matched the state's age and gender proportions according to the American Community Survey). A final round of sampling targeted certain states to enhance representation of race/ethnic diversity in the sample. In total, 17,201 email panel responses were collected, resulting in an overall national sample of 43,949. These data were weighted at the state level to align demographics (gender, age, race/ethnicity) with American Community Survey data and hunting/angling participation with data from the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

We replicated the multiple regression approach used during the South Dakota pilot study to test for effects of survey method in the national data. The model explained 7% of the variance in the national mutualism score (Figure 4). Controlling for the effect of other predictors, the email panel survey method explained 0.09% of the variance in mutualism. The model explained 19% of the variance in the national domination score (Figure 5). Controlling for the effect of other predictors, the email panel survey method explained 0.01% of the variance in domination.

Figure 4. Relative effect (percent of variance explained) of demographics, hunting/angling participation, and email survey method (online panel) on mutualism wildlife value orientations in the U.S.

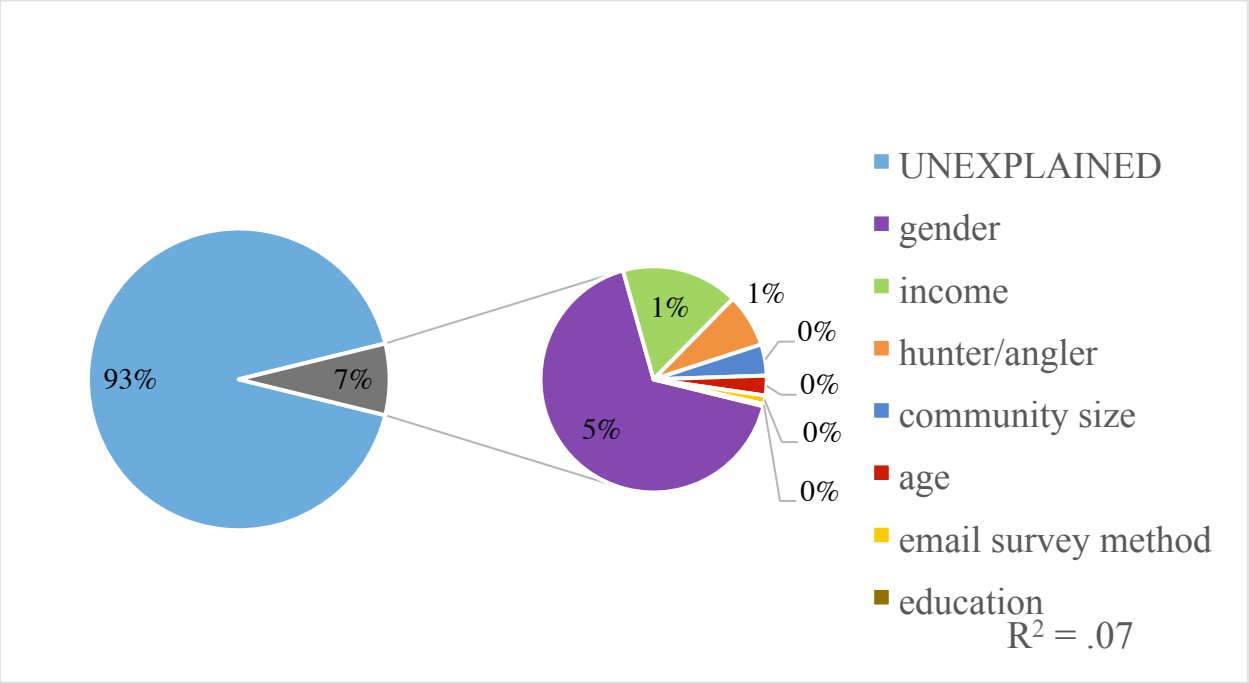
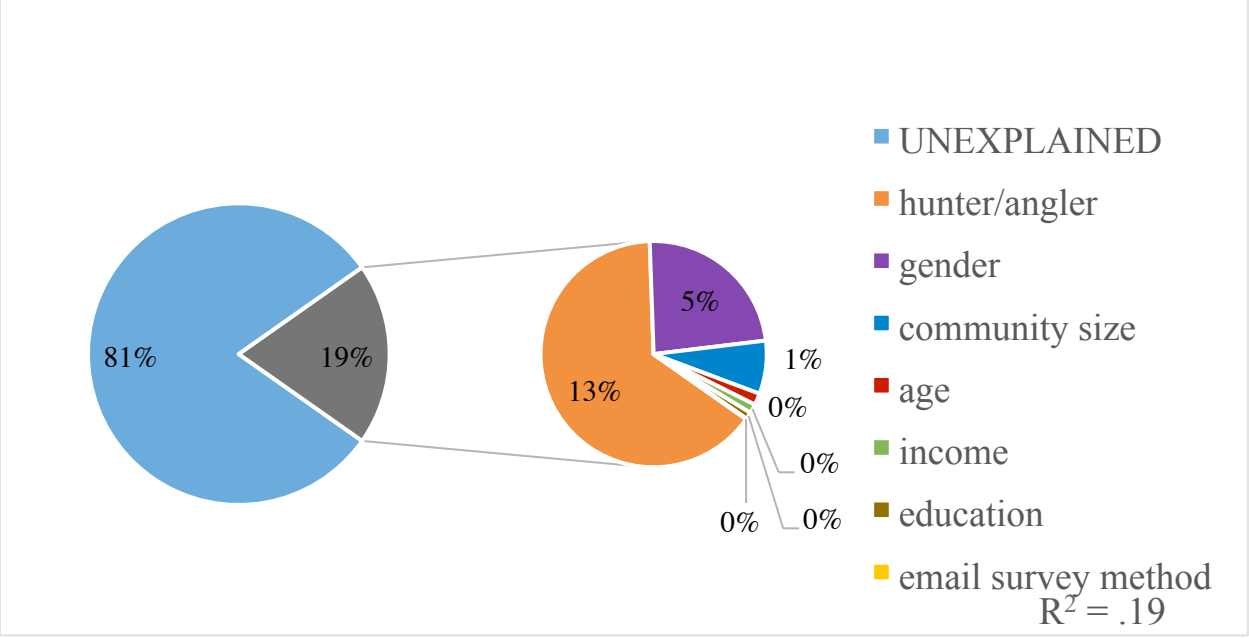


Figure 5. Relative effect (percent of variance explained) of demographics, hunting/angling participation, and email survey method (online panel) on domination wildlife value orientations in the U.S.



Discussion

We used the results of the South Dakota pilot study to aid in determining the final data collection strategy for the AWV project. The mail and email panel surveys provided estimates of mutualism and domination value orientations in South Dakota that were strikingly similar to each other and to the 2004 WVW survey results. This finding is in line with previous value orientation studies in the state that have indicated relative stability of these measures over time (Gigliotti 2012; Gigliotti and Don Carlos 2017). However, we discovered significant differences in measures of mutualism and domination value orientations between the telephone survey and the two self-administered survey methods. This result led to concern over the potential for a method effect if a telephone survey was used for the AWV project. Such an effect might have compromised our ability to assess change in wildlife value orientations in the western U.S. states where data baselines had been established via mail survey.

The higher scores for both the mutualism and domination value orientations achieved via telephone survey reveal a pattern of higher levels of agreement with the statements used to measure these orientations on the survey instrument (see Teel and Manfredo 2009 for a detailed explanation of this measurement approach). A review of methodological literature provides a plausible explanation for this response pattern. Several authors have noted the potential for measurement differences between self-administered and interviewer assisted survey methods (Fleming et al. 2013; Dillman, Smyth, and Christian 2014; Dillman et al. 1996; Hammarstedt et al. 2017). These differences have been attributed to the presence of an interviewer triggering respondents to provide either more agreeable responses or responses that they perceive to be more socially desirable (Holbrook, Green, and Krosnick 2003; Krosnick 1999). The wildlife value orientation measurement scales include several statements related to beliefs about appropriate treatment of wildlife and it is possible that these topics are particularly susceptible to motivational pressures on the respondent that are introduced by the presence of an interviewer. As such, we determined that maintaining the mail survey methodology was the most prudent choice for our specific purposes.

Ultimately, we administered the survey via mail in all 50 states. While our pilot study results revealed a 25% decline in the South Dakota mail survey response rate compared to 2004 results, response rates for the full 50 state effort varied considerably. Our response rate averaged 10% nationally and the mail survey provided sample sizes below our targets for many states. In need of an economical and efficient means to augment the state-level mail samples, we turned to email panel surveys. Convergence of estimates between email and mail in the pilot study suggested that these two methods could be used in a mixed-method data collection design. As a result, we augmented the samples using email panel follow-up surveys and aggregated the mail and email panel samples to produce state-level estimates.

Testing for method effects between mail and email showed that only a very small fraction of a percent of variance in value orientation measures could be attributed to the type of survey a respondent answered. We believe that these results provide support for an approach that uses the two data sources in a mixed-method design. Further evidence of the convergence of mail and email panel results was revealed during the estimation of the change in wildlife values between 2004 and 2018 in the western states. This effort revealed a fairly consistent pattern of value shift (away from domination and toward mutualism) across the American West (Manfredo et al. 2018). During the analysis, we isolated estimates obtained via mail and email panel surveys and looked at their independent measures of value shift. The average difference in percent change for wildlife value types (see Teel and Manfredo 2009 or Manfredo and Teel earlier in this volume for a discussion of value types) for 19 western states ranged from 0.6% to 3.6%.

We hope that our experiences with alternative methodologies presented here will add to an ongoing discussion about the modern state of survey research. All of the survey administration approaches we explored presented benefits and drawbacks from both logistical and methodological standpoints. Continued research attention toward such considerations could improve our understanding of persistent issues including convergent validity between survey methods, strategies to address response rate decline, and the integration of new technologies into study designs. This would contribute to the establishment of greater clarity in the literature to assist researchers in selecting the most appropriate and

defensible data collection strategy for future study of human dimensions in the wildlife and natural resource management context.

Acknowledgments

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What Is the Current Composition of Wildlife Values in the United States and Why Are These Values Important to Management?

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Introduction

A growing concern for wildlife professionals in the United States is the increase in social conflict over wildlife management issues. This conflict is largely rooted in value differences that form the foundation for differences in public attitudes and behaviors. Our prior research has indeed demonstrated a connection between wildlife values and attitudes toward wildlife-related issues (e.g., Fulton, Manfredo, and Lipscomb 1996; Manfredo et al. 1999; Whittaker, Vaske, and Manfredo 2006; Teel and Manfredo 2009; Manfredo, Teel, and Henry 2009; Manfredo, Teel, and Dietsch 2016; Dietsch, Teel, and Manfredo 2016). Findings as a whole show how wildlife values are predictive of attitudes across a diverse array of issues, forming the basis for conflicting positions, and are particularly useful in explaining variability on issues involving harm to wildlife and trade-offs between human interests and wildlife protection (Teel and Manfredo 2009; Manfredo, Teel, and Dietsch 2016). This research has identified two primary value dimensions—or wildlife value orientations: domination and mutualism (Manfredo, Teel, and Henry 2009; Teel and Manfredo 2009). *Domination* embraces the notion that wildlife is subordinate and should be used and managed in ways that benefit humans. *Mutualism*, in contrast, embraces wildlife as part of a person's extended social network and animals are seen as family or companions, deserving of caring and rights like humans. People with a strong domination orientation tend to exhibit greater concern for human interests, including private property rights, a healthy economy, and public access; those with a strong mutualism orientation are instead more likely to prioritize wildlife-focused concerns, including habitat protection and species declines, in their attitudes. Studies have also shown a strong association between wildlife values and certain behaviors including participation in wildlife-related recreation activities (e.g., Manfredo et al. 1996; Bright, Manfredo, and Fulton 2000; Zinn, Manfredo, and Barro 2002; Teel and Manfredo 2009).

Adding to these prior studies, data from the 2018 America's Wildlife Values (AWV) project allowed us to further examine the predictive validity of the wildlife values concept across all 50 states. The purpose of this manuscript, in relation to our collection of papers from the special session, is to report on select findings from this effort as to: (1) the geographic distribution of wildlife values across the 50 states and (2) the impact of wildlife values on key attitudes and behaviors that are indicative of important challenges to contemporary wildlife management. An understanding, fostered through this multistate effort, of the current composition of wildlife values in the United States and how those values relate to critical issues of management concern can help professionals better anticipate and respond to the mounting public controversy around wildlife-related topics.

Geographic Distribution of Wildlife Values in the United States

Figure 1 shows the geographic distribution of the four wildlife value types (see Manfredo and Teel earlier in this volume and Teel and Manfredo 2009 for more detail on this values typology). Color shading is used to show the range of percentages for each type across the 50 states. The highest percentages of traditionalists were found in the Rocky Mountains and Plains states as well as the Southeast, while the lowest percentages were documented in the Northeast and along the West coast. Percentages of traditionalists ranged from 17 to 18% in California and some of the northeastern states to nearly 50% in the Dakotas and Wyoming. Twenty-eight percent of people were classified at the national level as traditionalists.

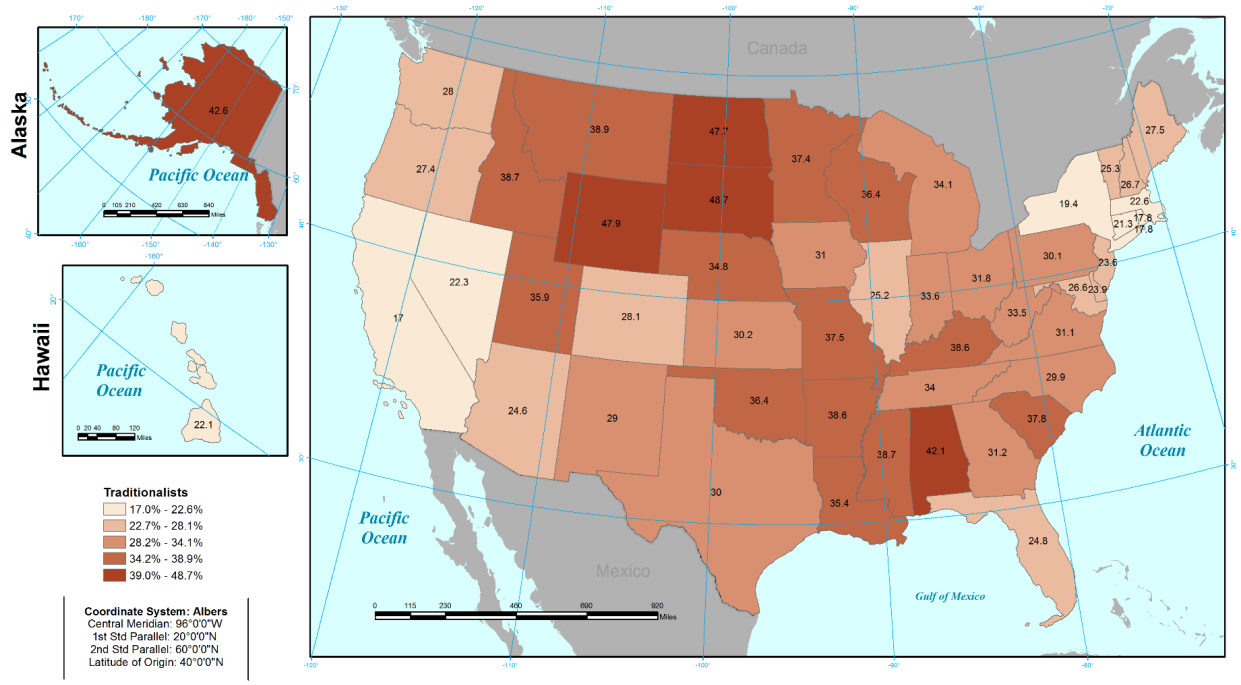
For mutualists, the pattern was reversed, with the highest percentages found mainly in the Northeast and along the West coast and in Florida and Hawaii. The range of percentages for this value type was from 16 to 18% in Mississippi, North Dakota, and Alaska to close to 50% in California. Mutualists represented 35% of the population at the national level.

The pattern for pluralists was similar in some cases to that of traditionalists. The highest percentages, at around 30%, were found in Alaska, North Dakota, and some of the southern states (e.g., Mississippi, Arkansas, West Virginia). The lowest percentages, ranging from 15 to 20%, were in the western and northeastern coastal states such as California and Massachusetts, respectively. Twenty-one percent of people were classified at the national level as pluralists.

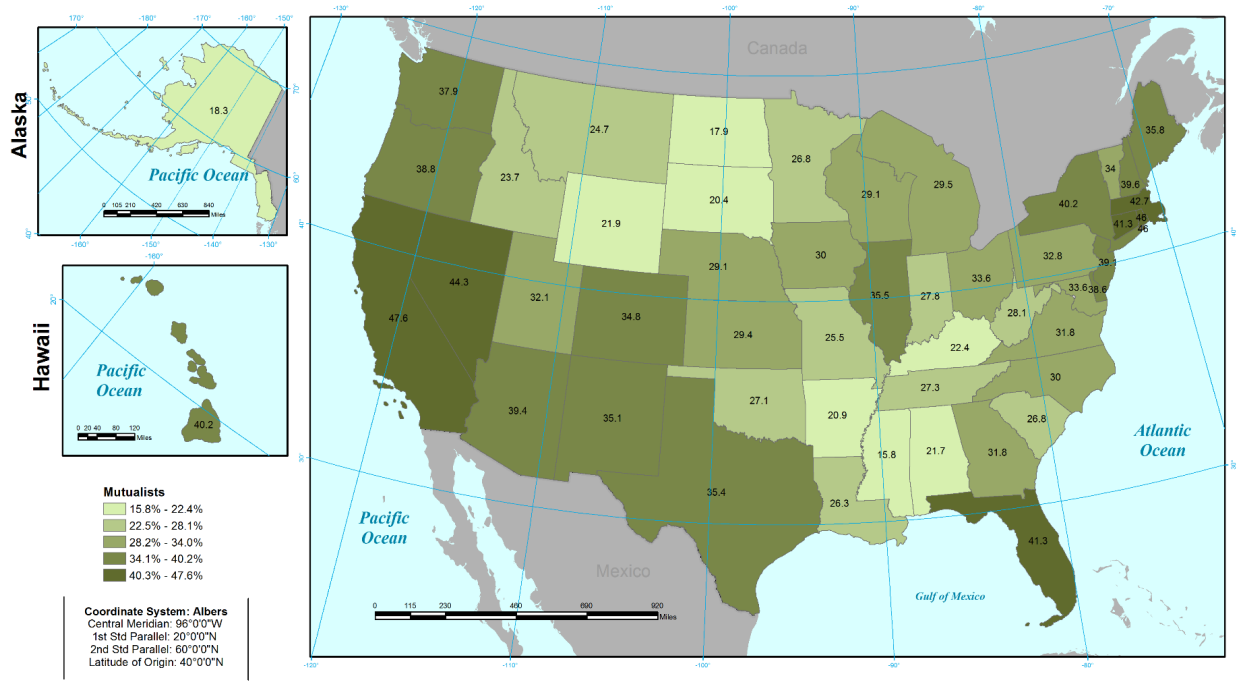
Finally, percentages for the distanced type were relatively low overall, with the exception of California (21%) and some of the northeastern states (e.g., New York, New Jersey, Maryland). The lowest percentage was found in Wyoming (5%) and 15% of people nationwide were classified as distanced.

Figure 1. Geographic distribution of wildlife value types across states.

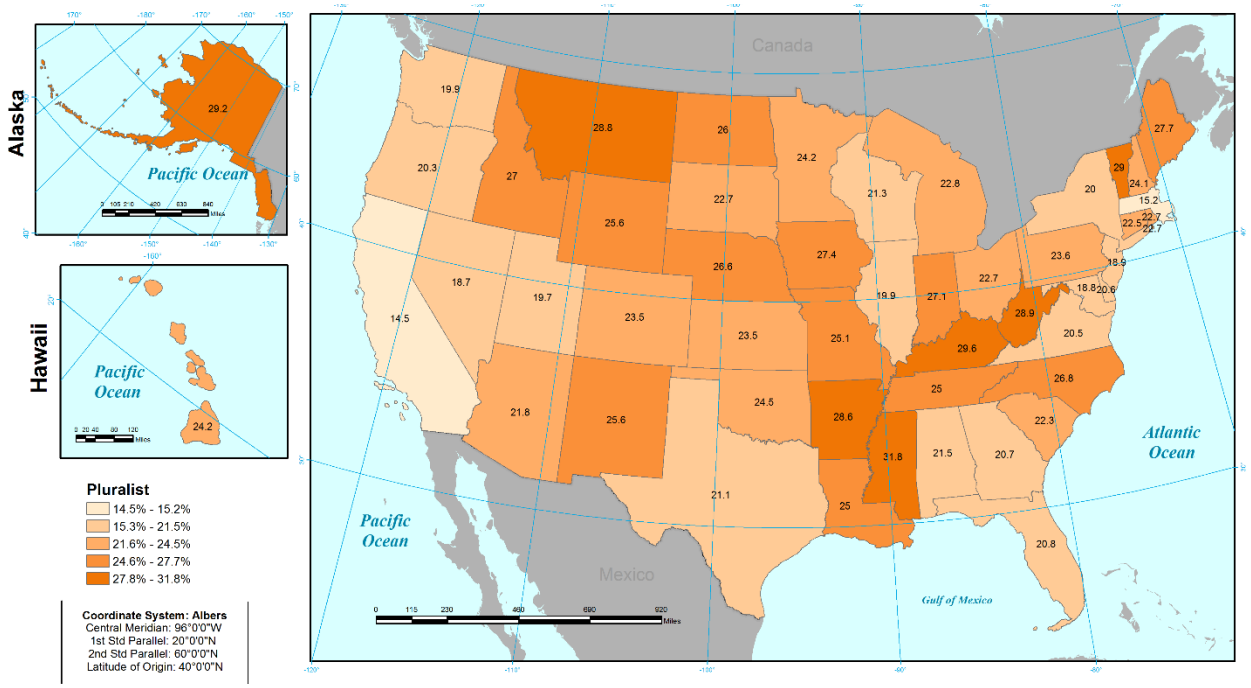
(a) Percent traditionalists.



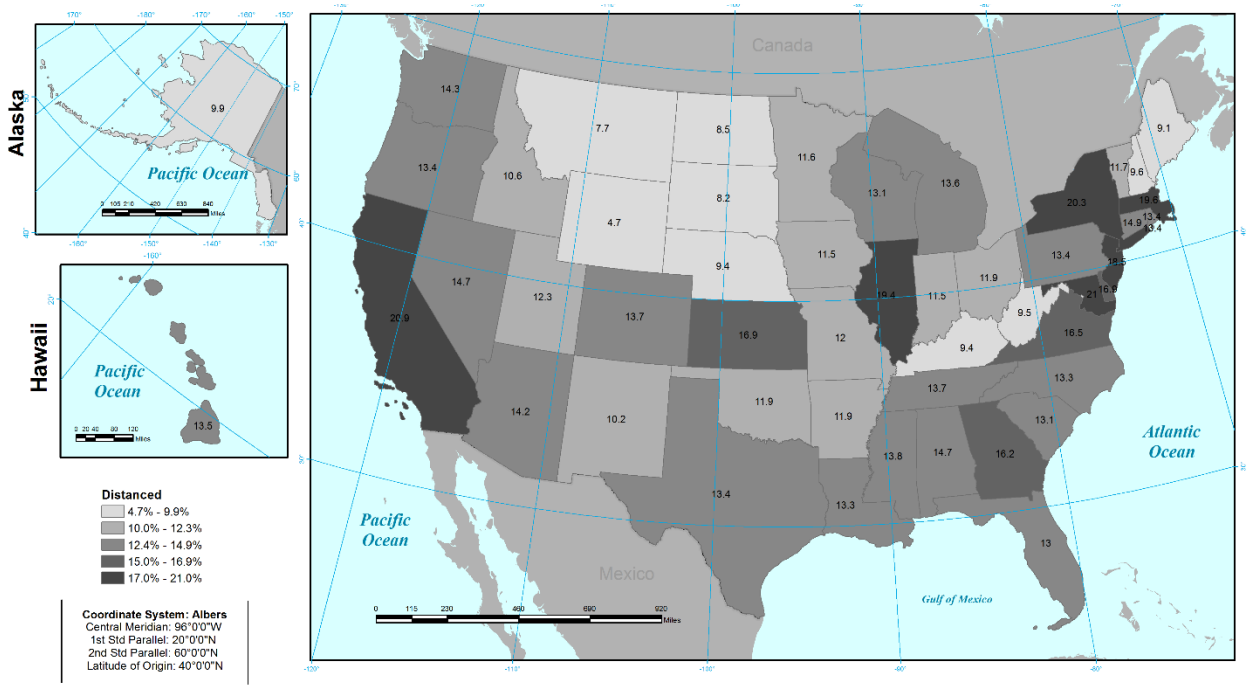
(b) Percent mutualists.



(c) Percent pluralists.



(d) Percent distanced.



Impact of Wildlife Values on Attitudes and Behaviors

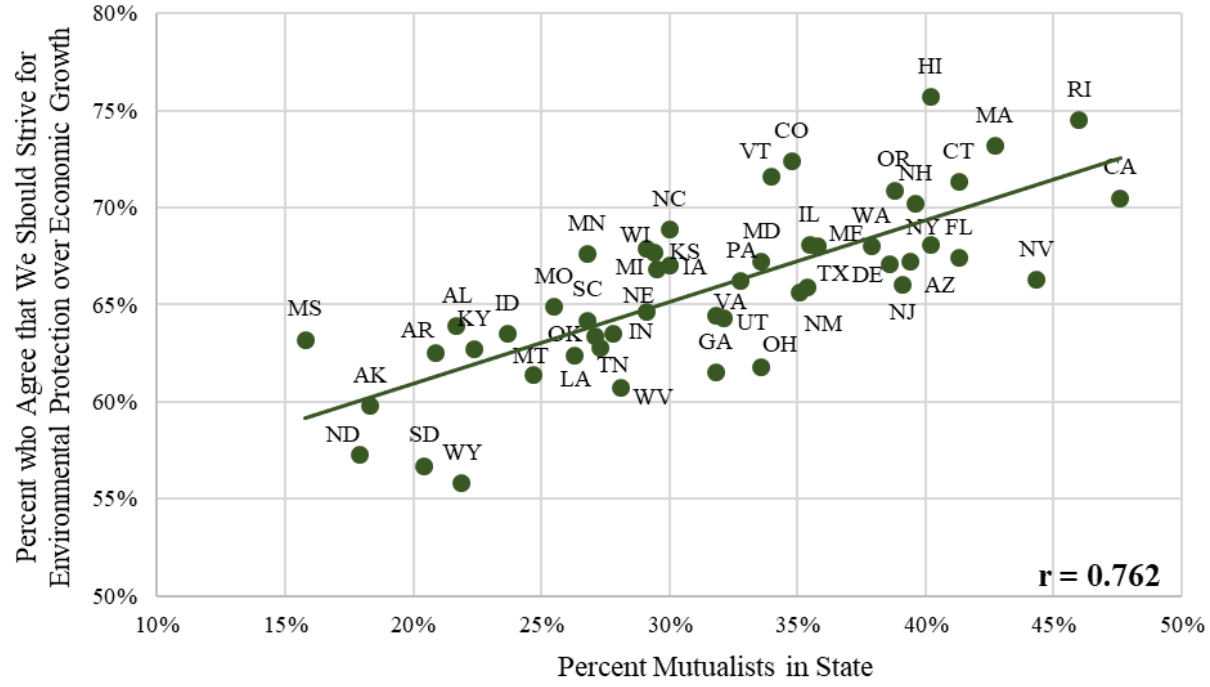
Below are illustrations of our findings that show how domination and mutualism impact attitudes and behaviors in the following areas: environmental protection; human-carnivore conflict and predator management; trust in government; preferences for agency funding; and hunting participation. By providing evidence of the role of values in affecting public response to these varied topics, results reveal how the mix of value types within and across states can define the social context of contemporary management issues.

Environmental Protection

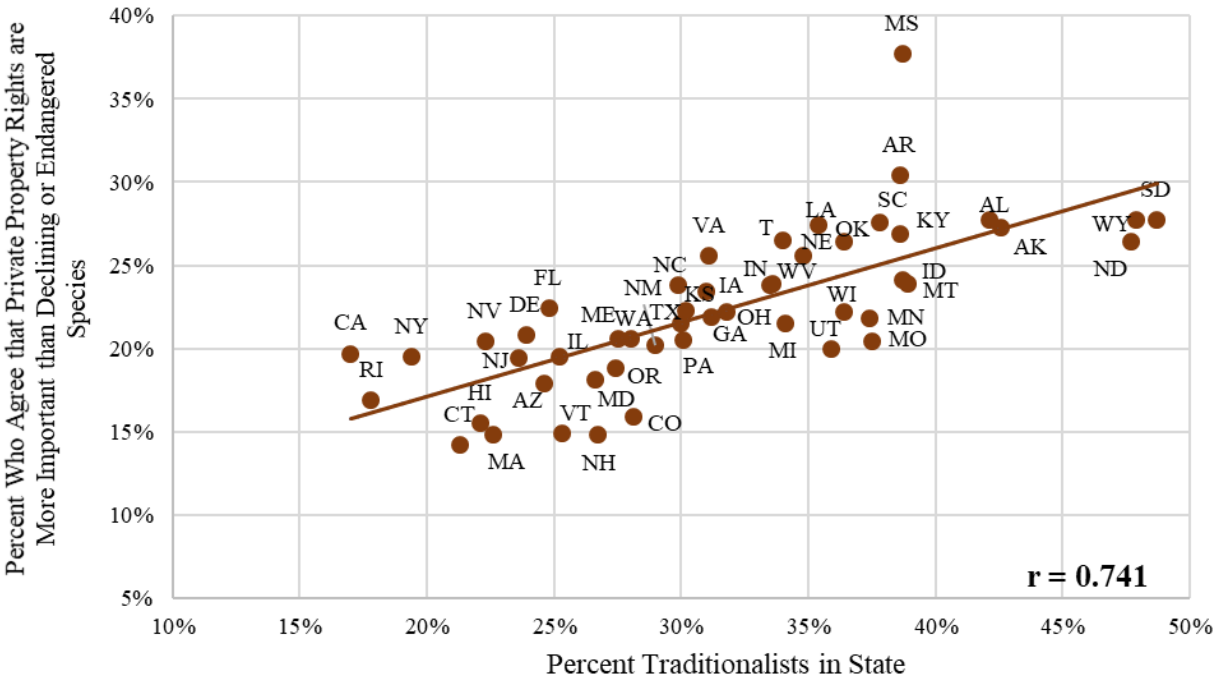
Figure 2 shows how wildlife values relate to broader environmental concerns. Specifically, it details the relationship between the percent of mutualists in a state and the percent of residents who agree that we should strive for a society that emphasizes environmental protection over economic growth. States with higher percentages of mutualists were more likely to agree with this prioritization of the environment. Figure 2 also provides an example that relates more explicitly to concerns about wildlife protection. It shows a strong, positive association between the percent of traditionalists in a state and the percent of people who agree that private property rights are more important than protecting declining or endangered fish and wildlife. States with higher percentages of traditionalists were more likely to agree with this statement, indicative of a broader preference for human interests taking precedence over wildlife protection.

Figure 2. State-level association between wildlife value types and attitudes toward environmental issues.

(a) Percent mutualists across states by percent who agree that we should strive for a society that emphasizes environmental protection over economic growth.



(b) Percent traditionalists across states by percent who agree that private property rights are more important than protecting declining or endangered fish and wildlife.

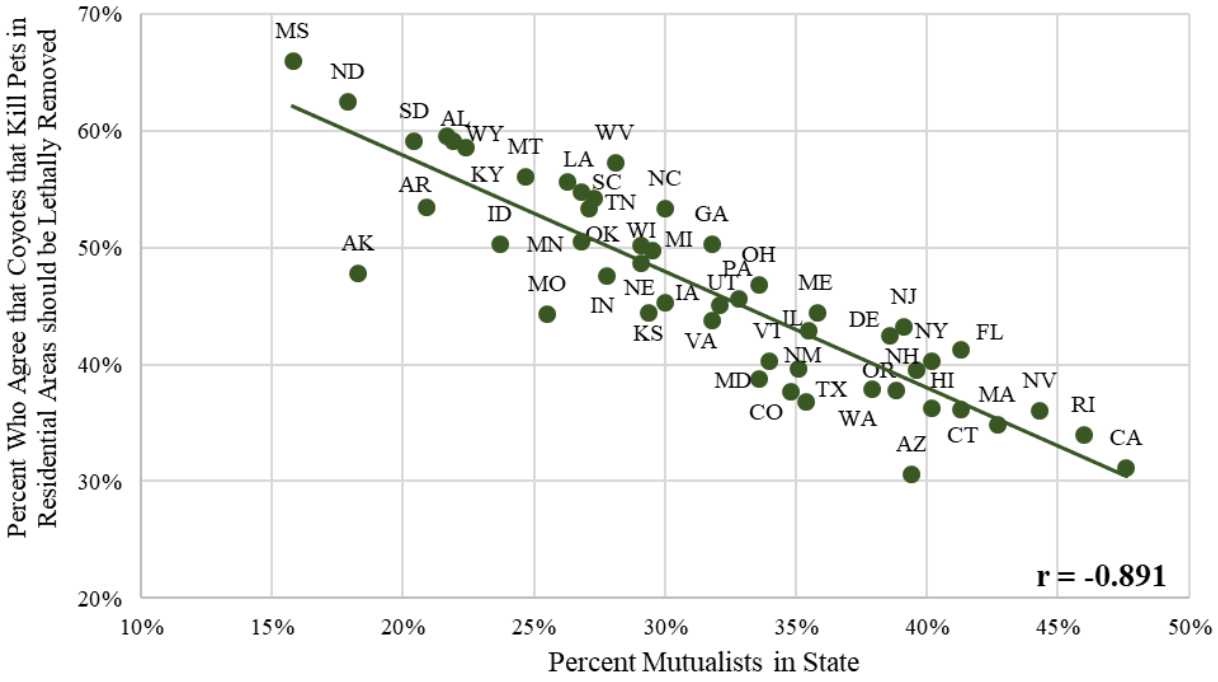


Human-Carnivore Conflict and Predator Management

Predator management has become increasingly controversial in the United States, and public opinion is often polarized, especially around lethal control measures. Figure 3 illustrates the impact of wildlife values on attitudes toward predator management issues, with a specific focus on control of carnivores involved in conflict situations. First, this figure presents results relevant to a situation on the rise in urban environments across the nation—coyotes (*Canis latrans*) attacking pets in residential areas. States with higher percentages of mutualists had much lower levels of support for lethal removal of coyotes involved in this situation. For example, only around 30% of residents in California agreed with this approach, compared to more than 60% in North Dakota and Mississippi, where there were much lower percentages of mutualists. Wolf (*Canis lupus*) management is another controversial topic, which we explore next in Figure 3. Results reveal how mutualism was associated with lower levels of support for lethal removal of wolves involved in conflicts with livestock. States with higher percentages of mutualists were less accepting of this practice.

Figure 3. State-level association between wildlife value types and attitudes toward predator management issues.

(a) Percent mutualists across states by percent who agree that coyotes that kill pets in residential areas should be lethally removed.



(b) Percent mutualists across states by percent who agree that wolves that kill livestock should be lethally removed.

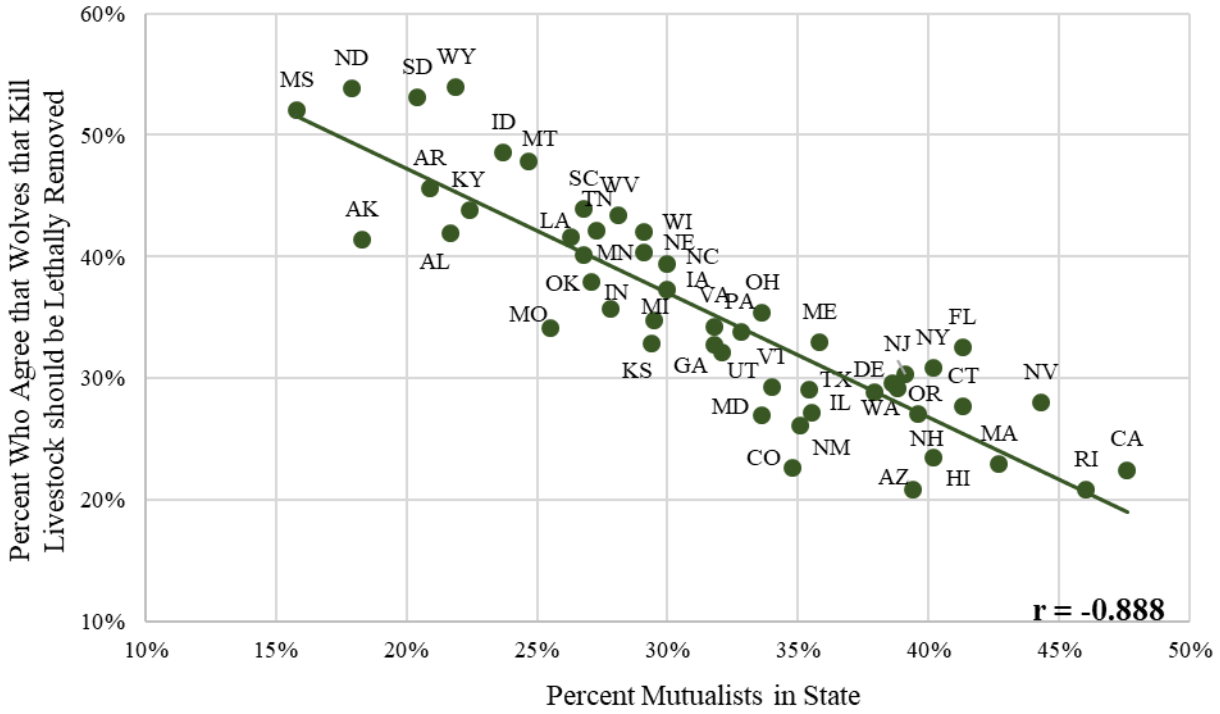
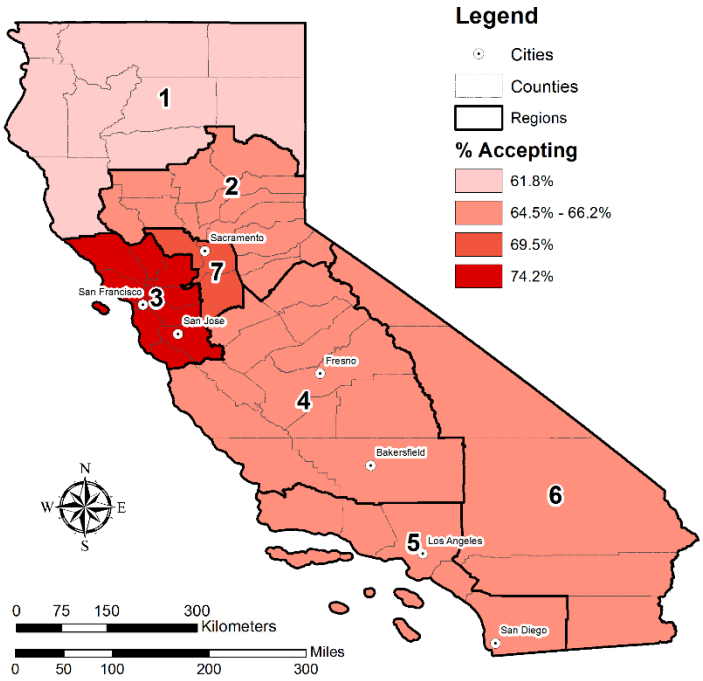


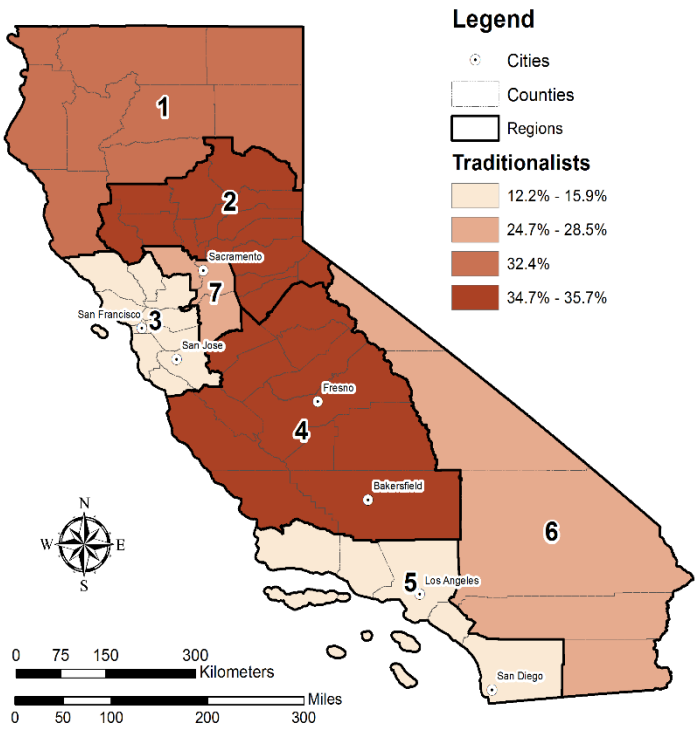
Figure 4 shows an example of state-specific findings from California where wolves have begun to move into the state from surrounding areas. Collection of data at the region level, in this case, allowed greater depth of exploration regarding variability in public attitudes within the state. The figure shows the acceptability of allowing wolves to recolonize and establish new populations on their own in California; data are reported across California Department of Fish and Wildlife (CDFW) regions, plus an additional Sacramento-area region. Results indicate that support for recolonization was relatively high overall at the state level (67%) but that support varied by region and by wildlife values composition. Regions with higher percentages of traditionalists, as shown here, were less accepting of recolonization. By depicting data in this way—spatially and at more local levels—areas of potential conflict (i.e., "hotspots") over wolf recovery can be more readily identified; these are areas where more intensive outreach may be needed to build greater support for species restoration. We expanded this analysis to also include information from CDFW about wolf habitat suitability (Figure 4). The comparison of maps here shows lower levels of support in certain regions that may be more likely to have wolf populations in the future.

Figure 4. Percent support for wolf recolonization across CDFW regions in California compared to wildlife values and wolf habitat suitability.

(a) Percent support for wolf recolonization.



(b) Percent traditionalists by region.

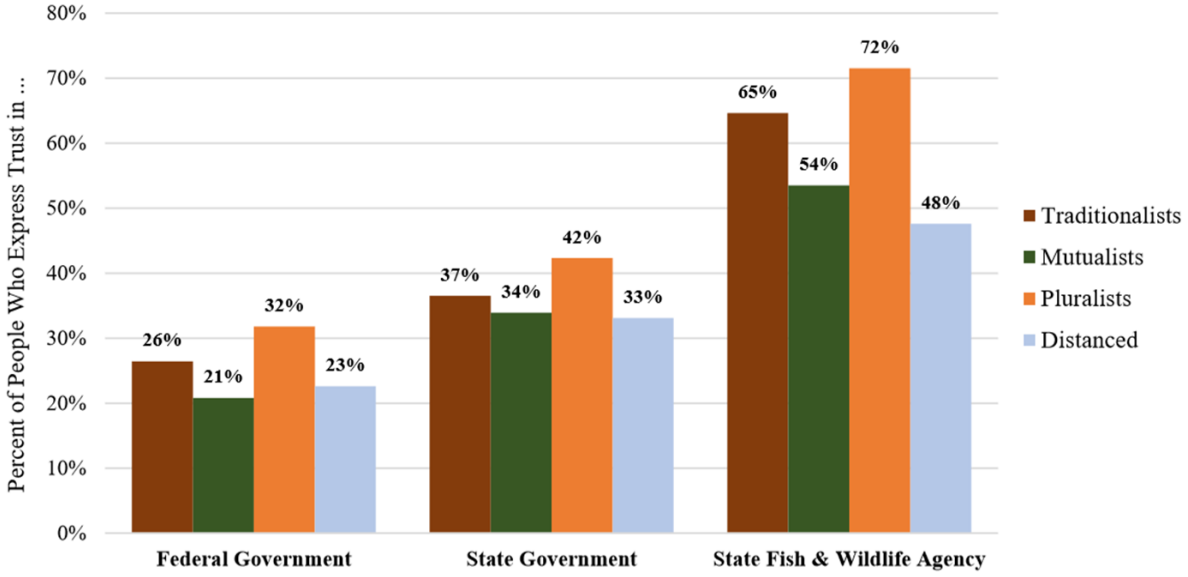


(c) Wolf habitat suitability.

Trust in Government

One of the outcomes of value shift that has been discussed in the literature is a gradual loss of faith in government (Inglehart and Welzel 2005). This decline in trust is believed to originate from the emergence of new expectations for government institutions that are slow to change and unable to keep pace with the demands of a changing public. Building on our previous work that began to explore these issues of trust in relation to the shift toward mutualism, we measured trust in different forms of government across all 50 states in 2018 (Teel et al. 2005; Manfredo et al. 2017). Figure 5 reports the results of these findings in relation to wildlife values, showing how trust in federal and state governments was substantially lower than trust in state fish and wildlife agencies. For the latter, traditionalists (65%) and pluralists (72%) were more trusting of the agencies than mutualists (54%) and distanced (48%) individuals. These results contribute to our broader argument that, with modernization, there may be a growing disconnect between emerging publics and the agencies charged with representing them in decisions. Mutualists, who perceive themselves as holding different values than wildlife management institutions, have lower overall levels of trust in the agencies. However, as agencies attempt to be more inclusive and attentive to the diversity of wildlife values, they may also see declines in trust among their traditional constituents (Manfredo et al. 2017, 2018).

Figure 5. Trust in different forms of government by wildlife value type.

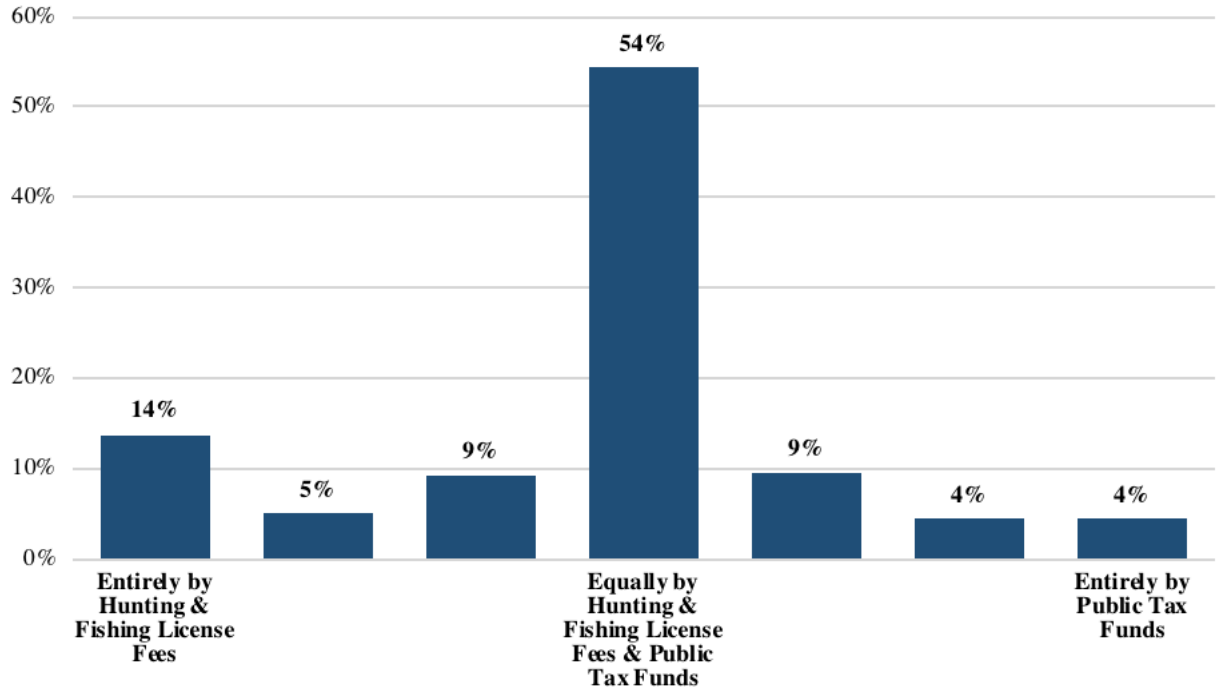


Preferences for Agency Funding

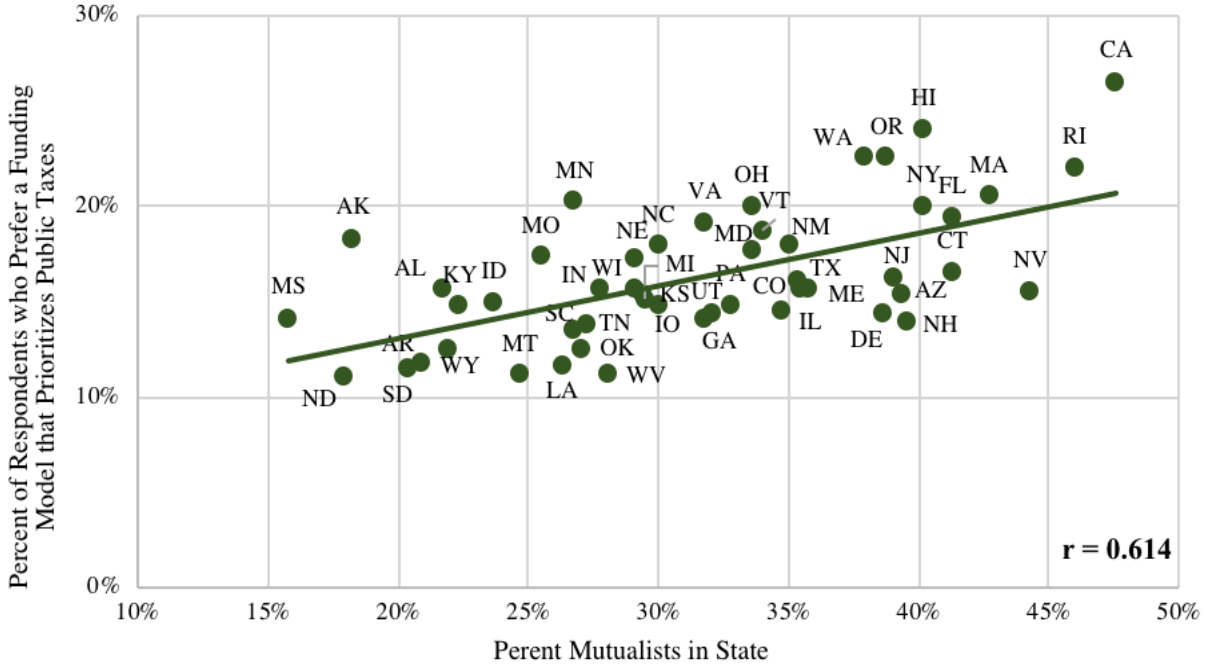
A critical challenge that state fish and wildlife agencies are facing is their ability to maintain a stable source of funding for wildlife conservation and management. Continued reliance on the sale of hunting and fishing licenses as the primary funding mechanism, in most cases, is proving problematic as agencies witness declines in hunting and other factors underscoring the need to diversify the funding base. Their ability to do so successfully, however, depends on how receptive residents are to different alternative funding mechanisms. To explore this issue on the 2018 AWV survey, we asked respondents to indicate how they think their state fish and wildlife agency should be funded in the future. Response options ranged from 1 to 7, where 1 was "entirely by hunting and fishing license fees" and 7 was "entirely by public tax funds," with a midpoint of 4 as "equally by hunting and fishing license fees and public tax funds." Results are reported in Figure 6, which shows that the majority (54%) of respondents preferred an approach where license fees and public taxes receive equal weight. However, as also illustrated in Figure 6, results varied by wildlife values. States with higher percentages of mutualists had higher percentages of residents preferring a funding model that prioritizes public taxes.

Figure 6. Association between wildlife value types and attitudes toward funding issues.

(a) National preferences for how state fish and wildlife agencies should be funded.



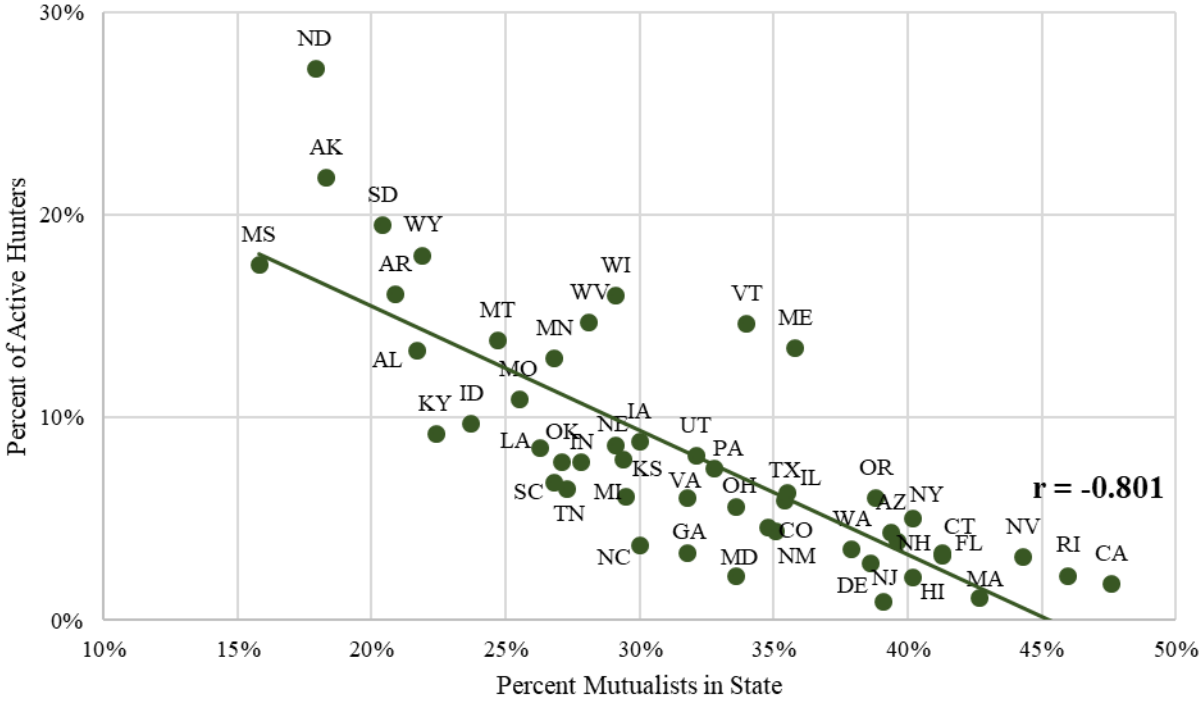
(b) Percent mutualists across states by percent who prefer a funding model for state fish and wildlife agencies that prioritizes public taxes (representing responses above the midpoint of four on the one-to-seven response scale).



Hunting Participation

Facilitating and managing participation in wildlife-related recreation is a central function of state fish and wildlife agencies. Concerns about declines in hunting and related concerns about sustainable funding have led to a variety of agency initiatives in recent years aimed at recruiting and retaining hunters and removing potential barriers (e.g., lack of access) to hunting participation (Council to Advance Hunting and the Shooting Sports 2016). An important question that demands attention in this context is: What is at the root of declines in hunting? According to our model, modernization is contributing to a broadscale cultural shift that is affecting how people interact with and relate to wildlife, which would include participation in different forms of wildlife-related recreation. We also know from previous research that individuals' participation in hunting is strongly associated with a domination orientation toward wildlife (e.g., Zinn, Manfredo, and Barro 2002; Teel and Manfredo 2009), an orientation that may be waning in influence with the growth in mutualism. As an illustration of these relationships, Figure 7 shows the association between the percent of mutualists in a state and the percent of people classified in our 2018 study as "active hunters." The latter are individuals who reported having hunted in the past and also in the last 12 months. States with higher percentages of mutualists had lower percentages of active hunters. In fact, some of the states with the highest percentages of mutualists (e.g., California, Rhode Island, Massachusetts, Nevada) had less than 5% of residents classified as active hunters, compared to more than 20% in North Dakota and Alaska (low mutualist states). These findings suggest that, with the growth in mutualism values, there is a potential for continued declines in hunting. Results also suggest that these declines may be rooted in broad cultural factors that go beyond individual barriers or constraints to participation in the sport.

Figure 7. Percent mutualists across states by percent of active hunters (those who had hunted in the past and in the last 12 months).



Conclusion

Broad underlying questions that are helping to guide our program of research include: How do agencies adapt and remain relevant, in the face of societal change, to an increasingly diverse constituency? What are ways for agencies to more effectively engage new audiences while still being responsive to the needs of traditional stakeholders? How can they garner broad-based support to ensure sustainable funding exists in the future?

Findings from the 2018 AWV project, including results presented here, are intended to assist agencies in their response to these questions by providing information to enhance understanding of the changing social context of wildlife management in the United States. Fostering this understanding represents a critical first step in formulating strategies that can attend to the increasing diversity of public interests and potential for conflict in wildlife management in the future. Taken in combination, the findings reported here illustrate the importance of knowing the value composition within a state, as it affects support for wildlife management practice and policy. This information can assist wildlife professionals in taking more proactive approaches in the future by being able to anticipate public reactions to new issues and determine areas where communication may be needed to build greater support for conservation and management efforts.

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Symmetry of Change: Are Agencies and the Public Co-Evolving?

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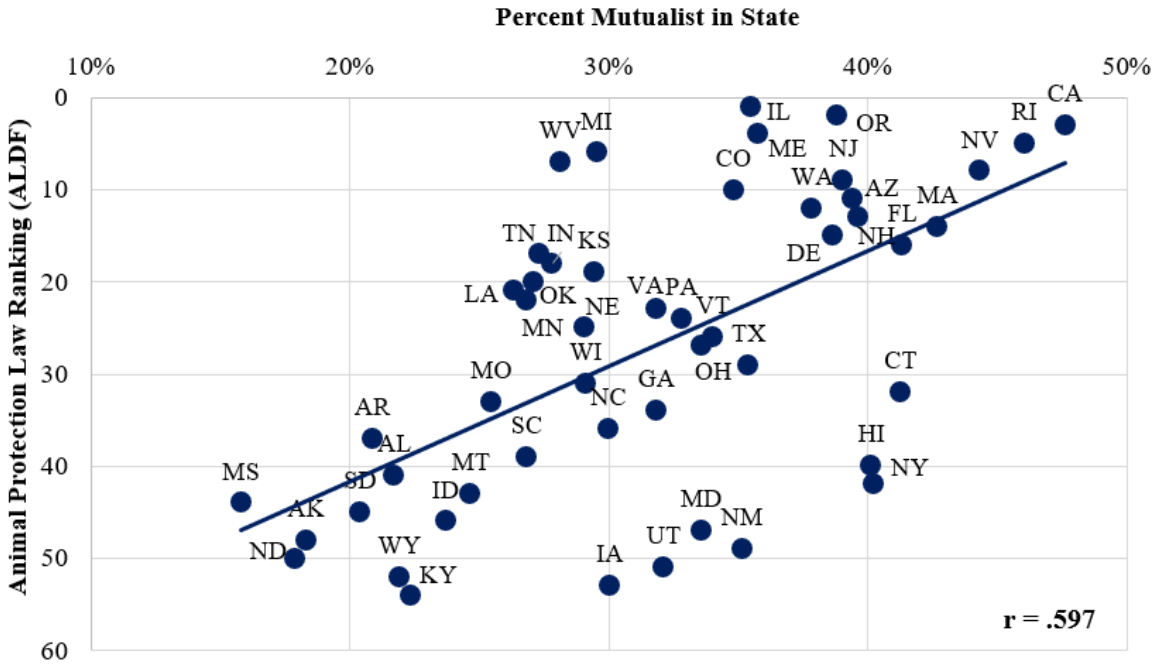
Introduction

Social values have shifted greatly in the last century as forces of modernization, including increased income, education, and urbanization, have altered the lifestyle and needs of many in American society (Inglehart 2018). Associated with this has been a significant shift in wildlife values, with many states across the U.S. becoming more mutualistic in their value orientations (see Manfredo and Teel earlier in these proceedings). This transformation poses significant challenges to state wildlife agencies, who have traditionally held domination values at the center of their decision-making. Likewise, value shift has been accompanied by an increasing interest in public participation in decision-making, which managers may see as contradicting their agencies' prioritization of science as a foundation for wildlife policy (Decker et al. 1991). As wildlife values grow increasingly pluralistic across the U.S. landscape, these factors compound to create new and complex challenges for managers who aim to reconcile diverse public values in wildlife management policy.

Such a discrepancy in values may be problematic because, as citizens, we expect public policy around natural resources to reflect collective values about the sort of world and environment we want to live in. In some instances, policy is indeed a strong mirror of public values. For instance, a 2017 study by the Animal Legal Defense Fund ranked U.S. states by the strength and comprehensiveness of their animal protection laws. As shown in Figure 1, those rankings had a strong correlation ($r = 0.597$) with the percent of individuals in the state classified as mutualists, indicating that as more people within a state hold a view that promotes animals having similar rights to those of humans, animals tend to gain greater protections under the law. However, in recent years there has also been a surge of lawsuits, protests, and citizen ballot initiatives designed to either strengthen or overturn existing wildlife-related policies and practices, indicating that in other instances, such an alignment between values and policy may not be so certain (Manfredo et al. 2017).

Figure 1. Mutualism values and ranking of animal protection laws in the United States.



Given the important role of wildlife agencies in driving policy decisions around wildlife—and the ongoing shift in social values across the United States—it is imperative to consider the ways in which wildlife managers integrate public values into the decision-making process either through adequate representation of diverse values and/or inclusion of the public in the policy process. The objective of this paper is to report on findings from the America's Wildlife Values (AWV) project, including a 2018 survey of wildlife agency culture, that illustrate: 1) similarities and differences between wildlife managers and the public in their value orientations and demographics; and 2) current support among wildlife managers for increased public participation in the decision-making process and how that support relates to managers' roles as scientific experts. These findings are designed to help those in wildlife agencies understand more about both the opportunities and challenges they face in serving an increasingly vocal and diverse public.

Do Wildlife Managers Look Like the Public?

To explore the similarities and differences between members of the public and wildlife managers across the United States, we conducted a survey of state wildlife agency employees, asking respondents to rate their agency on a number of characteristics related to agency culture and governance processes (i.e., the ways in which political actors, from government bureaucrats to members of the public, interact in the decision-making process; Armitage, de Loë, and Plummer 2012). We likewise asked respondents to answer the same set of wildlife values questions used in the public survey described earlier in these proceedings (see Manfredo and Teel earlier in these proceedings). For the agency survey, we received a total of 10,669 responses from across 30 states for a response rate of 69%. Findings from this survey were then compared with these 30 states' results for the public from the AWV study (for more information on methods, see Manfredo et al. 2018).

Wildlife Values

Across states, our findings illustrate a sharp contrast in wildlife values between the public and agency employees. An initial comparison between these two groups in our 30-state sample shows a public that leans slightly more toward mutualism (33% mutualist, 30% traditionalist), while state agency employees overwhelmingly appear to hold traditional domination values toward wildlife (7% mutualist, 64% traditionalist; Figure 2). Within states, however, some nuance emerged. We found that as the percent of a state's population who were classified as mutualists increased, there was an associated moderate rise in the percent of individuals within that state's wildlife agency who could be classified as either pluralists or mutualists (i.e., those who scored above the scale midpoint on our mutualism index; $r = .407$; Figure 3). We believe this illustrates that, rather than a dramatic shift in values as we have seen among members of the public in response to modernization, value change within the agencies may be manifesting as a layering of mutualist values on top of more traditionally-held domination ones. Managers in this context are influenced both by the culture and important historical role of domination as a foundation for wildlife management, as well as the forces of modernization that are driving increased mutualism values in their states.

Figure 2. Comparison of wildlife value orientations—agency to public—across 30 states.

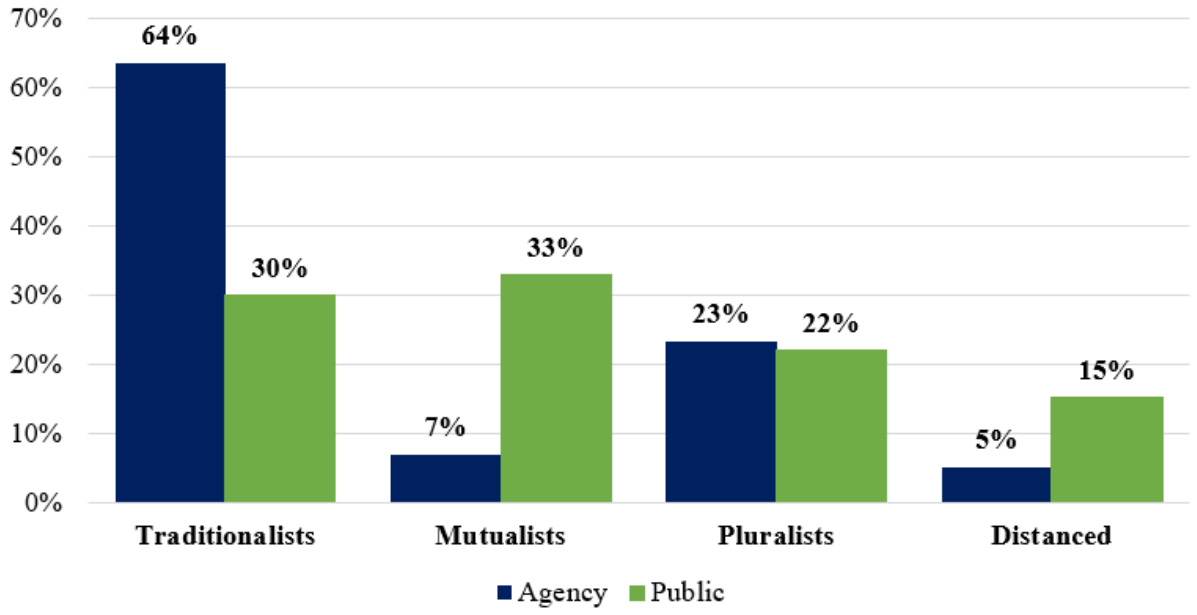
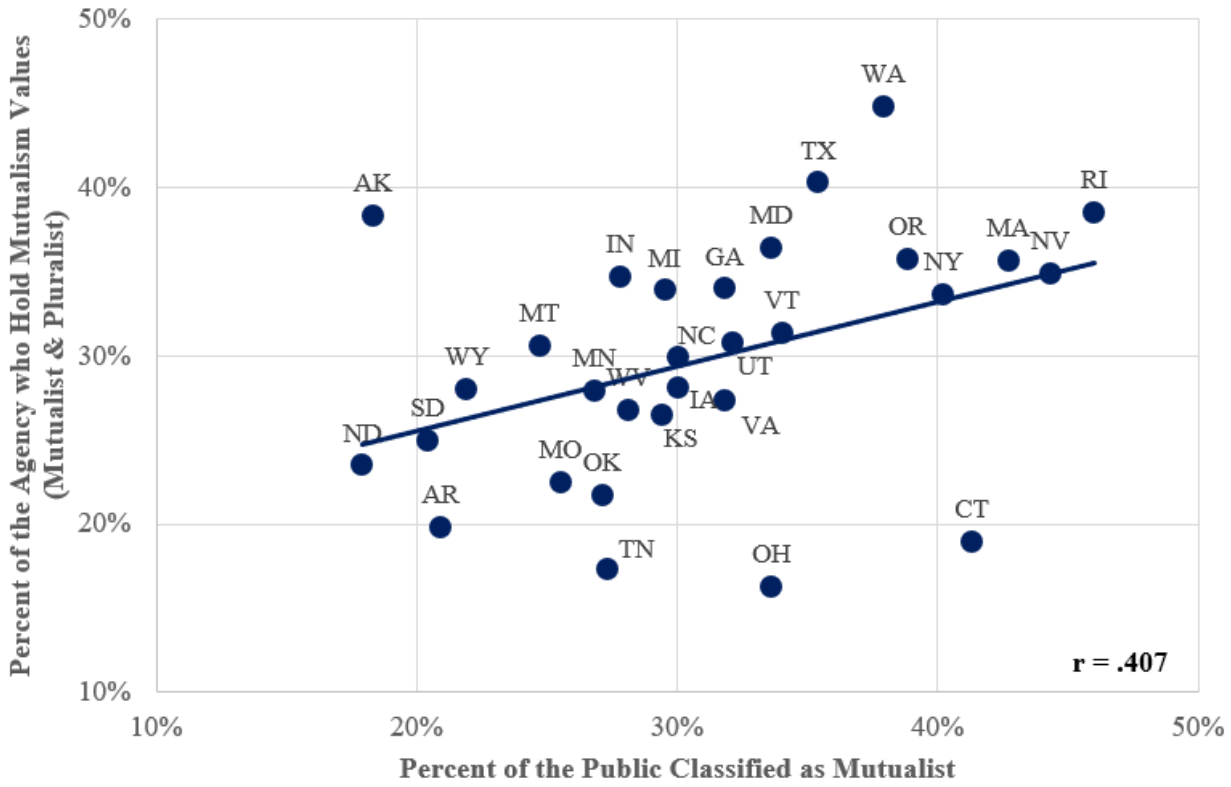


Figure 3. Percent of mutualists in the public by the percent of agency employees with mutualism values (including mutualists and pluralists) across states.



Demographics

Our comparison also highlighted differences between the public and agency employees on a number of key demographics. For instance, while around 65% of our public sample from the 30 participating states specified their race as white, more than 93% of agency employees selected this option. Agencies had lower percentages of blacks, Hispanics, and Asians compared to residents of their states but were slightly more representative of American Indian populations (Figure 4). Additionally, despite a near equal gender split in our public sample, agencies had significantly higher percentages of males than the populations of their states (Figure 5). These demographic differences between the public and agency employees may have implications for differences in wildlife values. Our data on public values illustrates, for example, that whites are more likely to be classified as traditionalists, while Latinos and Asians are much more likely to be classified as mutualists. As another illustration, 47% of our male sample was categorized as traditionalists, compared to only 25% of our female sample (Figure 6).

Findings from our AWV study point to increasingly diverse values and attitudes among members of the public but largely homogenous agencies that continue to reflect and represent a subsection of the public who hold traditional domination values towards wildlife. The resulting imbalance between agencies and the publics they serve, as well as the resulting utilitarian slant in current wildlife policy, has resulted in calls for governance reform in recent years that aim to make agencies more inclusive, transparent, and accountable in their decision-making processes to people with a wider range of values, attitudes, and beliefs about wildlife (see Lockwood 2010; Decker et al. 2016). Given what we know about the misalignment of values between agencies and the publics they represent, is there evidence to suggest that managers will support deeper engagement with their states' residents as a means of integrating diverse values into management?

Figure 4. Comparison of race/ethnicity—agency to public—across 30 states.

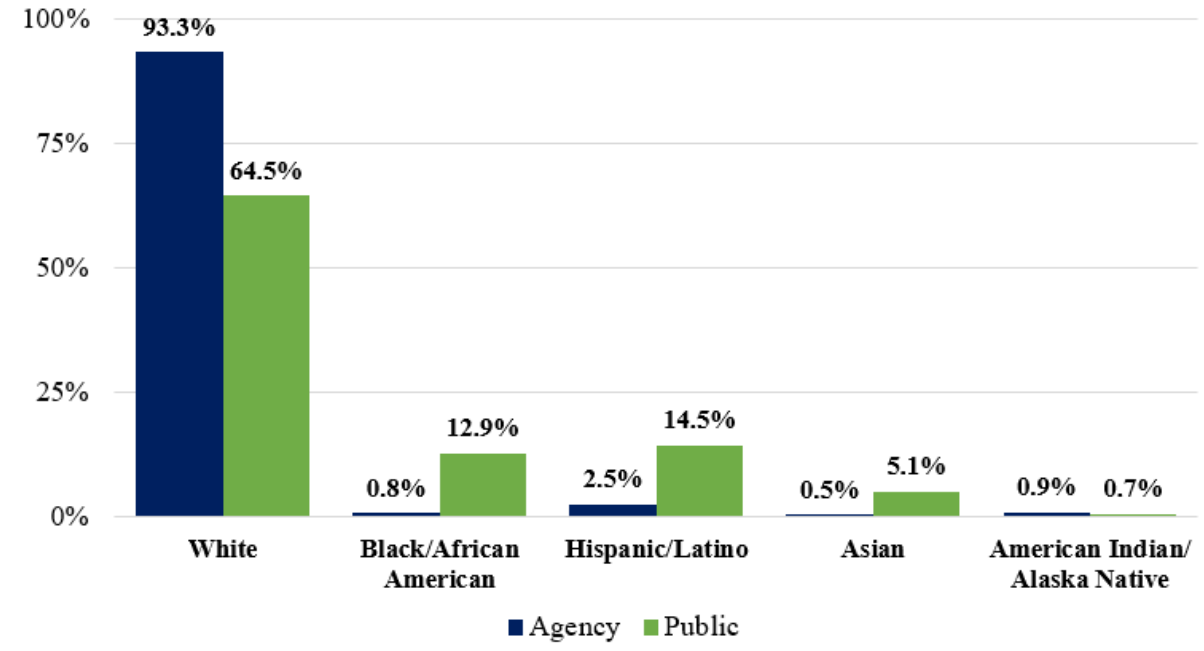


Figure 5. Comparison of gender—agency to public—across 30 states.

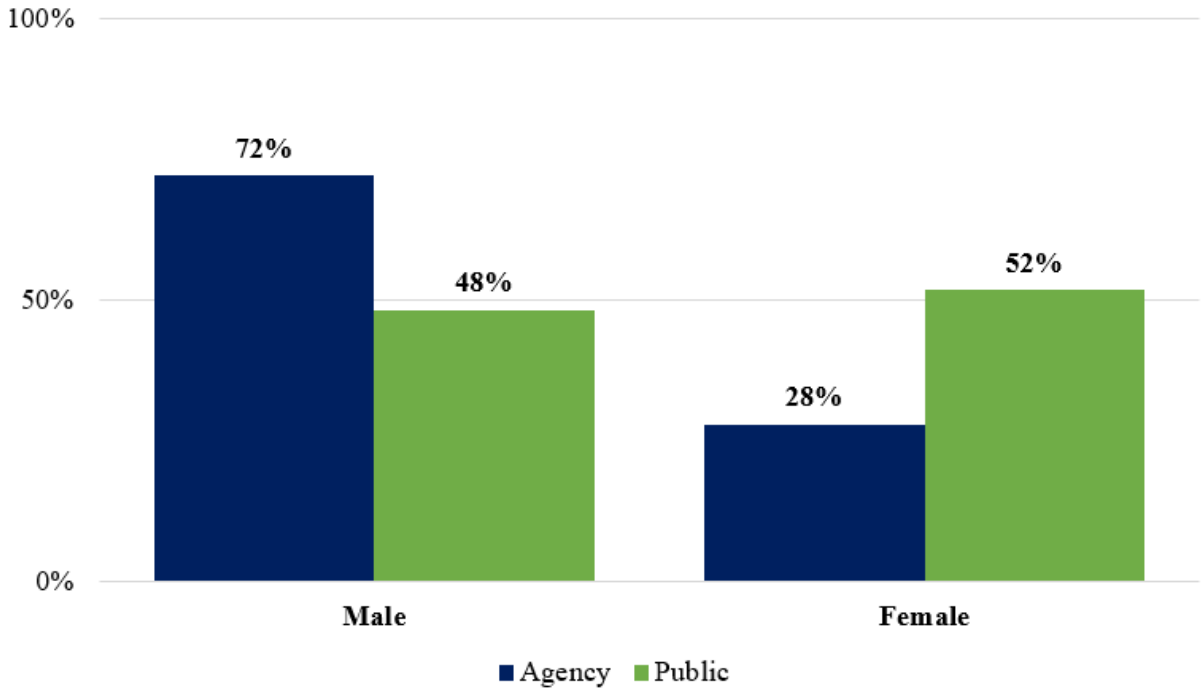
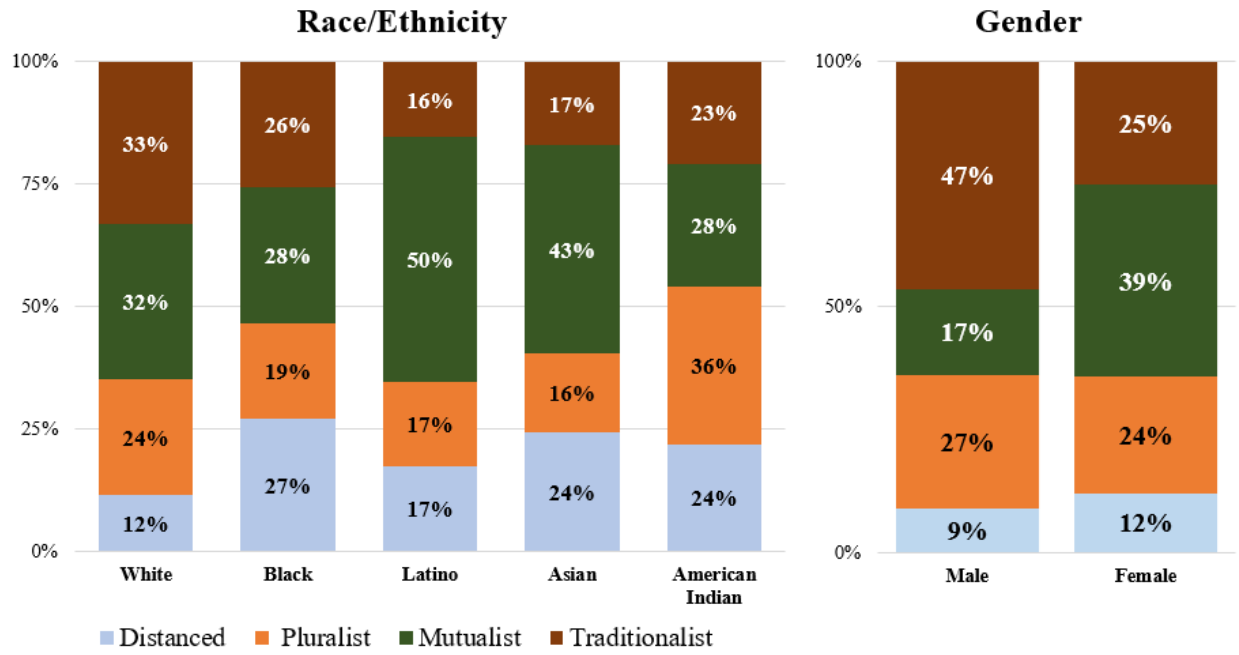


Figure 6. Wildlife value orientations by race/ethnicity and gender for public in 50 U.S. states.



Public Participation in Wildlife Management

To measure support for public participation in wildlife management, we adapted Arnstein's (1969) ladder of participation, which segments nonparticipatory forms of citizen engagement (e.g., citizen education) from advisory and highly participatory forms (e.g., partnerships and citizen control). In our survey, we asked agency employees to identify both their agency's current level of participation and their personal views on the ideal level of participation for two groups: 1) members of the general public and 2) paying stakeholders such as hunters and anglers. Using this information, we then categorized agencies as having either open forms of public engagement, meaning that all members of the public are invited into the decision-making process, or closed forms where paying stakeholders are given priority.

In about half of the state agencies we surveyed, the majority of managers described their agencies' current systems of public participation as advisory forms open to all members of the public, while employees in 11 agencies described them as advisory forms open primarily to paying stakeholders. Respondents from three states—Nevada, Utah, and South Dakota—in contrast, viewed their agencies as highly participatory but primarily for paying stakeholders (Figure 7). Moreover, we found that at the individual level agency employees across our sample both *preferred* and felt that their agencies *currently have* advisory forms of public engagement (Figures 8 and 9). These advisory approaches would be situated in the middle of Arnstein's (1969) ladder where the focus is on collecting public input that could be used or not used at managers' discretion. Because of the consistency between current and ideal models of engagement, which largely skew toward advisory forms, and the priority role given to paying stakeholders over the general publics in many states, we believe there may be little support among managers for shifting away from the status quo to embrace more inclusive, participatory governance models.

Figure 7. Map of current forms of public participation in state wildlife agencies, according to agency employees.

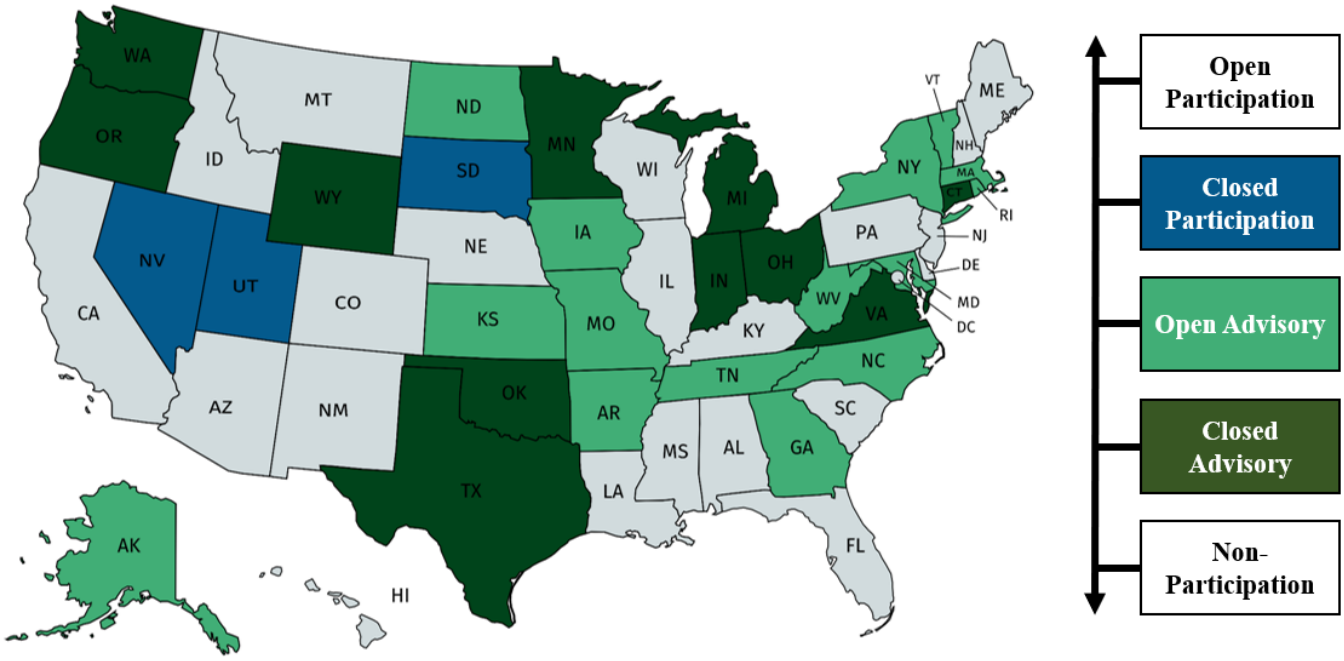


Figure 8. Current and ideal levels of public participation in wildlife decision-making, according to state wildlife agency employees.

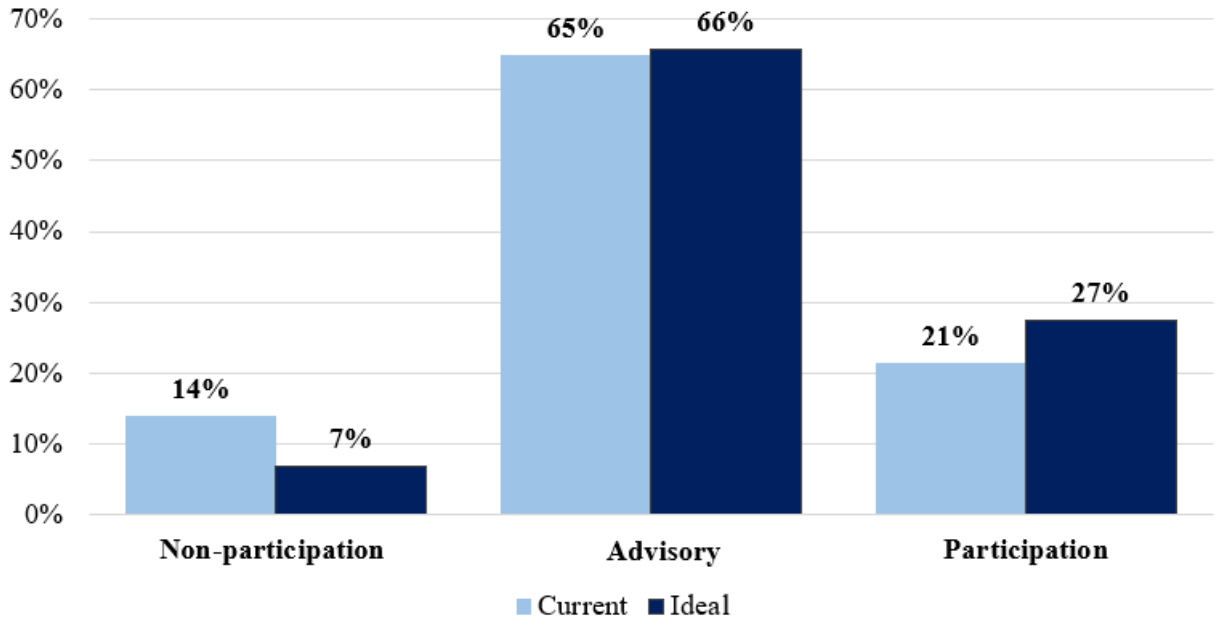
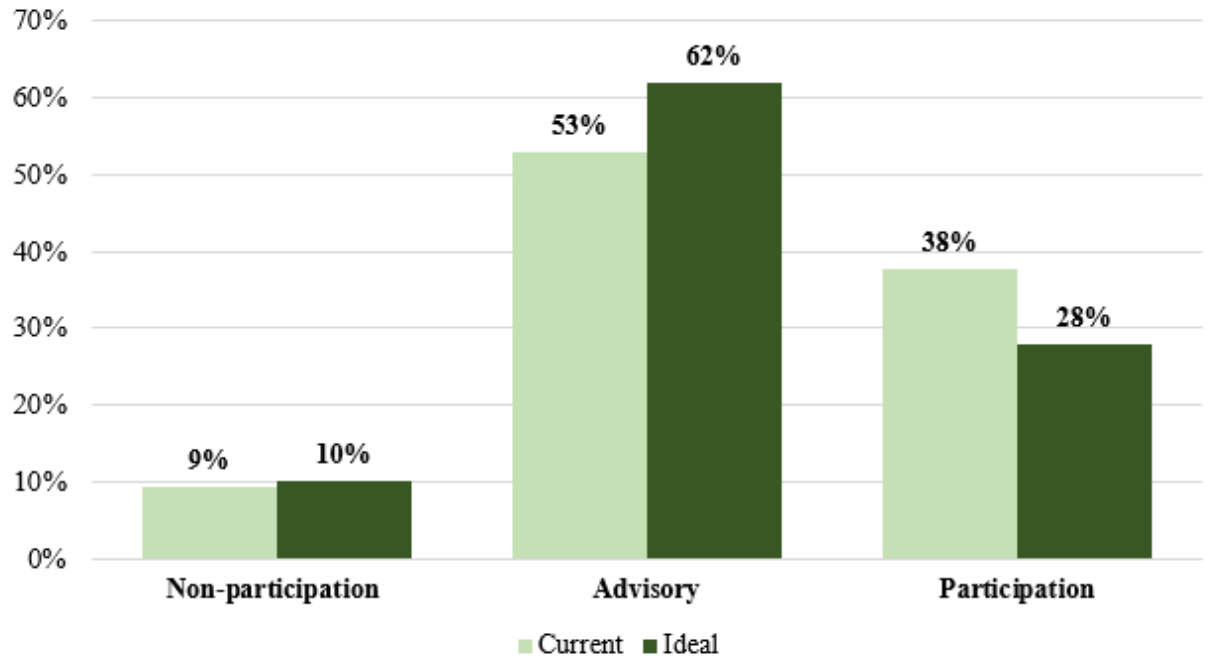


Figure 9. Current and ideal levels of participation among paying stakeholders in wildlife decision-making, according to state wildlife agency employees.



The Role of Expertise vs. Public Input in Decision-Making

Our analyses above show that many state wildlife agency employees feel a strong sense of responsibility toward serving traditional hunting and angling stakeholders and prefer current advisory forms of public participation to more participatory forms of decision-making. We propose that this is in part due to a perception among agency employees that they hold a priority position in decision-making around wildlife because their skills and training in the sciences have made them natural resource experts. To illustrate, we classified state agencies as either ascribing to an *expert* or *clientele* management model based on employees' responses to questions relating to agency goals. Agencies seen as prioritizing an expert model were more likely to place priority on science, innovation, and meeting the needs of wildlife, while those prioritizing clientele models were more focused on politics, tradition, and providing recreational opportunities. We found that in states where more employees viewed their agency as having an expert model of management, fewer respondents expressed support for increased involvement of the general public (r = -0.411; Figure 10) and paying stakeholders (r = -0.490; Figure 11) in decision-making, suggesting that managers may view the use of science and expertise as oppositional to the use of public input in decision-making (Jasanoff 2009). These ideals are indeed reinforced through professional training programs and philosophies such as those promoted in the North American Model for Wildlife Conservation, which encourages managers to prioritize utilitarian values and scientific methods in wildlife management, likely making them resistant to change despite calls for increased participation (Organ et al. 2012).

Figure 10. Percent of employees who view their agency as prioritizing an expert management model by percent who believe the general public should be more involved in decision-making.

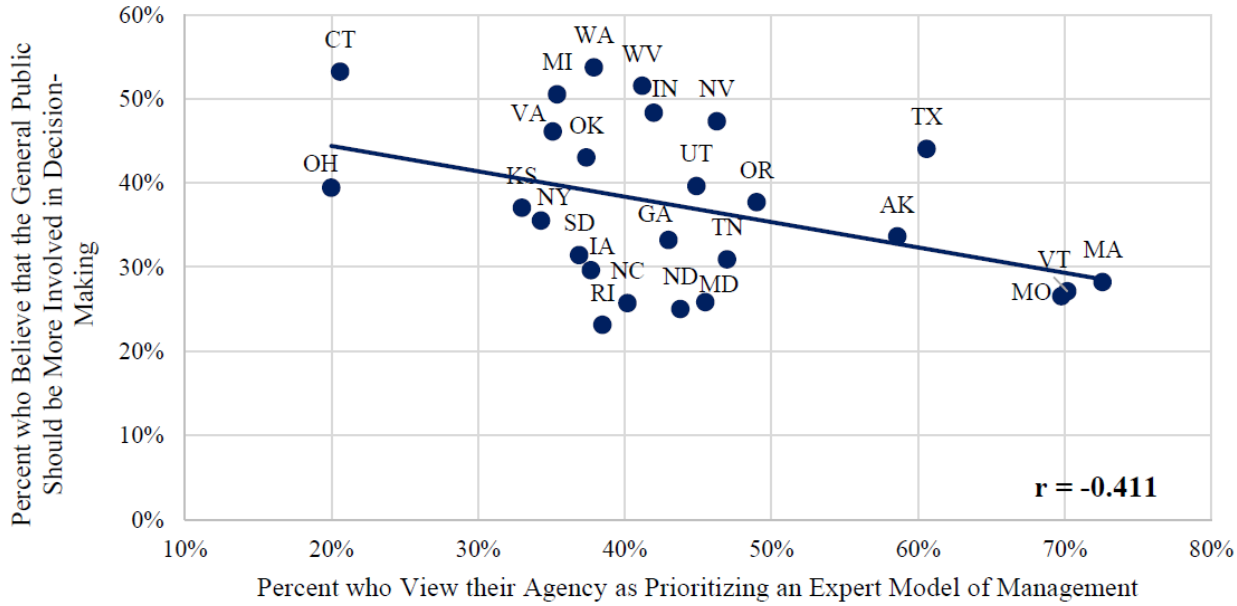
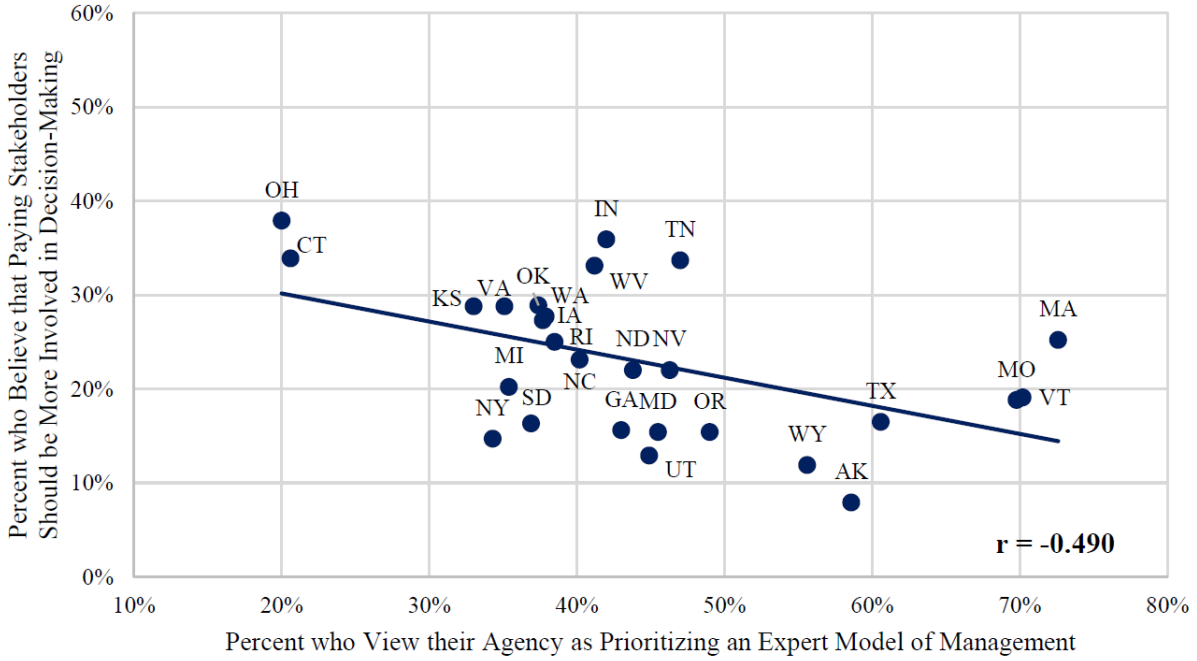


Figure 11. Percent of employees who view their agency as prioritizing an expert management model by percent who believe paying stakeholders should be more involved in decision-making.



Conclusion

Social values are shifting across the U.S., changing the ways in which people view wildlife and wildlife-related issues and contributing to calls for more direct public participation in natural resource

decision-making. In more modernized states, research shows that the public is becoming increasingly more politically engaged and mutualistic in their values toward wildlife but that agency employees have maintained many of the traditional values central to wildlife management institutions since the turn of the 20th century. In particular, we found that despite significant changes in public values and social demographics, state wildlife agency employees overwhelmingly hold domination values toward wildlife and have a disproportionately larger percentage of employees identifying as white males than their respective state populations. These differences and an accompanying decline in consumptive wildlife-related recreation in recent years (see Teel, Manfredo, and Don Carlos earlier in these proceedings), have resulted in calls for agencies to represent a more diverse range of public values in both the recreational opportunities they provide and in their formal decision-making processes. However, our findings show support among wildlife managers for maintaining current advisory forms of participation, both for the general public and paying stakeholders such as hunters and anglers. This support for the status quo is in fact stronger in state agencies that prioritize expert models of management, suggesting that managers' support for increased public participation may be tempered by their view of their own priority role as scientific experts in the decision-making process.

Taken together, our findings highlight the lingering influence of historical values and ways of governing within wildlife agencies, which reinforce existing values and ways of governing and limit the potential for transformative change despite widespread changes within the public. Armed with this knowledge, agencies may become more aware of how their own social processes can create barriers to deep engagement with nontraditional publics and begin to innovate new means of wildlife policymaking that bridge the gap between their historical legacies and the values of a changing public.

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Special Session Two.
Wildlife Management in Canada: Uniqueness and Alignment of Indigenous Rights, Policy, and Funding

Opportunities for Enhanced Collaboration Between Wildlife Agencies in the United States and Canada

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Association of Fish & Wildlife Agencies
Washington, District of Columbia

Looking Back

The National Association of Game and Fish Wardens and Commissioners was formed in 1902. Today, the mission of the Association of Fish & Wildlife Agencies (Association) is to support and advocate for state, provincial, and territorial responsibility for science-based fish and wildlife conservation. All state fish and wildlife agencies, nearly all provincial and territorial fish and wildlife agencies in Canada, all federal agencies with a substantive role in fish and wildlife management, and many nongovernmental organizations ranging from the National Audubon Society to the Boone and Crockett Club are members.

The membership and the mission suggest no consideration, per se, for geopolitical boundaries in managing the wildlife resources of the United States and Canada. Indeed, Canadian officials and agencies became eligible for membership in the Association beginning in 1910. During the better part of the next decade, Canadian and United States conservation professionals would actively engage in a highly complicated policy and legal dialogue concerning the management of migratory birds (i.e., the roles of federal, state, provincial, and territorial governments in delivering conservation of migratory avifauna).

In 1917, the Association signaled tangible support for continental collaboration with the addition of the word *International* to its name of record, thereby becoming the International Association of Game, Fish and Conservation Commissioners. That was the jumping off point for the election of seven presidents from Canada, the first in 1921–22 (Mr. Honore Mercier, Quebec), and 10 annual meetings in Canada—the first in 1920 (Ottawa), the last in 1988 (Toronto).

Manifold Opportunities for Collaboration

The next time an Association annual meeting will be in Canada is September 2023 in Calgary, Alberta—35 years after the last one. What an unfortunate gap. In recent years, the Association has made new and concerted efforts to reengage with wildlife leaders in Canada across the organizational spectrum, in part, through the work of the Canadian Wildlife Directors Committee and through international policy and conservation entities and proceedings such as the International Union for Conservation of Nature (IUCN) and the Convention on International Trade in Endangered Species, respectively. International trapping issues have offered like opportunity for cross-border cooperation. Relationships have been further enriched by embedding a Canadian contractor into the Association for focused work on behalf of the Canadian partners, in support of the North American Wetlands Conservation Act, its respective boards in the United States and Canada, and the North American Waterfowl Management Plan.

The conservation challenges ahead suggest even greater need for collaboration. Sustainable use policy within the IUCN, recovery of threatened and endangered species, new landscape science paradigms, invasive species, wildlife diseases (e.g., chronic wasting disease, white-nose syndrome of bats), and climate change adaptation are only a few of the contemporary issues meriting cross-border

attention. The Association is an ideal convener—through its committees—to reinvent the value proposition of the past regarding the collaborative work of delivering conservation in our two countries.

Special Session Three.
Landscape Connectivity and Wildlife Corridors: Linking Science, Practice, and Policy

Opening Remarks—Making the Right Connections

John Kanter
National Wildlife Federation
Washington, District of Columbia

My name is John Kanter and I am the senior wildlife biologist at the National Wildlife Federation (NWF). The federation is America's largest conservation organization, uniting all Americans to ensure wildlife thrive in a rapidly changing world. Our organization is two years into the implementation of its five-year strategic plan. This ambitious plan is built around three pillars:

1. Protect, connect, restore wildlife habitat
2. Transform wildlife conservation
3. Connect Americans with wildlife

Connecting wildlife habitats is at the center of the first pillar. With more than five million members, 52 state affiliates, and seven regional offices, we are well positioned to use our conservation network to help protect and enhance landscape connectivity and wildlife corridors by advocating for policy at the local, state, and national level; by informing people about the need for their protection through a broad array of education programs; and by initiating on-the-ground implementation efforts.

Recently, NWF hired Dr. Andrew Jakes as the western regional biologist. Andrew has conducted extensive research on pronghorn migration and has expert knowledge about the latest approaches to modeling and mapping wildlife connectivity and identifying corridors. He will work with NWF staff, state affiliates, and partners who are undertaking a growing number of connectivity and corridor projects in western states. Our California staff is leading a multimillion-dollar effort to build an overpass at Liberty Canyon, which would connect the Santa Monica Mountains to the Sierra Madre Range and allow for the movement of mountain lions and other wildlife between these protected areas. Furthermore, they have used this project to engage Los Angeles residents of all ages to understand and support the need for habitat connections. Today, we are here in collaboration with the Mule Deer Foundation to convene this special session at the North American Wildlife and Natural Resources Conference and bring together scientists, practitioners, and policy makers to share information, expertise, and experiences aimed at advancing this critical area of wildlife conservation.

As the human footprint expands across the globe through transportation, energy development, agriculture, and residential and commercial development, the need for wildlife corridors and landscape connectivity are moving rapidly from theoretical models to on-the-ground projects. Lack of planning, communication, and expertise can lead to poor selection of focal species and landscape connections, which results in misalignment of resources. Mistakes can be costly given that land prices and infrastructure costs for improving connections are often expensive. Furthermore, conservation practitioners often lack direct technical assistance from scientific experts when selecting wildlife corridors and landscape connections, and scientific experts lack more regular feedback from on-the-ground projects. Participants will have the opportunity to help shape the goal for a unifying approach to bringing scientists, managers, practitioners, and policy makers together to advance this critical area of wildlife conservation.

No Species Left Behind: Using Science to Conserve Wildlife Corridors

Paul Beier
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An Overview and Some Lessons About Conserving Corridors

My experience conserving wildlife corridors began in 1988, when I started a five-year study of mountain lions in Southern California. At the time, I had no idea that conserving connectivity would become a dominant theme of my scientific and professional career.

My first scientific discovery was grim. Mountain lions were on the road to extinction in every southern California mountain range. As the encirclement of each mountain range became complete, each mountain lion population would wink out, one by one (Beier 1993). I also discovered that it didn't have to end that way. In 1990, mountain lions were still moving between mountain ranges. If they could continue to do so, they could survive in every linked mountain range. More important, by radio-tagging cubs, I learned that these animals would find and use narrow, highly disturbed corridors through urban areas (Beier 1995). Imagine how successful a corridor would be if *we designed them* to facilitate movement by animals. Not just mountain lions, but also badgers, jackrabbits, bighorn sheep, arroyo toads, steelhead trout, and even plants and invertebrates. Here, I share six important lessons I learned during the years of work that followed (Beier 2008).

Lesson 1: Work for a Connected Landscape Instead of Working Against Fragmentation

As a recipient of these scientific insights, I felt obliged to bring them to the attention of managers. I published scientific papers on my findings, but I knew that wasn't enough. So for several years, I did the only thing I could think to do. I fought against proposed highways and housing developments that would sever corridors in my study area. I wrote scathing critiques of environmental impact reports and testified at hearings on proposed projects. I wrote letters to the editor and helped reporters write news stories. I was twice plaintiff in a lawsuit. But reacting to proposals to destroy connectivity is like fighting a one-way ratchet: sometimes you'll stop a bad action, sometimes you'll reduce the impact on connectivity, but you'll *never* permanently protect or restore a corridor.

This work had to be done. But fighting development proposals is not a strategy for success. A victory may stop one bad project, but next year there will be another proposal, just as bad, on the same piece of ground. It took me seven years to figure out that we could only win if we moved beyond reacting to bad proposals and put forward a positive proposal for a connected landscape.

The breakthrough came in 1998 when I worked with 15 conservation biologists to develop the South Coast Regional Report, which identified 10 areas critical to connecting the major wildlands of southern California. Instead of gasping at maps of the latest development that would sever connectivity, we had created a map reflecting our positive vision for the land. Instead of trying to slow down the rate at which things get worse, finally I was working for a conserved landscape—I had a ratchet that worked in the right direction.

Lesson 2: Scientists Cannot Lead by Asking Others to Follow; We Must Lead by Serving

I admire my colleagues on the South Coast Regional Report, and I treasure my memories of our effort. But ultimately the report was a fine positive vision that collected dust. The problem was not its vision but the fact that the authors were 15 PhDs who wanted to help the befuddled management agencies. While I'm sure we did help some managers think about a positive vision for a connected wild system, other managers saw that our map failed to connect some important wildlands. If they had been part of the process, they might have agreed with our priorities, but instead they'd been handed a map and told to "make it happen." Worse yet, most managers, already forced to read the mountain of paperwork from their own agency, didn't even have time to pick up the regional report. The report gathered dust. The

press ignored it. I had failed. Instead of asking managers to "trust me—I'm a scientist," I needed to say "I trust you to identify needs for connectivity; I'm ready to work with you to develop sound and fair ways to meet those needs."

In November 2000, a nascent nongovernmental organization called South Coast Wildlands gave me the opportunity to go back and do it right. South Coast Wildlands and five cosponsors invited 250 people to map a connected conservation landscape for the state of California. The workshop included a few scientists like me, but the meeting was dominated by managers, all of who were concerned about the increasing isolation of the lands they managed. These people knew more than I did about what was important. They loved the land as much as I did. They were passionate about creating a landscape more than the sum of its parts, because they owned the parts. The resulting Missing Linkages report, released in August 2001, included a map of 232 potential linkages in California, and instantly became the primary reference book on connectivity issues for agencies, consultants, and corridor advocates in California. On the release date, almost every daily newspaper in the state carried a positive front-page story on the report. This good press was directly related to the collaborative nature of the workshop. When a newspaper called the offices of their local wildlands, they found someone who had been at the workshop and was eager to point out what local linkage was at risk and why it was important to the readers of the paper.

Lesson 3: None of Us Is as Smart as All of Us

Turning the 232 potential linkages into conserved corridors would require prioritizing them and developing detailed conservation plans for priority areas. In August 2001, 10 days after the release of the statewide Missing Linkages report, South Coast Wildlands invited representatives from 12 state, federal, and private conservation groups to discuss how to prioritize areas and develop plans for the 69 potential linkages in southern California. At the meeting, we (I was now part of South Coast Wildlands) did not mention that we had no budget, no office, and no legal status. As it turned out, our miniscule size became our strength. We walked into the meeting prepared to negotiate anything—except the goal of conserving and restoring connectivity. We had a list of a dozen priority linkages and a proposed analytic approach, but everything was on the table. When our partners suggested we hold another workshop to identify the top priority linkages, we agreed. When they suggested changes to our approach and what each report should contain, we again agreed.

We walked out the door with pledges of financial support, which soon snowballed. Within weeks, we held a prioritization workshop, which produced a list of 15 priority linkages that partially overlapped our original list of 12. Instead of relying solely on scientists to prioritize linkages, we invited every interested party to the workshop. After participants saw the priorities resulting from the first weighting scheme, they argued to change the weights. It took hours, but at the end of the day, each participant agreed that the final criteria were better than the scheme each of us had advocated at the start of the day. And everybody owned the final priorities.

At every juncture, we had another workshop. As a scientist, I took a while to embrace the idea of inviting nonscientists to participate in scientific issues. But science is nothing more than a way of knowing that is transparent, evidence-based, logical, and open to correction. No assumption or logical chain in ecology is so esoteric that a manager can't understand it. A scientist who wants to be effective simply must invite managers to participate in our science. Our science is improved by having managers challenge our assumptions and offer alternative evidence and alternative interpretations of the evidence. In every case, the result was better than what I could have invented on my own.

Lesson 4: Leadership is Engaging Diverse People to Develop Fair, Sound, Transparent, and Comprehensive Solutions to Hard Problems

If South Coast Wildlands had produced 15 linkage plans on its own, the plans probably would have languished. Instead, in 2001, we asked all interested stakeholders: "How can we help all of you identify and protect the most important wildlife linkages in southern California?" The stakeholders became partners. When our reports were complete, they rushed to implement them.

As a scientist, I now see that my role in conservation is to insist on scientific rigor, consistency, and honesty and to radically trust our partners to grapple with the scientific issues and set the agenda. The key to successful workshops is to make sure that the goal of each workshop is clearly defined and to explain what it is—and what it isn't—to every invitee. Not all stakeholders need or want to attend every workshop. In one paragraph, you can provide enough information to let each person decide whether to attend. If you can't say it in a paragraph, your goal is not clearly defined. Some workshops will be large, others small, but each will have the right people engaged in the task at hand. Invite appropriate skeptics, real-estate developers, and other potential opponents, and let them invite themselves. Such openness demonstrates that your process is transparent, honest, and inclusive. You have nothing to lose and much to gain by inviting anyone who wants to advance the scientific rigor of the conservation plan and its implementation.

Lesson 5: No Species Left Behind

Historically, most linkage plans have been developed to serve the movement needs of one or two focal species, typically large carnivores. In contrast, each of our linkage plans was designed to serve the needs of at least a dozen focal species, sometimes including plants, invertebrates, amphibians, reptiles, and fish.

I encourage all conservation planners to use many focal species. We want to conserve not only populations but also their evolutionary potential, which requires gene flow and ability to respond to climate change. With imperfect knowledge of which species most need connectivity, the best strategy is to have a large group of focal species that serve as a collective umbrella for all species, natural patterns, and ecological processes we want to conserve. So our focal species included area-sensitive species because they'd be first to disappear when connectivity was lost; habitat specialists because they most needed closely-interspersed patches of each vegetation type; and barrier-sensitive species because they would dictate how to manage roads, fences, lighting, pollution, and domestic animals in the linkage. Corridors designed for multiple species will be close to functioning ecosystems, rather than narrow gauntlets a few animals might use with a bit of luck.

Because of my association with mountain lions, people often assume that I am promoting mountain lion corridors. Mountain lions were indeed regularly selected as a focal species because they are area-sensitive. They also make great flagships for garnering public support. However, mountain lions and other large carnivores should never be the sole focus of a linkage planning effort because most large carnivores are habitat generalists and able to move quickly through a long corridor that would never be useful to a habitat specialist such as a tree squirrel. And successful implementation of a "carnivore corridor" could have a negative umbrella effect because conservation investors will become less receptive to subsequent proposals to provide corridors for less charismatic species. Large carnivores best serve biodiversity if they are part of a large group of focal species.

Lesson 6: A Linkage Plan is Not Just About Getting Animals Across the Road

A few days after the statewide Missing Linkages workshop in November 2000, another event illustrated the power of a coordinated and comprehensive plan. A key corridor that I had identified in my mountain lion study—the only corridor that would allow nonflying animals to move between two large wildlands—was conserved. Conservation donors contributed millions of dollars to buy private lands, including a parcel with a permit to build 1,500 new homes. At the same time, California Department of Transportation (CalTrans) promised to relinquish the freeway interchange at Coal Canyon and convert it into a wildlife underpass. These two actions were no coincidence—they happened together because of a plan. Conservation investors would have been insane to buy the land if the 10-lane freeway continued to prevent wildlife movement. CalTrans would have been similarly foolish to make the freeway permeable if 1,500 homes were built adjacent to their new wildlife crossing structure. Quite rationally, no partner would take the first step on their own. It was essential to have a plan so each party could be sure they would not make a meaningless investment. We can debate whether a cup is half-empty or half-full, but

half a corridor is no corridor at all. It took months of negotiations before everyone agreed: "I'll do my part if everybody else does theirs."

Conserving land will not create a functional linkage if major barriers are not made permeable; an excellent crossing structure will not create a functional linkage if the adjacent land is urbanized; and an integrated land acquisition-highway mitigation project could be jeopardized by inappropriate practices such as predator control, fencing, or inappropriate artificial night lighting. Our plans address all these issues. Perhaps, most importantly, our reports include suggestions to engage human residents as stewards of the linkage. Although coercive measures are unlikely to be successful, collaborative measures should be effective, just as they were in other aspects of linkage design.

Steps for Creating Regional Connectivity Maps, Linkage Designs, and Corridors for Climate Change

Regional Connectivity Maps

A regional connectivity map is not implementable because a highway engineer cannot use it to design a permeable road and a conservation investor cannot use it to identify parcels to conserve. Rather, it is a coarse-grained, spatially extensive map that depicts areas where linkage designs (which can be implemented by engineers and investors) should be developed. Most regional connectivity maps have two goals, although a map may emphasize only one. One goal is to identify areas where conservation of connectivity can be addressed by linkage designs and decisions to forego or mitigate projects that would likely reduce connectivity. This was the main goal of connectivity maps for Bhutan, India, Tanzania, and most statewide maps in the United States. The Western Governors' Association (2008) refers to these as decision-support maps. The second goal is to express a vision of future ecological connectivity and inspire potential partners to achieve that vision, such as the maps produced by the Yellowstone to Yukon; Subtropical Thicket Ecosystem Planning in the Cape Floristic Region; and the Two Countries, One Forest initiatives (Y2Y 2004; Rouget et al. 2006; Trombulak et al. 2008). I offer a third goal for regional connectivity maps, a goal that is never explicitly stated—namely, a Trojan Horse. A regional connectivity map is like motherhood and brotherhood—a positive concept that everyone can agree is a good thing. Getting people—and especially bureaucracies—to buy into a regional connectivity plan is smart so that later, when the costs of implementable projects become apparent, the endorsing entities feel committed to walk the talk.

I helped develop statewide connectivity maps for California and Arizona and a nationwide map for Bhutan, and I consulted with the governments of Israel and Taiwan on their national plans (Spencer et al. 2010; Nordhaugen et al. 2006; Wildlife Conservation Division 2010). In 2011, developers of other regional maps and I produced a roadmap that remains the only comprehensive overview of this topic; interested persons can read this guidance in Beier et al. (2011), which recommends options for transparent and repeatable procedures, outputs that are easy to understand, and ways to effectively engage stakeholders.

Linkage Designs

A linkage design is a detailed, implementable plan to conserve connectivity between two (or occasionally more than two) protected areas or natural landscape blocks. It generally includes a map of areas that should be conserved; recommendations for locations and types of crossing structures across highways, canals, and other linear barriers; management guidelines for human recreation, fencing, artificial night lighting, and livestock grazing in the corridor; a habitat restoration plan; and a strategy to engage human residents in or near the corridor as stewards. Perhaps, most exciting, in many cases the linkage design outlines a strategy not only for mitigation (slowing down the rate at which things get worse) but for creating a landscape that is more permeable than what currently exists.

There are several good papers on linkage design, including Beier, Majka, and Spencer (2008); Rudnick et al. (2012); and Cushman et al. (2013). Almost all linkage designs were produced under the assumption that the probability of animal movement through a habitat feature (e.g., land cover type) is a

simple reciprocal of habitat suitability as assessed by studies of animals in their home ranges. However, Keeley, Beier, and Gagnon (2016) and Keeley et al. (2017) found that, during dispersal movements, animals readily pass through habitats that are strongly avoided in their home ranges. Because dispersal is precisely the type of movement that accomplishes the goals of corridors (facilitating gene flow, recolonization, and range shifts), this means there is considerable room for compromise in shifting the location of a linkage design. This is good news for implementers because it can allow compromises that can lower costs with little impact to conservation. Case Study 5 in Rudnick et al. (2012) describes corridor evaluation tools that can help evaluate compromises during implementation of a linkage design.

No empirical work has addressed a crucial issue in linkage design—namely, how wide a corridor should be to provide long-term conservation benefits. Sadly, this question cannot be answered because there are only a small handful of studies that document long-term benefits of corridors through human-dominated matrix. Until such studies are completed, Beier (2019) offers a rule of thumb that a corridor should be at least 2 kilometers (km) wide (except at unavoidable bottlenecks such as highway crossing structures), at least for corridors to connect habitat blocks 8 to 80 km apart, each at least 50 km^2 in size.

Corridors for Climate Change

Although some species will tolerate climate change, other species will be forced to shift their ranges, adapt to the new conditions, or become extinct. In human-dominated landscapes, range shift will occur either via corridors or assisted colonization. Keeley et al. (2018) comprehensively lists and briefly describes approaches to design corridors to facilitate range shifts. Beier (2012) argues that one dominant approach—i.e., modeling the shifting "climate envelopes" of species one by one—is impractical and risky. Instead, Beier (2012) advocates much simpler coarse-filter corridors based on enduring features such as riverine corridors. This area of corridor planning and climate adaptation will likely evolve rapidly in the next few years.

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No Way to Run, No Way to Fly: Considerations for Connecting Amphibian and Reptile Populations

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Thank you, John and Steve, for inviting me to participate in this panel. I am Priya Nanjappa, Director of Operations at Conservation Science Partners and formerly Program Manager at the Association of Fish & Wildlife Agencies. I see a lot of old friends in the audience; it's good to be here among all of you. As you might have noticed, my topic is quite a bit different from the others on this agenda. I greatly appreciate the opportunity to share a little bit about the very unique considerations that emerge when thinking about amphibians and reptiles. I also want to observe that I am the only woman on this panel; in my talk, I will be highlighting the work of five other women in this realm of connectivity and corridors and note that it would not be too difficult to find other women for panels such as these.

I will start by noting that many of the considerations I will present in the first part of this talk are covered in great depth—for not only amphibians and reptiles, but for other animals that are lower in physical profile—in the book *Ecological Infrastructure: Concepts and Applications for Small Animals* (Andrews, Nanjappa, and Riley 2015). This book was part of a series jointly developed by The Wildlife Society and Johns Hopkins University Press and includes a whole host of experts from academia, nongovernmental organizations, and agencies. My colleagues Dr. Kimberly Andrews of the University of Georgia and Dr. Seth Riley of the National Park Service in California and I coedited this volume. (It is available for purchase from the Johns Hopkins University Press website, and please note that neither I, nor my coeditors, receive any proceeds from the sale of this book.)

In developing the book, we defined—or redefined—the term "ecological infrastructure" to highlight the relationship in connecting ecosystems and species. The definition we developed is: *The basic habitat components and their connections necessary for species survival and for populations, communities, and ecosystems to function properly.* You might see how this is not unlike the way hard infrastructure allows us to connect between our homes, the grocery store, our friends, families, and other needs throughout the year.

Very quickly, there are three major sections in the book. Section one ("Roads and Small Animals") includes some history in the field of study of road ecology and natural history, direct effects such as road mortality, and indirect or habitat effects such as pollution from runoff that can be particularly harmful to animals like amphibians that take in moisture through their skin. Section two ("Planning and

Design") covers public engagement and the process of transportation planning and design as well as opportunities for funding, mitigation planning and techniques, and ways to modify existing structures such as bridges or culverts to be more compatible with the movement needs of these animals. And section three ("Construction, Maintenance, and Monitoring") helps identify ways to engage with transportation entities at these stages to ensure that structures or mitigation measures remain effective or can be adapted to improve them if needed.

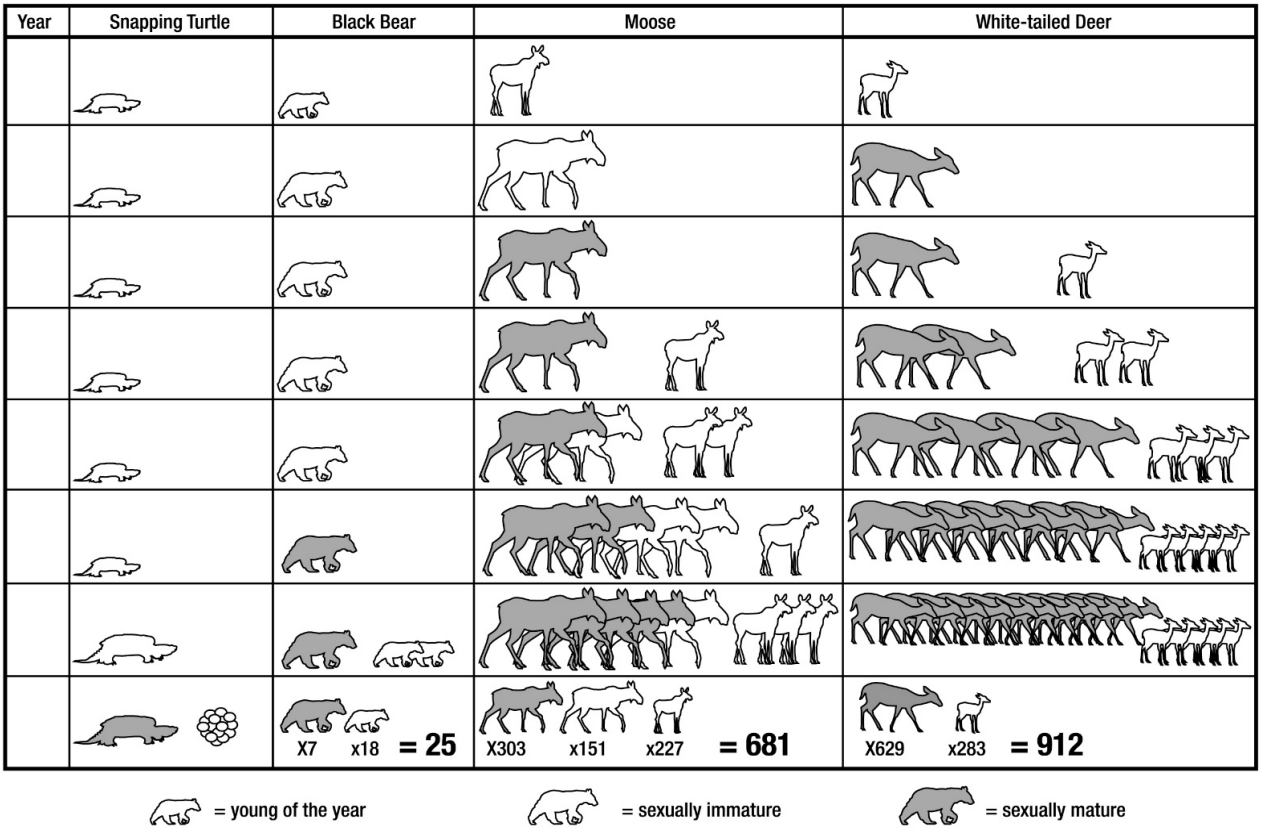
My coeditors and I recognized the need for the collation of this information given the rapid rates of urbanization in many areas of the country. When looking at an aerial photo of Atlanta, for example, you might be able to imagine, if you were a deer, how you could get from the east side of the city to the west side—and how, if you were a bird, you could fly over the top of it. But imagine you are two to three inches long and your skin needs to be moist and you are a tasty little snack for predators and to traverse a half-mile takes at least 2,500 hops and a lot of energy. Your chances of survival are pretty slim.

The more obvious impacts from roads are fairly universal for large mammals and ungulates as they are for amphibians and reptiles. Specifically, the addition of a road creates loss of habitat adjacent to the roads, increased mortality from direct hits by traffic, and isolation from other potential genetic contributions and metapopulation dynamics with increased fragmentation. We know that pronghorn are particularly sensitive to roads and treat them as a barrier. The same is true for certain amphibians and reptiles, combined with the fact that these animals are "low profile"—i.e., less likely to be seen due to low physical stature (critters that occur "below the bumper")—or sociologically low in profile as less understood or less appreciated.

Safety is an obvious concern with large ungulates—a strike can be highly damaging to vehicles and can put passengers in very high risk. However, amphibians and reptiles can create their own safety considerations—for example, during spring or fall migrations on one stretch of road between two wetland areas in northwestern Iowa, the road would become so slick with the corpses of smashed frogs that cars would slide off the road (Linck 2000).

Another aspect of safety to consider is that of the population—amphibians and reptiles are among the largest group of recently petitioned species under the Endangered Species Act. In certain species of turtles, for example, females tend to be hit on roads as they move to nesting areas. Figure 1 demonstrates the relative impact that the loss of one common snapping turtle (*Chelydra serpentina*) can have. As the figure illustrates, within the time that a single turtle has become sexually mature and produces one clutch of eggs, one black bear (*Ursus americanus*) would have reproduced itself about 25 times over; one moose (*Alces alces*) 681 times over; and one white-tailed deer (*Odocoileus virginianus*) upwards of 900 times over. These turtles are living dinosaurs, having been around through the extinction of those large reptiles, and yet the impact of one road mortality can greatly affect generations to come.

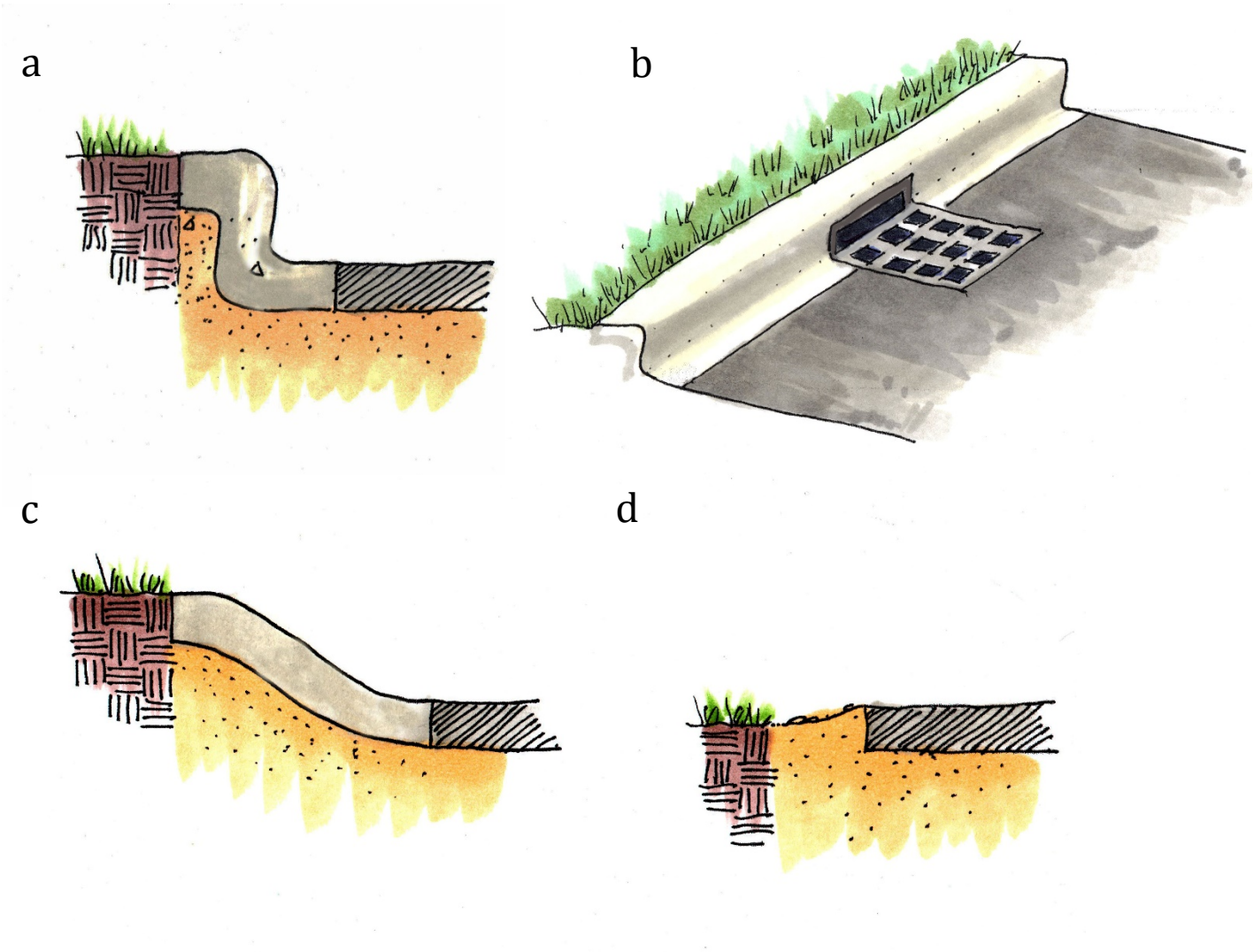
Figure 1. Rate of reproduction among common snapping turtles in comparison to certain large mammals. Chart re-created and caption adapted from an original idea by George Kolenosky, modified in 2005 by the Ontario Ministry of Natural Resources Black Bear Technical Team, and further modified in 2008 by the Ontario Multi-Species Turtle Recovery Team to include snapping turtles. Credit: Victor Young.



Another example of impacts on these long-lived species is at the Lake Jackson causeway in Florida. One scientist, Dr. Matt Aresco, took it upon himself to count the turtles he kept seeing getting hit. During the course of 40 days, from February to March 2000, he observed 367 turtles dead on the road. In a separate study also at Lake Jackson, more than 2,000 turtles were found killed by road mortality throughout the course of one year. Can you imagine if these were the numbers of black bear or deer observed killed on a road? Things around that road would be quickly changing. But this is the challenge with these low-profile species. The population impacts are large, but they can be difficult to observe without those in-depth studies. This is also true because these animals, particularly smaller and softer-bodied animals such as frogs or lizards, are often quickly scavenged; thus, underestimates of impact are likely. In this particular instance, the addition of directional fencing leading to existing culverts provided an interim solution that greatly improved survival of many more turtles, frogs, snakes, lizards, and alligators until the permanent Lake Jackson Ecopassage was built in 2010 (LJEA 2019).

Apart from direct mortality, there are many barriers that can impact amphibian and reptile movement. As previously mentioned, moisture, cover, even distance (or somewhat related light and openness) of below-road crossing structures can make a huge difference for these critters. In addition, something as simple as the shape of a curb can create a barrier to passage for certain amphibians or reptiles (Figure 2; Andrews, Nanjappa, and Riley 2015).

Figure 2. Traditional curb systems (a) typically limit or inhibit movement of many species of amphibian and reptile and can serve as a wildlife barrier and sink. This is especially true when curb and gutter systems are in place (b). When possible, modifying design for a more gradual slope (c) or elimination of a curb (d) can help facilitate small animal passage and reduce road-related mortality. Adapted from Mifsud (2015). Credit: Herpetological Resource and Management, LLC.



I will shift gears a bit now to work in which my colleagues at my current organization, Conservation Science Partners (CSP), have been involved in relation to movement and connectivity modeling. More generally, CSP has worked on issues of connectivity, corridors, and movement for a variety of species, including pronghorn (*Antilocapra americana*), mule deer (*O. hemionus*), and elk (*Cervus canadensis*), and in collaboration with several states including Arizona, Idaho, and Colorado, to name a subset. Given my topic of focus for this talk, however, I will discuss our projects that involve amphibians and reptiles.

This first example is from research that related to the dissertation work of one of our staff, Dr. Amanda Kissel. She and colleagues Dr. Wendy Palen and Gavia Lertzman-Lepofsky looked at desiccation impacts on frogs in various environments, as it relates to the impacts of climate change. As I

mentioned previously, frogs need to maintain skin moisture while moving. This is why you often see mass migrations of amphibians during rain. However, sometimes movements must occur without rain; this may be to disperse from natal sites or to move to or from mating ponds or simply for foraging. The ability to retain or gain moisture prior to these journeys contributes greatly to their survivorship. Often, frogs will stay in dry pond beds waiting for rains or the ponds to fill; it is not atypical to find desiccated frog carcasses in dry pond beds.

In their experiment, Lertzman-Lepofsky and colleagues placed agar gel models of frogs, which mimic water loss properties of amphibians, in four different environments at high elevations in Olympic National Park in Washington State: full sun/dry environments; full sun/wet environments; shaded/dry environments; and shaded/wet environments. The researchers measured the water loss rates of these models. Then, using these data along with daily climate data and projections for 2040s and 2080s, they estimated the number of days in which either thermal optima or critical evaporative water loss threshold were exceeded during the growing season. They found that by the 2080s, amphibians could be restricted to shaded or aquatic (wet) habitat on 95% of growing season days (Lertzman-Lepofsky 2019). This greatly reduces their ability to move any great distance to meet their life history needs. So, as you can see, along with many other challenges to movement for amphibians, climate change may further exacerbate the situation.

Similarly, particular habitat features can have an impact on movement patterns as well. In a project in the Mojave Desert ecoregion that my CSP colleagues Miranda Gray and Dr. Brett Dickson have been working on, they used telemetry data from Mojave Desert tortoises (*Gopherus agassizii*) to develop a model of movement habitat quality. This model allowed for the derivation of a range-wide, omnidirectional (or wall-to-wall) map that was not dependent on core habitats or populations. The model was based on movement data from 31 tortoises fit with GPS dataloggers from 2007 to 2010 in the Mormon Mountains and also the Hidden and Dry Lake Valleys in extreme southern Nevada. The omnidirectional model draws on concepts of electronic circuit theory—as initially developed by Brad McRae of The Nature Conservancy—that my CSP colleague Brett Dickson and his coauthors published in *Conservation Biology* in 2018 (McRae 2006; McRae et al. 2008; Dickson et al. 2018). The model results predicted greater movement through dry washes. These results were then vetted with movement data from another 102 individuals reflecting more than 2,000 point locations; the model had high accuracy.

Despite a lot of high quality tortoise habitat in the area, the tortoises were essentially moving between these areas. These results suggest that not only is primary tortoise habitat important, but those movement pathways and connections are equally important. Still, maps are hypotheses; these models are easily updated and modified as new information becomes available or combined, for these or for any other wildlife species, for planning scenarios. Our team has worked with various state fish and wildlife agencies to model these sorts of movements, and we are happy to work with any of you on similar modeling efforts.

In summary, amphibians and reptiles have unique traits, life history needs, and behaviors and differ greatly from those of large ungulates, other mammals, or birds. The topics I covered in my short time here are treated in much greater depth in our book *Ecological Infrastructure: Concepts and Applications for Small Animals* available on the Johns Hopkins University Press (Andrews, Nanjappa, and Riley 2015). Thanks again to panel organizers John and Steve and to the other panelists for allowing me to offer a very different perspective on this topic. Finally and again, please note that much of the material I covered was led or co-led by women with great expertise in corridors and connectivity; if we want to diversify our community, we need to try harder to be inclusive when these platforms are available. Thank you.

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Mapping and Managing Movement and Migration

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In North America many ungulate species move from separate winter to summer ranges with animals being forced out of high elevation summer ranges in the fall by winter storms and accumulating snow depth. After spending the winter on marginal nutrition, they move out of low elevation winter ranges in early spring, following the gradual green as it progresses upslope in elevation until arriving back on their summer ranges. This migration strategy allows individuals to maximize their annual nutritional intake, obtaining great forage that provides a foundation for higher survival and reproductive rates.

Summer range habitat is more abundant and nutritious in most places, but the availability of winter range and migration corridors is limited and frequently in conflict with human land uses. These uses and conflicts have been increasing and will continue to do so as our human population grows. The estimated human population in North America was more than 491 million in 2017, with a birth rate that is nearly double the death rate. Each year there are approximately 4 million births in the U.S. and 2.4 million deaths. With more and more people in the West, we will need more subdivisions, shopping centers, industrial parks, and more energy development to power them. But all this development can remove or reduce quality mule deer (*Odocoileus hemionus*) habitat and block migrations of mule deer and other large mammals.

Infrastructure fragments wildlife habitat piece by piece at a slow, almost imperceptible rate. Much research has been done on habitat fragmentation that results in lost genetic diversity and reduced numbers of wildlife. Most of us live in a home, drive a car, shop in local shopping malls, and turn the thermostat up a notch when the house is cold so the source of the problem is not elusive. This fragmentation is our doing and so wildlife will need our help to undo it. We have to learn to live with wildlife in such a way that they not only persist but thrive—and that will take a combination of science, long-term planning, and hard work.

Turning to Technology

Most western wildlife agencies have rolls of paper maps from decades ago with arrows, numbers, and polygons in colored pencil to show winter ranges and migration routes of key herds. Some of those paper maps have been digitized into computer files, giving them the appearance of an encyclopedia of refined science, despite their birth as a coloring book.

In the 1960s, some biologists began to experiment with building collars that emitted a radio signal that could be located with a receiver and directional antenna. Through continued development, the wildlife profession launched the practice of affixing radio collars on animals so that they could be relocated periodically. Locating animals remotely was revolutionary at the time and contributed immensely to our knowledge of habitat use and animal movements. This was an obvious improvement from relying on anecdotal information to delineate movements, but locations once per week or month gave us only a pixilated view of movement corridors.

In the 1990s came collars with global positioning system (GPS) technology that allowed very accurate locations to be recorded and transmitted to a central database, either in real time or later when the collar was retrieved. Being able to chart coordinates of an animal every 12 hours, two hours, or even more frequently has completely revolutionized the type of information we can glean and the research

questions we can ask. Importantly, it has turned our pixelated view of migration corridors into high definition images.

The USGS Wyoming Cooperative Fish and Wildlife Research Unit at University of Wyoming founded the Wyoming Migration Initiative (WMI) in 2012. The WMI is a consortium of researchers and science communicators collaborating on migration research to identify corridors and better communicate this information to the public, biologists, and decision makers. WMI is one group that recognized that, in the current decade, although we can collect detailed data, there is still work to do to actually map corridors and advance their conservation.

One important piece of information that has come to light with recent research is that the migration corridors themselves are not just a line from Point A to Point B, but instead represent important habitat (Aikens et al. 2017; Monteith et al. 2018). These migration corridors are not simply conveyor belts that move deer between seasonal ranges, rather they provide critical foraging habitat that contributes to the annual nutritional cycle of deer and other large mammals (H. Sawyer, personal communication: 2019). Fine-scale movement data collected from GPS collars show that ungulates often stopover for days, and sometimes weeks, before continuing their migrations (Sawyer and Kauffman 2011). Sawyer and Kauffman (2011) estimated mule deer in Wyoming spend 95% of their migratory time in stopover sites; accordingly, these areas are now becoming the focus of conservation and additional research.

These stopover areas are a key component to the mule deer strategy of "surfing the green wave" of vegetation green up to higher elevation summer range (Merkle et al. 2016; Aikens et al. 2017). Stopovers allow them to maximize nutrition in the spring—foraging in just the right place at the right time—to regain body weight lost during the harsh winters. If they migrate too fast and overshoot the green up, they won't have nutritious forage or may get stuck in a late snowstorm too high. If they migrate too slowly, they miss the upslope progression of the most nutritious peak of new growth. In fall, they move down to winter range with other animals so they need to add as much body fat as possible on their way down, which means they stopover in areas with abundant nutrition until being driven down by snowstorms.

Kevin Monteith of the Wyoming Cooperative Fish and Wildlife Research Unit, and an important part of WMI, led mule deer research that found movement during migration has a strong nutritional underpinning, but human disturbance can disrupt this connection and alter movement patterns and timing (Monteith et al. 2018). Other research shows how mule deer and pronghorn react to energy and other infrastructure development on the landscape. Some animals alter their path to go around disturbances, while others stage at a stopover area for a while before or after moving more rapidly through the disturbed area (Sawyer et al. 2013, 2017).

Migrations exhibit considerable variability. The research has shown that some mule deer move through perfectly good winter range or summer range occupied by other mule deer to keep traveling tens or nearly 100 more miles (160 km) to seemingly similar habitat. Even a single deer population may contain some individuals that are resident and others that migrate 150 miles (241 km). Having a diversity of migration strategies in a single mule deer population means different segments of the same population might be exposed to different weather patterns and habitat conditions. This is a hedge bet to assure at least a portion of the population experiences favorable conditions rather than all animals gambling on the same strategy.

One showcase example of all this technology is the Red Desert to Hoback migration corridor originally discovered in 2011 by Hall Sawyer after he collared mule deer in the Red Desert of southern Wyoming (Sawyer et al. 2014). Once collared, deer left their Red Desert winter range in the spring and traveled 150 miles (241 km) northwest to near Jackson Hole. These deer are traveling back and forth along this 150-mile route for four months of the year and have to traverse sand dunes, lake and river crossings, multiple highways, and more than 100 fences. Recently, it was discovered that a collared doe in this population not only migrates 150 miles to the Hoback Basin, but then continues over the Gros Ventre Range, into Jackson Hole, and over the foothills of the Tetons all the way to Island Park, Idaho—90 miles (145 km) farther than the other Red Desert deer that stopped in Hoback. The movements of this deer

could be an outlier, but it may also be that she is simply the only one so far collared out of a portion of the population that makes this impressive migration each year.

Wyoming is not the only state or province working on this issue, and what has worked well in Wyoming may not work everywhere because of different human population density, topography, and other factors. Wyoming is identifying long migrations of several species, but other states may have shorter movements that represent shifts in elevation more than long-distance travels. For example, Montana has worked on mapping migrations and ungulate movements for many years with a focus on habitat quality in all important habitats. Providing the quality habitat they need on summer and winter ranges is as important as preserving connectivity between the two (Justin Gude, personal communications, 2019). Montana published its first maps of ungulate movements in the 1960s and these guided land purchases and hunt season structures at the time. Since then, they have been developing, adapting, and applying various technologies such as Step Selection Function and resistance path and connectivity modeling, as well as the Brownian Bridge Movement Modeling used in most of the Wyoming work.

Corridor Coordination and Collaboration

Identifying and maintaining these movement corridors and stopover areas is now a major focus of collaborative conservation efforts by state, provincial, tribal, and federal agencies. This work is being amplified by the assistance of many nongovernmental conservation organizations like the Mule Deer Foundation, The Pew Charitable Trusts, and Theodore Roosevelt Conservation Partnership. With all this great work being done throughout the West, there is value in making sure all efforts are coordinated. There are important differences in the various states and so the same analytical methods may not work everywhere, and we may need a diversity of strategies to identify and protect corridors. Despite these differences, consistency in how the identified corridors are mapped or presented is necessary for effective conservation. Being able to knit together polygons of these important movement corridors and winter ranges allows for a large-scale look independent of artificial state borders. Mapping corridors in this way is valuable because neither the animals nor sources of habitat disturbance stop at state lines.

Because of the early work in Wyoming and the growing recognition of the importance of these habitats, a collaboration developed between the Western Association of Fish & Wildlife Agencies (WAFWA), Wyoming Migration Initiative, U.S. Fish & Wildlife Service, The Pew Charitable Trusts, the U.S. Geological Survey, Mule Deer Foundation, and others to advance the identification of movement and migration corridors. Cooperatively, a series of "Wildlife Movement and Migration Workshops" were held throughout the West to provide training on methods to collect, store, analyze, and visualize movement data and discuss how this information can effectively be used to develop policy to manage and conserve these habitats. This also enabled states that are doing innovative things to share the successful methods they are using with other state agencies without a long history of work in this arena.

Between September 2017 and September 2018, four regional workshops were held, with the first in Eugene, Oregon, bringing together representatives from Oregon, Washington, and California to discuss and learn about the science accumulating on this issue. After the first workshop, the corridors issue was boosted when Secretary of the Interior Ryan Zinke signed Secretarial Order 3362 (SO3362) to improve habitat quality of western big game winter range and migration corridors for pronghorn antelope (*Antilocapra americana*), elk (*Cervus canadensis*), and mule deer (DOI 2018). The secretary then selected a national lead to implement the secretarial order. Three more workshops followed in Mesquite, Nevada (Nevada, Arizona, Utah); Laramie, Wyoming (Wyoming, Colorado, New Mexico, Texas); and Bozeman, Montana (Montana, Idaho), to eventually reach 262 state and federal agency staff in 12 western states, as well as some representatives from academia and federal and tribal agencies.

The original intent of the workshops developed prior to the signing of Secretarial Order 3362, but because of the timing of the workshops in relation to SO3362, interest and attendance increased dramatically from the first to the last workshop. The U.S. Department of the Interior's national coordinator for the SO3362 attended three of the workshops (the first workshop occurred prior to the

order's existence). Workshops provided an interactive opportunity to discuss available information and needs for the implementation of SO3362.

Attendees of the workshops were approximately 80% state wildlife agency staff; 15% federal agency staff (Bureau of Land Management, U.S Forest Service, U.S. Geological Survey); and 5% from departments of transportation or academia. There were two primary subgroups of attendees—wildlife practitioners attending largely for the technical training offered by the WMI and managers or agency leadership attending for the policy dissemination and discussion. Breakout sessions during the first day of each workshop acknowledged these two different types of attendees and catered to both. During the workshops, more than 110 agency staff were trained in using the Migration Mapper software for corridor analysis. In addition to the four workshops, a follow-up webinar, attended by an additional 150 agency staff, was offered in December to cover the migration science overview that had been presented in each workshop.

Mapping and Managing Migration

Corridors visualized by plotting high resolution GPS collar data have, in many cases, confirmed what the experienced field biologists and managers have known for a long time in a general way, but those general notions are not good enough to conserve these corridors on today's complex and fragmented landscape. GPS collar technology has allowed us to identify fine-scale constrictions in migration corridors that must be kept open to allow herds to reach the habitats they need to thrive.

At the request of the Department of the Interior, the western states developed state action plans that not only documented the known movement corridors in their state, but also included a prioritized list of research projects to learn about other movement corridors not yet mapped. These state action plans will be updated each year and serve as the guidance documents for prioritizing movement research and habitat improvements. In addition, a corridor mapping team is being coordinated and funded by the U.S. Geological Survey in collaboration with state wildlife biologists, resulting in a diverse team with strong computer mapping skills to work with the millions of animal coordinates flowing into agencies West-wide from many thousands of GPS radio collars deployed on mule deer, elk, and pronghorn.

The Department of the Interior has worked hard to foster strong collaboration in identifying and improving these corridors by working with conservation organizations, states, and federal agencies by making significant funding available for the research and habitat improvement projects identified by the states. The Bureau of Land Management, U.S. Geological Survey, and state wildlife agencies are all working together to implement this secretarial order. State wildlife agencies are assembling groups of interested stakeholders to discuss these priorities at a local level and continue to refine actionable projects that will improve the effectiveness of these corridors and help us learn more about migration corridors in other places.

Foundation for the Future

We are now beginning to see the landscape as a living organism with an ebb and flow of life across the surface. The first step in the conservation of large mammal corridors is to identify these movements and the multitude of things that interfere with them. By producing maps of these movements, managers can illustrate quite vividly why these habitats are important and work to resolve the conflicting use issues. For wildlife managers and conservationists, it will be vital that we act now for future generations to preserve the functioning of these important corridors.

Rarely has such an effort for large mammal conservation been so comprehensive across so many jurisdictional borders and offered so much potential to establish a solid foundation of research and management actions that will have a profound effect long into the future. By working closely with their state agency partners, nongovernmental organizations can play an important role to act as a force multiplier to help with project funds, prioritization, volunteer labor, and advocacy when issues are controversial.

Our actions today for the conservation of these important habitats will be heralded by future generations just as some of the early conservation efforts are celebrated today. These conservation actions are yet another example of the importance of collaboration in the continuing effort to maintaining sustainable wildlife populations.

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Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors

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Background

The concept and subsequent implementation of the Department of the Interior (Department) Secretarial Order 3362 "Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors" (Order) is a new conservation effort across 11 western states. The Order was signed in February 2018, and I was selected to serve as the coordinator in May 2018. Leaning on experience, most notably from a decade as a migratory bird joint venture coordinator, I adopted an implementation approach for this Order that has proven exceptionally successful throughout the 30-year existence of joint ventures. Fundamentally, we are trying to approach and implement the Order in a manner that creates durability while expanding our scientific knowledge and habitat conservation activities.

Migratory bird joint ventures are a creation of the North American Waterfowl Management Plan. Generally, they are highly successful landscape-based partnerships that approach their work in a nonregulatory and voluntary fashion. The partnership develops science that is used to direct habitat conservation efforts in the most important areas within a specific region.

As the Prairie Pothole Joint Venture coordinator for the past 12 years, there are several lessons I've learned and brought forward to help guide implementation of the Order. Those lessons include: accumulate science and build an implementation plan that provides focus and direction on the most important places within the landscape to utilize human and fiscal resources efficiently; reach out to and work with a broad range of partners; be flexible to be successful; and perhaps the hardest lesson to learn—not to let "the perfect be the enemy of the good."

The Order includes several directives and important statements. For example, the species of focus (i.e., mule deer, elk, and pronghorn) in the Order are under the management authority of state wildlife agencies, so language throughout the Order addresses the need for the Department to work closely with the respective states. Similarly, the Order recognizes state authority to manage big game species and recognizes private property rights. Notably, the Order does not use the term protection but instead uses words such as conserving, enhancing, restoring, or improving the condition of priority big-game winter range and migration corridor habitats. Ultimately, the Order is focused on habitats that provide the necessary requirements for sustainable big game populations and many other species of wildlife.

Among the first steps I took upon becoming coordinator was to develop seven overarching principles and objectives. These principles/objectives serve as touchstones throughout the implementation of this Order and they are:

- Respect state authority to manage wildlife, namely elk, deer, and pronghorn;
- Respect the rights of private property owners;
- Be pragmatic and move forward with implementation recognizing this Order can't be everything to everyone;
- Remain focused on state-defined priority migration corridors, stopover, or winter range areas;
- Follow a thoughtful plan and approach to guide actions strategically and effectively in a respective area, rather than multiple scattered efforts that amount to little cumulative impact;
- Fully embrace the conceptual and legal directive of multiple-use lands, as applicable, including recognizing traditional and legal land uses; and
- Seek collaboration, not polarization, by actively and positively engaging landowners, nongovernmental organizations, industry, and others through one-on-one interactions.

Implementation

The Order calls for identifying liaisons who serve as a state-level contact to work closely with the respective state fish and wildlife agency staff. They serve in a colateral duty capacity and are employees of the land management bureaus identified in the Order. The five liaisons were selected to ensure representation across the bureaus in order to benefit from differing perspectives and to create support from the respective bureaus on implementation. As a result, there are two liaisons from the U.S. Fish & Wildlife Service (USFWS), two from the Bureau of Land Management (BLM), and one from the National Park Service.

Once a process was developed to implement the Order, the next step was to send a letter to all directors of the state fish and wildlife agencies within the respective 11 states identified in the Order. Specifically, we asked the states to provide their top three to five migration corridors, winter range areas, and stopover habitat priorities. If a respective state lacked scientific data to identify these areas, we requested they provide their top two to three research priorities to fill these gaps. All 11 states provided a response to the requests in the letter. Using the information received from the individual states, along with any relevant information from the Department of the Interior and U.S. Department of Agriculture (i.e., amount of land they manage in the respective state and current conservation activities in priority corridors or winter range areas) we embarked on the process of developing individual SO3362 state action plans. We submitted each of the respective draft plans to the state director for their approval and all 11 plans were approved by October 17, 2018.

The original intent for the state plans was to have a document that would create focus, allow partnership development, and ultimately serve as the tool to accomplish conservation. Accordingly, approved plans were shared with a variety of partners to help initiate habitat conservation projects or other related activities.

From a funding perspective, we can look at the implementation of this Order like an equation:

Research Funding + Mapping Support and Funding +
Habitat Conservation/Management Funding =
Priority Habitat Conservation

All combined, in the first six months since the state action plans were approved, we have provided nearly $8 million toward meaningful science and habitat activities. This total does not include staff costs and programmatic funding within the bureaus that have focused habitat efforts in the state defined priority areas. Further, it does not include partner funding efforts or match funding through a related National Fish and Wildlife Foundation (NFWF) grant program.

Science

As previously mentioned, we requested the states provide their top two to three research priorities to fill data gaps that inhibit their ability to identify migration corridors. We asked them to develop a research proposal(s) not to exceed $300,000 for their most pressing corridor-related research priority. Once each state submitted a thorough and complete proposal, we reviewed the submission and funded the proposal, and to date, we have provided more than $3.2 million to the states to address their identified migration corridor research priorities. The species of focus in the research projects include mule deer (eight projects), pronghorn (five projects), and elk (four projects).

The following two research examples show the types of projects we are funding. In Utah, they are using the research funds to mark a total of 180 mule deer with GPS collars across three relatively large herds that have limited to no data on migration and movements. The state of Utah is experiencing rapid population growth and expanding housing developments. Additionally, corresponding increases in traffic volume is occurring on many highways. The Utah Division of Wildlife Resources recognized they have limited data on specific mule deer herds in areas with rapid landscape changes due to human population

growth and expansion, so they sought research funding to understand the migratory corridors of three herds. The state of Nevada is fitting a total of 60 pronghorn with GPS collars in two important herds to their state. The objective of the research project is to gather the necessary data to delineate corridors and stopover locations, as well as to quantify the amount of time the herds spend on winter range. Additionally, proposal funding will support data analysis. Once the analysis and mapping is complete, the Nevada Department of Wildlife will use the new knowledge to develop a suite of habitat management and restoration projects.

Beyond research specific projects, the U.S. Geological Survey's Wyoming Cooperative Research Unit created and is leading a corridor mapping team. The team consists of federal and state biologists and their goal is to provide technical assistance to states to facilitate corridor mapping, troubleshoot unique issues, and to deploy consistent methods/mapping across state boundaries. To date, approximately $700,000 has been provided to support the team and specific states in their mapping needs. States such as Arizona, Nevada, Idaho, and Colorado are initial beneficiaries of this team and funding.

Habitat

To advance efforts that improve the habitat quality for mule deer, elk, and pronghorn, we partnered with the NFWF to develop a migration corridor and winter range grant program. Funding for the first year of this program came from the BLM, USFWS Partners for Fish and Wildlife program, and ConocoPhillips. The $2 million provided by BLM was restricted to sage-steppe habitat and the $500,000 from USFWS restricted to private land. The $250,000 provided by ConocoPhillips was not restricted. Unfortunately, no other groups or industry stepped forward with funding to support this grant program in 2018. There is ongoing discussion regarding another request for proposals (RFP) in late 2019 so efforts are underway to secure additional and more diverse sources of habitat conservation funding to offer through the grant program. The response to the initial RFP was strong. It is important to point out that for a proposal to be eligible for funding, it needed to have a signature by the fish and wildlife agency director or designee. Again, this requirement demonstrated the commitment of focusing on state-identified priorities. The NFWF received 20 proposals seeking $6.6 million. The NFWF grant proposal process is not yet complete. A panel of individuals reviewed all the proposals and developed a suite of recommendations that must go before the NFWF board for approval in mid-March 2019. Projects recommended for funding include easements, habitat restoration, and habitat management activities. Unfortunately, several worthy projects could not be recommended due to lack of funding and/or restrictions on available funding.

Additionally, the USFWS Partners for Fish and Wildlife Program (Partners) set aside $1.5 million annually to support private land habitat conservation activities within state wildlife agency defined priority corridors or winter range areas. The project review process was conducted internally within the Partners program, but similar to the NFWF process, each proposal was required to have a signature from a state fish and wildlife agency employee in order to be eligible. In total, 44 proposals were reviewed and considered and 22 of those proposals were funded for projects found in all eight states in which submissions were received. Out of the 22 projects funded, most activities were related to fencing projects such as removing interior fencing, replacing old fence with wildlife friendly fencing, or an innovative project in Montana where they are testing virtual fencing. Additional projects funded included weed management activities and pinyon-juniper removal in priority big game winter range areas.

Transportation

We asked the states to address a series of questions related to their top three to five priority big game migration corridors or winter range areas. One of those questions concerned the risks or threats to the priority corridors or winter range areas they identified. Responses from the 11 western states clearly showed that highways are a risk/threat across the West to big game movement. In fact, it was the only risk/threat identified by all 11 states. Given the significance of this issue to western states, the Department

reached out to the U.S. Department of Transportation at the highest levels to initiate conversations regarding opportunities to address the topic. Additionally, a few very successful and well-attended transportation-wildlife workshops have taken place in Montana, Wyoming, and Colorado. Consequently, important communication is occurring at both the national and state levels. On a West-wide scale, we considered the value of holding a workshop that included at least the 11 states identified in the Order. Subsequently, we reached out to the Theodore Roosevelt Conservation Partnership (TRCP) since they have developed workshops in the past and asked if they would be willing to develop a workshop focused on highways and big game. They agreed, and in late January 2019, the Ungulate and Transportation Workshop was held in Salt Lake City, Utah. The workshop was well attended, and a report will be forthcoming along with a workshop-specific page on the TRCP website that will provide the presentations, list of attendees, and other information.

Next Steps

We have consistently held that the state action plans are fluid documents that will be annually updated with new analyses, mapping, or information to further focus and refine priority corridors or winter range areas for targeted habitat conservation. Importantly, the focus will remain on the top three to five corridors or winter range areas. We will initiate the update process in late April 2019, and we will have a Version 2 of the respective state action plans finalized in October 2019.

As noted earlier, each research priority submitted by the states was funded in 2018. Research projects are well along in some states, while projects are just beginning in others. In 2019, we will again solicit individual state research priorities to facilitate the collection, analysis, or mapping of data necessary to define priority migration corridors or winter range areas.

We have held meetings with individuals at the U.S. Department of Agriculture and U.S. Forest Service (USFS) on several occasions. Consequently, they have assigned a USFS employee from the headquarters office to serve as a point of contact as we implement the Order. The land managed by the USFS and the landowner programs offered by the Natural Resources Conservation Service are important to the ultimate success of this conservation effort, so continued collaboration will be important.

Finally, the implementation of the Order has certainly raised the consciousness of the issues concerning highway-wildlife interactions. We expect conversations among the Departments of the Interior and Transportation to continue. In addition, nongovernmental organizations are engaged on related discussions with staff on Capitol Hill. Perhaps the time is right to make a meaningful and lasting difference for wildlife by developing opportunities to address the impact of highways across the West.

Grouse Movements and Migrations

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Migration is widespread in birds living in seasonal environments with fluctuating food sources (Hedenström 2007). Migration distance and strategies do, however, vary a great deal among species and populations, probably depending on a multitude of ecological factors. The maximization of survival from one breeding season to the next probably is the primary reason for migration to occur.

Several North American grouse (*Tetraoninae*) exhibit migratory behavior (Hoffman and Braun 1975; Herzog and Keppie 1980; Schroeder 1985; Cade and Hoffman 1993; Fischer, Reese, and Connelly 1996). Grouse likely migrate because of elevational or seasonal differences in habitat availability or fidelity to seasonal-use areas (Herzog and Keppie 1980; Schroeder and Braun 1993). Twelve species of grouse are native to North America, and ≥6 species display migratory behavior. Migration in grouse appears to be primarily in those inhabiting prairie and shrubland habitats and those inhabiting mountainous terrain.

Movements of grouse can be categorized into different types including: dispersal from place of hatching to place of breeding or attempted breeding; movements of individuals within a season; migration between distinct and spatially-separated seasonal ranges; and home ranges that sum all movement types seasonally or annually (Connelly, Hagen, and Schroeder 2011). In this paper, I focus primarily on grouse species that have been shown in the scientific literature to migrate between distinct and spatially-separated seasonal ranges.

Dusky Grouse

Dusky grouse (*Dendragapus obscurus*) have a large geographic range, extending from the Northwest Territories in northern Canada to northern and western New Mexico in the United States. They live in a wide variety of environments, ranging from quaking aspen (*Populus tremuloides*) mixed with sagebrush (*Artemisia tridentata*) at lower elevations to dense areas of Douglas fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and spruce (*Picea spp.*) at higher elevations (Animal Diversity Web). Dusky grouse use these areas for different purposes throughout the year and migrate between them. During the summer months, dusky grouse spend their time feeding in subalpine meadows or low-lying areas rich with quaking aspen, chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier spp.*), and Gambel oak (*Quercus gambelii*). Along with grasshoppers, these plants are a prominent food source for dusky grouse during summer and early autumn. During the winter months, while most other animals found in mountainous areas have migrated to lower elevations, dusky grouse spend their time at high elevations. They spend most of the winter roosting in Douglas fir and lodgepole pines and feeding on the cones and needles these trees produce. These high elevation areas not only provide major food sources, but also tend to have less predation during this time of year.

Cade and Hoffman (1993) examined migration in adult dusky grouse in Colorado. They found that elevational movements of males up to winter areas (median = 1,600 feet (488 m), range = 600–2,200 feet (183–671 m)) was greater than for females (median = 400 ft (122 m), range = -200–2,500 feet (-61–760 m)). Some females actually migrated down in elevation to winter areas (-200 feet (-61 m)). They also found a partial segregation of sexes during winter with males (median = 6.5 miles (10.5 km), range = 0.6–18.3 miles (1.0–29.4 km)) moving farther than females (median = 0.6 miles (1.0 km), range = 328 feet–17.4 miles (0.1–28.0 km)). Most birds were sedentary on their winter ranges.

Greater Prairie-Chicken

The greater prairie-chicken (*Tympanuchus cupido*) inhabits prairies in central North America (The Crane Trust). It once ranged from central Canada to Texas and included three distinct subspecies. The heath hen (*T. c. cupido*) inhabited portions of the eastern U.S. but is now extinct. The Attwater's prairie-chicken (*T. c. attwateri*) persists only in coastal Texas. The interior greater prairie-chicken (*T. c. pinnatus*) is the most widespread of the three subspecies. The range of the interior greater prairie-chicken has shifted a great deal under the influence of human land use patterns. It originally occurred in moister tallgrass prairies and oak savannas from southern Ohio to southeastern South Dakota and from parts of northern Tennessee to south-central Texas. Oak savannas likely provided an important winter food source. As small areas of prairie were converted to agriculture during early settlement of the Great Plains, greater prairie-chickens expanded their range, moving north into southern Canada and west throughout the Dakotas, Nebraska, and Kansas and into eastern Wyoming and Colorado where small croplands provided winter forage.

Schroeder and Braun (1993) examined migration in greater prairie-chickens in northeastern Colorado. They found that the average migration distance between winter and breeding ranges differed significantly by sex. Distances between winter and breeding areas ranged between 2,000 feet (600 m) and 24.9 mi (40.0 km) for females ($\bar{x}$ = 5.7 ± 1.1 miles (9.2 ± 1.7 km), n = 38) and between 0.6 and 3.8 miles (1.0 and 6.1 km) for males ($\bar{x}$ = 1.7 ± 0.3 miles (2.7 ± 0.4 km), n = 12). Both females and males appeared to display fidelity to both breeding and winter sites.

Greater Sage-Grouse

Greater sage-grouse (*Centrocercus urophasianus*), also known as the sage hen, is the largest grouse in North America. Its range is sagebrush country in the western U.S. and southern Alberta and Saskatchewan, Canada (Cornell Lab of Ornithology). They usually nest in areas with relatively dense cover from big sagebrush and tall, cool-season bunchgrasses, although they also use areas with rabbitbrush (*Chrysothamnus spp.*), greasewood (*Glossopetalon spinescens*), and grassy areas. Leks are located in clear areas such as broad ridgetops, grassy swales, dry lakebeds, and sometimes recently burned areas. Adult hens lead their growing chicks to areas with good forage, including irrigated pastures, wet meadows, and alfalfa fields, in addition to sagebrush.

Berry and Eng (1985) examined interseasonal movements and site fidelity in female greater sage-grouse in southwest Wyoming. They used radio telemetry to track movements of 12 birds. Eleven birds migrated approximately 22 miles (35 km) from their respective breeding areas (leks) to wintering areas. The 12th bird migrated approximately 13 miles (21 km) from its breeding area to its wintering area.

Fischer, Reese, and Connelly (1996) examined how vegetal moisture content and nest fate influenced timing of migration in female greater sage-grouse. They used radio telemetry to track the movements of 116 birds and found that the majority of females began migrating when the moisture content of vegetation (forbs and sagebrush) declined to less than 60%. The authors speculated that hot, dry weather may trigger migration from summer range to winter range 30 days earlier than normal weather patterns.

Leonard, Reese, and Connelly (2000) used radio telemetry to track the distribution, movements, and habitats of 14 female and 39 male greater sage-grouse on the Upper Snake River Plain of Idaho. They found that the straight-line distance of the birds that migrated between summer and winter ranges averaged approximately 66 miles (107 km) (range = ~57–78 miles (~92–125 km)).

Beck et al. (2006) used radio telemetry to examine the movements and survival of 58 juvenile greater sage-grouse in lowland (4,800–5,900 feet (1,463–1,812 m) above mean sea level) and mountain valley (5,500–7,500 feet (1,664–2,282 m)) areas in southeastern Idaho. Juvenile sage-grouse captured in the mountain valley area moved an average of 1.4 miles (2.2 km) (20%) farther ($\bar{x}$ = 8.1 ±0.7 miles (13.0 ±1.2 km)) from autumn to winter ranges than juvenile grouse captured in the lowland area ($\bar{x}$ = 6.7 ±0.7

miles (10.8 ±1.2 km)). The authors concluded that juvenile greater sage-grouse that moved farther distances to seasonal ranges experienced lower survival than juveniles from a more sedentary population.

Connelly, Hagen, and Schroeder (2011) examined the characteristics and dynamics of greater sage-grouse populations from available literature. They summarized demographic data for females during the breeding season for the eastern (Great Plains, Wyoming Basin, and Colorado Plateau) and western (Southern Great Basin, Northern Great Basin, Snake River Plain, and Columbia Basin) portions of the species range. Grouse in nonmigratory populations tend to be relatively sedentary with seasonal movements <6.2 miles (10 km), while birds in migratory populations may travel well over 62 miles (100 km).

Tack et al. (2012) examined migratory pathways of 39 female greater sage-grouse in northeastern Montana and south-central Saskatchewan, Canada. They found that all females migrated ≥13 miles (21 km) between summer and winter ranges. The longest document was 76 miles (122 km). The authors concluded that greater sage-grouse in their study probably migrated because breeding areas lacked sufficient sagebrush cover in winter.

Lesser Prairie-Chicken

The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is found in the Southwest region of the U.S, living in the five-state region of the southern Great Plains where they have access to vast native grasslands mixed with low-growing shrubs such as sand sagebrush (*Artemisia filifolia*) and shinnery oak (*Quercus havardii*). The main threats facing lesser prairie-chickens are habitat loss and degradation from livestock grazing, agriculture, oil and gas extraction, herbicides, mining and roads, and wind-energy production (Center for Biological Diversity).

Earl et al. (2016) examined the characteristics of long-distance migrations in lesser prairie-chickens in southeastern Colorado, southern and western Kansas, east-central New Mexico, and Oklahoma. The authors found that dispersal movements were recorded ≤44 miles (71 km) net displacement for females, much farther than hitherto recorded for lesser prairie-chickens. The farthest dispersal movement in males was 10 miles (16 km). The average migration distance was 8 miles (13 km) for all locations. They concluded that these distances might indicate that the connectivity among populations is greater than previously documented. Dispersal movements were displayed primarily by females and had a northerly directional bias. Lesser prairie-chickens displayed both exploratory foray loops and round-trip movements, half of which appeared seasonal, suggesting a partial migration in some populations.

Spruce Grouse

As a specialist of the taiga, the spruce grouse (*Falcipennis canadensis*) is found throughout Canada. In the U.S., it is present in Alaska, northern New England, northern Michigan, northeastern Minnesota, and the montane coniferous forests of Montana, Idaho, Maine, Oregon, and Washington (Wikipedia). Spruce grouse are associated with conifer-dominated forests, including pine, spruce, or fir (*Abies spp.*). In summer, they can be found near rich understory of blueberries (*Vaccinium spp.*) and other shrub, and in winter, they prefer dense conifer stands.

Herzog and Keppie (1980) examined migration in spruce grouse in southwestern Alberta, Canada. They found that 39% of the birds they monitored displayed migratory behavior, and they migrated each year of their study regardless of weather conditions. Females migrated at a higher rate than males, and straight-line migratory distance for females ($\bar{x}$ = 3.1 ±0.6 miles ($\bar{x}$ = 5.0 ±1.0 km), n = 9) was longer than for males ($\bar{x}$ = 1.1 ±0.3 miles (1.7 ±0.5 km), n = 4).

Schroeder (1985) used radio telemetry to examine migration in 93 spruce grouse in southwestern Alberta, Canada. He found that all migrants displayed fidelity to summer and winter ranges. Males migrated ≤6.2 miles (10 km) between spring dispersal and winter areas, and females migrated ≤11 km.

Some short-distance (<1.2 miles (2 km)) migrants repeated migratory trips during a single season. Among long-distance (>1.2 miles (2 km)) migrants, females tended to migrate in flocks with other females.

White-Tailed Ptarmigan

The white-tailed ptarmigan (*Lagopus leucura*) is the smallest grouse in North America. It inhabits alpine habitats from treeline to the high alpine of the West. This species has been recorded nesting at elevations up to 13,300 feet (4,054 m), making it North America's third highest elevation breeding bird after horned lark (*Eremophila alpestris*) and rosy finch (*Leucosticte tephrocotis*) (Martin et al. 2015). It is the only bird in North America that remains exclusively in alpine or upper-subalpine habitats year round.

Hoffman and Braun (1975) examined migration of a wintering population of white-tailed ptarmigan in north-central Colorado. Movements were documented for 16 adult females, 17 subadult females, six adult males, and six subadult males. They found that females migrated greater distances (adult females $\bar{x}$ = 4.2 miles ($\bar{x}$ = 6.8 km), subadult females $\bar{x}$ = 4.0 miles ($\bar{x}$ = 6.5 km)) than males (adult males $\bar{x}$ = 0.9 miles ($\bar{x}$ = 1.4 km), subadult males $\bar{x}$ = 1.9 miles ($\bar{x}$ = 3.1 km)). Most adult females (19) did not venture beyond 5 miles (8 km) from wintering sites, but five moved >6.2 miles (10 km). Movements >6.2 miles (10 km) were not uncommon for subadult females—15 of 39 subadult female movements exceeded this distance. The longest documented migration (14.1 miles (22.7 km)) was by a subadult female. More females (79%) apparently migrated to winter habitat than did males (21%).

Conclusion

Migration has been documented in the scientific literature for six of 12 grouse species in North America. Grouse probably migrate because of elevational or seasonal differences in habitat availability or fidelity to seasonal-use areas. Female grouse often migrate in single-gender flocks and travel farther than males between summer and winter areas. Subadults often migrate farther distances between summer and winter areas than adults. Some grouse migrate vertically between summer and winter areas. Portions of a grouse population may choose not to migrate. Migration distances of individuals within a species may exceed 90 miles (150 km).

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Special Session Four.
Broadening the Tent: Valuing Wildlife Conservation

Strengthening the Future of Fish and Wildlife Management in Colorado: Keeping the Public in the Public Trust Doctrine

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This is an excerpt from a longer report produced in 2012 assessing opportunities for Colorado Parks & Wildlife to increase relevancy and diversify funding. The full report is available upon request.

Executive Summary

Government agencies currently face a number of pressures to increase services, while doing so with fewer and fewer resources, as they experience the growth of a diversifying population, limits to revenues, an increasing distrust in government, an advance in reliance on technology, and changing environmental patterns. All of these factors are cause for governments to review the type of services they undertake and the methods by which those services are provided.

State wildlife agencies are challenged to increase services in response to both biological and social pressures while simultaneously witnessing a collapse of their traditional funding structure. Historically funded by a user-pays model, state wildlife agencies are experiencing a steady decline in their traditional user base, along with an increase in demand for services necessary to meet their mission of protecting wildlife—a common resource held in trust by governments for the benefit of the public. With the recent merger in Colorado to a combined Division of Colorado Parks & Wildlife (CPW), the agency is positioned to embark on a strategic change effort in response to these challenges.

In support of strategic change, public value theory suggests that change efforts will be most successful if they produce increased value to the public. Responding to values of the public first requires a clear understanding of what the public finds important. Followed closely is development of a clear vision and action plan for what an agency could accomplish that meets the interest of the public. Several state wildlife agencies have attempted such strategic change to increase their value to the public, and ultimately, a small number were successful in harnessing that support to secure additional public funding for the agency.

The goal of this project is to answer the following question: how can CPW strategically position itself to increase its value to the public and justify a long-term need for funding to maintain that value? CPW has already begun structural and strategic changes through the recent merger of the Parks Division with the Wildlife Division and strategic planning is underway to connect the mission and mandates of both agencies. This project applies public value theory to a number of successful cases where strategic change efforts resulted in increased revenue for wildlife management. Data from five cases was analyzed to identify common themes of success. The results are a series of recommendations for the Colorado Department of Natural Resources (DNR) and CPW to undertake in order to improve public support for wildlife management in the state.

The recommendations provide a process to clearly demonstrate the value CPW can provide for the citizenry of Colorado. This is an initial element in productively moving towards agency change because increased wildlife services cannot be institutionalized without new funding streams. And any efforts to develop new funding streams will require a compelling justification for the value the agency provides to the public.

Recommendations

In order for CPW to respond to changing demographics and maintain relevancy for the citizens of Colorado, they should begin a strategic change effort that: 1) creates a new vision for natural resource conservation in Colorado; and 2) builds towards a sustainable funding stream to support that vision. Colorado DNR and CPW have a unique opportunity with upcoming strategic planning efforts, in light of the recent merger of the Parks Division with the Wildlife Division, to adapt the mission of the agency to closely align with the public's values. Previous successful funding initiatives functioned largely as strategic change efforts, beginning years ahead of when the agency publicly pursued any new funding mechanism. Given the recent CPW merger, DNR has the opportunity to change how natural resources are supported and bring together key leaders in the community to develop a new vision for conservation in the state. A public involvement campaign would initially build support for the vision of change. This broad vision would be the foundation for a new strategic work plan for CPW. And, if adequately structured to respond to what the public sees as the future of natural resources in the state, that work plan would be the foundation for a public funding request to support agency activities.

The below recommends implementation steps that could be undertaken to initiate and support such an effort:

1. *Establish a Group to Lead Change*. With the right leadership in place, strategic planning around the CPW merger provides a significant opportunity to redefine what is necessary for the future of fish, wildlife, and park resources as well as other resources in Colorado. Leadership within DNR (executive director), with close coordination with the CPW director, should initiate a process for strategic planning. Very quickly these leaders should work to bring in key members of the Parks & Wildlife Commission, the governor's office, and other relevant state agencies.
2. *Identify Key Partners*. DNR and CPW should quickly identify a few key nongovernmental partners in the states who would support the visioning effort. These partners should be expected to help secure early funding for public polling and outreach efforts. Ultimately, this group of partners will be expanded, but DNR will need to begin with a few very committed and connected groups to initially leverage political and financial support.
3. *Identify the Need for Change*. Strong support came from processes initiated outside of the agency. Leadership should consider commissioning a small external team to assess the needs of the agency and recommend necessary activities to sustain its future. This neutral needs assessment can then be the foundation of a visioning exercise led by DNR and CPW staff. Simultaneously, conduct statewide analyses to begin to gauge where public interest exists for natural resources, as this will determine the breadth of issues in the vision. While more in depth public outreach will be necessary later on in the process, early assessments of broad public interest in natural resources will help provide a starting point for DNR and CPW. Recent assessments have been conducted in western states that can provide initial insights for Colorado. These assessments, which can be used as a starting point for CPW, highlight the public's general values towards wildlife and the priorities they place on specific activities of state wildlife agencies.
4. *Develop a Vision for Change*. Using the needs assessment and statewide analyses as a foundation, DNR, CPW, and key partners can begin to develop a vision that will guide change within the agency. Ideally, a citizen committee would be formed to better incorporate public values into development of a vision for change. Strategies to employ include open-ended efforts such as statewide meetings, focus groups, and citizen advisory groups. CPW staff should also be included in vision development to understand the benefit it will have for them. As a vision is established, agency staff should use it to set internal strategic planning activities, including development of a more detailed work plan of activities necessary to achieve the vision.
5. *Communicate the Vision for Change*. Once a broad vision has been outlined by agency leaders and key partners, public input should be incorporated in order to receive critical feedback on the connection of the vision to public values. DNR, CPW, and partners should present the vision,

along with agency work plans, and listen to the reactions of the public. This will require more than outreach to key interest groups and regular attendees at commission meetings. Citizen advisory groups, focus groups, and key partners who were involved in the visioning effort should be utilized to communicate the plan to the general public and solicit feedback.

6. *Finalize a Strategy*. After receiving and incorporating public input on the vision and preliminary agency work plan, DNR, CPW, and other key partners will need to finalize a formal strategy for achieving the vision. This will lead to the development of a long-term strategic plan for all impacted government agencies. Again, internal agency support for this work will be essential to successful implementation.
7. *Determine Funding Goal*. Simultaneous to strategy development, DNR, CPW, and key partners can work with political and legislative staff to assess the most palatable funding mechanism to pursue in support of the strategic plan. Leadership should consider forming a committee through the Colorado Wildlife & Parks Commission, legislature, or governor's office to assess long-term, dedicated funding opportunities. This is an opportunity to think creatively about funding solutions, so including private sector representatives will be valuable.
8. *Begin Public Campaign for Funding*. This will be the first time the public will hear a specific funding request associated with their vision for natural resources. Once a funding mechanism is identified, the effort will become a public campaign to support natural resources in Colorado. Aggressive marketing will commence, and DNR and CPW should mobilize key partners from the visioning exercise to help fundraise for this campaign. Leadership will have to be as strong as ever to support a funding request, and political support from the governor is essential. Agency staff can play a role within the limits of the law. By the time this process reaches the funding stage, all parties can feel confident that they are working towards a goal that is broadly supported by the public, which will significantly strengthen the advocacy efforts.

Colorado Parks & Wildlife Future Funding Study

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Introduction

Colorado Parks & Wildlife (CPW) commissioned a study to develop a list of potential alternative funding sources and to gauge user groups' perspectives about each. This is a summary of the report that was created for the Transactions of the North American Wildlife and Natural Resources Conference. The full study is available online.

Why This Study?

CPW has long been interested in diversifying its funding beyond the current sources, which rely heavily on hunting and fishing license fees and park generated revenue to support wildlife conservation and parks management. The recent passage of the Future Generations Act is helpful in addressing funding needs for CPW. However, the agency continues to face significant and likely long-term trends and changes in the state, such as changing demographics, growth in demand for outdoor recreation, and decline in participation in hunting. CPW has a diverse mission: to perpetuate the wildlife resources of the state, to provide a quality state parks system, and to provide enjoyable and sustainable outdoor recreation opportunities that educate and inspire current and future generations to serve as active stewards of Colorado's natural resources. Diverse, stable, long-term funding that is equitable and supported by a broad set of stakeholders is important to the success of CPW into the future.

Approach

To assess and summarize funding ideas for CPW, we conducted a literature review to explore and catalogue funding mechanisms that have been used or proposed to support state parks and wildlife agencies in the United States. Building on those findings, we explored a subset of funding mechanisms to consider Colorado-specific context, such as revenue generation potential and specific policy or regulatory considerations. With those findings, we consulted a wide range of stakeholder groups and individuals who provided input on funding mechanisms and shared broader observations about future funding for CPW. As part of the stakeholder engagement process, we met with more than 200 individuals through a series of presentations and discussions at existing group meetings, consultations with specific user groups, and interviews.

Colorado-Specific Context

There are several characteristics that make Colorado unique when considering funding mechanisms for CPW:

- Combined parks and wildlife agency: In 2011, Colorado State Parks and the Colorado Division of Wildlife merged to create CPW. As required by law, CPW maintains two separate budgets—one for parks and one for wildlife.
- Taxpayer Bill of Rights: Funding for CPW faces unique challenges because of the Taxpayer Bill of Rights (TABOR), which has significant implications for tax revenue for the state government. TABOR makes passing new or increased taxes in the state difficult due to ballot initiative requirements. CPW also currently has a beneficial enterprise exemption status because 90% of its funding is generated from sources besides state and local government.

Issues and Funding Priorities

As part of the stakeholder engagement process, we sought feedback on what issues related to conservation, wildlife, and outdoor recreation were of the highest priority when considering future funding. Some of the priorities include:

- Outdoor recreation priorities, such as trail maintenance and development, improved access, minimizing the negative impacts of outdoor recreation, and supporting outdoor recreation-related planning processes.
- Wildlife management priorities, such as funding to support the State Wildlife Action Plan; establishing and supporting long-term wildlife monitoring programs; and management activities that support nongame species.
- Other conservation goals, such as supporting clean water and open space.

Overarching Feedback on Future Funding

In addition to providing feedback on nine specific funding mechanisms included in the study, we heard some key themes across stakeholder groups and funding ideas, including:

- CPW needs to continue to build a broad constituency beyond the sportsmen and angler community. Not all groups see their priorities aligned with CPW, and in some cases, there is a historic lack of trust.
- Many of the current user-pays funding mechanisms are successful because they maintain a high degree of transparency about where the funding goes. Future funding should also maintain this transparency.
- For a funding mechanism to be well supported it must address an important funding need. A successful funding campaign needs to be paired with messaging about the current and future funding challenges faced by CPW.
- User-pays mechanisms should support user benefits, with some flexibility to support broader public priorities related to wildlife, conservation, and outdoor recreation.
- User-pays mechanisms should not limit equal accessibility to public land.

Specific Funding Mechanisms

Below is a summary of the revenue generation potential, policy considerations, and stakeholder feedback on nine specific funding mechanisms that were analyzed as part of the study.

General Sales Tax

An increase in general sales tax (typically ⅛ of 1%) that would be dedicated revenue for CPW.

Annual revenue generation potential. $128 million.

Policy considerations.

- Passing a new tax is difficult under TABOR.
- CPW would lose its enterprise exemption status unless the new tax revenue was capped at $10 to 13 million.
- Sales tax is a long-term stable funding source.
- A small sales tax increase is an equitable and low-impact model for Coloradans.

Stakeholder feedback.

- Getting a new tax passed would be very challenging in Colorado.
- A sales tax hike may represent one of the most stable and long-term funding options.

Dedicated Revenue from Existing Sales Tax on Outdoor Gear

A portion of existing revenue generation from sales tax on outdoor gear would be "earmarked" for CPW.

Annual revenue generation potential. $36.2 million to $42.6 million.

Policy considerations.

- There are political challenges inherent with shifting tax revenue from other state priorities to parks and wildlife, especially in Colorado where tax-generated revenue is limited because of TABOR.
- CPW would lose its enterprise exemption status unless the new tax revenue was capped at $10 to 13 million.
- This mechanism could be a long-term stable funding source if it is passed as a constitutional amendment that exempts outdoor gear tax revenue from annual appropriations.
- It invests the revenue generated from outdoor gear sales in the agency that supports outdoor recreation opportunities and wildlife resources.

Stakeholder feedback.

- It is supported by the Outdoor Industry Association and does not pose a burden on retailers or increase costs of outdoor gear.
- It does not pose additional barriers to participation or access by low-income user groups.

Excise Tax on Outdoor Gear

A new tax on outdoor gear that would generate dedicated revenue for CPW.

Annual revenue generation potential. Depends on the size of the tax. $13 million (0.8% excise tax) to $230 million (10% excise tax).

Policy considerations.

- Since it is impossible to distinguish who buys outdoor gear for outdoor recreation and who buys outdoor gear for other purposes, this is not a perfect users-pay model.
- An excise tax could drive consumers to buy online or from other states. An accompanying sales tax holiday could be used to keep costs the same for consumers.
- CPW would lose its enterprise exemption status unless the excise tax was designed to generate less than $13 million (0.8% or less).
- A state excise tax represents a stable long-term funding source.
- Federal excise taxes on hunting and fishing gear have been very successful in funding conservation and wildlife.

Stakeholder feedback.

- The Outdoor Industry Association strongly opposes an excise tax and represents a powerful lobbying force and important partner in outdoor recreation.
- Sportsmen and anglers have supported a similar funding mechanism through Pittman-Robertson and Dingell-Johnson at the federal level.
- The outdoor industry already pays high tariffs on imported goods.
- Excise taxes could raise costs for outdoor enthusiasts.

- A new excise tax is burdensome to retailers, especially if they must track certain categories of gear at different tax rates.

Vehicle Registration Fee

A fee assigned at vehicle registration would support access to state parks. The fee could be opt-in, opt-out, or mandatory.

Annual revenue generation potential. $11 million to $21.6 million.

Policy considerations.

- A vehicle registration fee has the potential to both lower costs for residents to access state parks and raise more money than current state parks pass revenue.
- A vehicle registration fee would likely produce more revenue as the state population grows, partially helping to offset the impact of a growing population on outdoor recreation and wildlife resources.
- A mandatory or opt-out fee model may not be supported by those who don't visit state parks.
- The cost of vehicle registration in Colorado is already high and any fee increases could drive fleet vehicles to be licensed in other states.
- Any kind of vehicle registration fee addition would require legislative action.
- If a mandatory fee were collected by the DMV, which is not an enterprise agency, TABOR revenue impacts may be triggered. An opt-out or opt-in fee would likely not trigger TABOR since they are clearly fees rather than taxes.
- In other states, funding from vehicle registration fees goes to their parks budget (although funding for wildlife could be explored in Colorado).
- A fee tied to vehicle registration could get caught up in conversations about funding highway infrastructure, instead of CPW.

Stakeholder feedback.

- There are equity questions related to funding state parks through vehicle registration fees, especially if they are mandatory. Residents who will not visit state parks would be required to pay if they own a vehicle. However, the overall cost of visiting state parks may go down and the on-site cost would be less of a barrier to those who already purchased a pass through vehicle registration or are visiting parks through public transportation or other nonvehicle modes of transportation.

Mountain Bike Registration Fee

Mountain bikers would purchase an annual registration fee (either per rider, per bike, or a hybrid).

Annual revenue generation potential. $6.1 million to $11.5 million.

Policy considerations.

- There are likely no TABOR implications with a gear registration fee.
- It would be relatively straightforward to establish, if there is good support from participating users.
- There are logistics considerations regarding the scope, implementation, and enforcement.

Stakeholder feedback.

- There is strong participation, enthusiasm, and support for the OHV and snowmobile registration programs on which the fee would be based. These groups support the expansion of the program to included nonmotorized user groups.

- From the groups who participated in stakeholder engagement, there is an appetite in the mountain bike community for a fee program to support trail maintenance and building.

Nonmotorized Boat Registration Fee

Boaters would purchase an annual registration fee for specific nonmotorized boats (defined by vessel type or length).

Annual revenue generation potential. $3.8 million to $7.6 million before administrative and enforcement costs, which were not included in this revenue generation estimate.

Policy considerations.

- The existing motorized and sailboat registration program provides a structure for administering a nonmotorized registration program.
- Enforcement for river vessels would be challenging, as motorized boaters are typically charged or checked at reservoir and lake launches, but there is no current infrastructure at the intervention point on rivers (put ins and take outs).
- There are no TABOR implications with a nonmotorized boat registration fee.

Stakeholder feedback.

- The nonmotorized boat community does not see benefits from a boat registration fee and does not support a user-specific funding mechanism.
- The nonmotorized boat community is concerned about access and users "right to float" and would like to see better support from the state on this issue before considering funding mechanisms that implicate them.
- The nonmotorized community has concerns about a per-vessel funding model due to ownership patterns.
- Other user groups supported this mechanism and believe it is a feasible option, particularly since many other states have implemented a similar fee structure.

Colorado Outdoor Stamp

Outdoor recreation users would be required (or encouraged) to purchase an annual pass to support conservation, outdoor recreation, and wildlife through CPW and potentially other agencies.

Annual revenue generation potential. $9.5 million to $28.5 million before administrative and enforcement costs, which were not included in this revenue generation estimate.

Policy considerations.

- Additional work is needed to determine if this could be a mandatory, opt-out, or voluntary funding mechanism with significant implications for revenue generation potential.
- The engagement and education effort that would be needed to make this mechanism widespread and successful would be time-consuming and difficult.
- This model implicates all outdoor recreation user groups equally and simplifies the current à la carte approach to fees.
- A mandatory Colorado outdoor stamp would need to support funding priorities and be clearly linked to the fee.

Stakeholder feedback.

- Many stakeholders were enthusiastic about this model, especially those already paying a user fee.
- Stakeholders raised many questions about enforcement and implementation of this mechanism, which would need further exploration.

Incentivized Habitat Stamp Contribution

Incentivize outdoor recreation users to voluntarily purchase a habitat stamp or make a donation through targeting membership-based organizations, outfitters, or other intervention points.

Annual revenue generation potential. $263,000**.**

Policy considerations.

- Voluntary incentivized donations do not represent a long-term stable funding source.
- Habitat stamp funding is statutorily directed to narrow wildlife-related purposes, not the broader wildlife budget or other priorities. A habitat stamp-style mechanism that does not face the same funding restrictions may be most effective.
- Past voluntary approaches in Colorado have not been successful.
- There are no TABOR implications since this is a voluntary contribution.

Stakeholder feedback.

- Many people would be unlikely to contribute without explicit understanding of where the funding is going and alignment with their priorities.
- Outfitters and nonprofits were concerned about the administrative burden of collecting money on behalf of CPW.
- For membership-based organizations, a $5 donation for CPW represents a significant percentage of their membership fee and could deter new members. Similar concerns were raised with outfitters.

Technology-Based Voluntary Donations

Leverage technology—and especially smartphones—to encourage voluntary giving.

Annual revenue generation potential. Not available.

Policy considerations.

- Voluntary donations do not represent a long-term, stable, or reliable funding source for the agency.
- There are no TABOR implications with voluntary donations. Developing new apps that could incentivize technology-based donations would require outside expertise and could be expensive.
- There are no political risks associated with voluntary donations.
- Technology has the potential to help CPW with greater engagement of a wide range of stakeholders and outdoor users.
- Technology could be used to effectively implement or support other funding ideas.

Stakeholder feedback.

- Stakeholders felt that this was a low- or no-risk option.
- They also recognized that these funding ideas are unlikely to generate significant revenue and that state government may not be the right organization to advance entrepreneurial technology (either because of a misfit of skills or because paid apps from government agencies may not align with the agencies mission of serving the public).
- There may be opportunities for technology to play a role in supporting, promoting, and encouraging other funding mechanisms described above (e.g., mountain bike registration fee could be through an app).

Conclusions

All funding mechanisms included in this analysis come with significant pros and cons. Funding for CPW will likely need to be a mix of funding mechanisms since no one solution addresses all objectives and criteria. Tax-based funding mechanisms have the potential to generate the most revenue, but TABOR makes them very challenging, and for revenue generated over $10 to $13 million, CPW would lose its enterprise exemption status. Fees associated with specific uses, activities, or access build on the link between activities and the outdoor recreation infrastructure and wildlife resources that support or enhance them. There is enthusiasm for the Colorado Outdoor Stamp model, but more work is needed to define how it would work. There is also potentially a near-term opportunity for a mountain bike fee, which could support user benefits (i.e., trail maintenance and construction). Voluntary funding mechanisms are unlikely to generate significant revenue, but could build a broad base of support, partners, and a coalition of enthusiasts for CPW. CPW is well positioned to bring together a diverse group of partners towards a common vision for Colorado with abundant wildlife and ample outdoor recreation opportunities.

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Reflections on CPW Future Funding Study

John Howard
Colorado Parks & Wildlife
Boulder, Colorado

I served on the Colorado Parks & Wildlife (CPW) Commission for two years before I became chairman the last two years. During this time, I realized that one of the potential opportunities for the commission was to be a larger forum for discussing natural resources issues in the state—and that there is a role for the commission beyond the pressure of our mandated statutory and regulatory agenda.

Last year, we held two open forums with invited panels of experts that included live public involvement, streaming live on Facebook, and posting on YouTube. CPW staff documented that we had approximately 15,000 interactions in the two forums. The topics we focused on directly related to expanding the relevancy of the agency and the reach of the commission's traditional audience. They were:

1. How to involve recreationalists, beyond sportsmen, in the broad work of the agency.
2. How to engage with underrepresented communities in our state parks (disabled people, communities of color, youth, agriculture, veterans, and others).

These forums were held concurrently with the development of the Meridian Institute's Future Funding Study in 2018. Between the stakeholder interactions in the forums and the study, I had the following reflections on how Colorado Parks & Wildlife—and the commission—can increase our relevancy and reach to the public.

1. We don't tell our story very well and that is largely due to structural reasons. To start, storytelling is not a natural skill set for a government agency with a mandated mission. The agency has outreach and marketing staff, but it is not a seasoned advertising agency.
2. There are some near-term opportunities to engage with certain user groups who see the value of engaging with CPW and have the resources to engage. Specifically, mountain bikers are ready to get involved. They want more recreational opportunities and yet know that CPW's wildlife review of their projects is critical for securing needed public grants for trail projects. Other groups are the farthest away from seeing the value of engaging with CPW—outdoor manufacturers are a good example. Other groups like hikers, bird watchers, and other nontraditional recreationalists fall in between and there is an opportunity to cultivate those relationships.
3. When it comes to funding, there will be the challenge to convince people to pay for the base conservation work of the agency. It is a much easier sell to convince someone to pay for something that directly benefits them. The question remains: how do you convince other user groups to contribute money and volunteer time to the conservation of wildlife, lands, and water as well as their own direct interests, like more recreational trails?
4. And while the agency must focus on engaging new audiences to stay relevant, staff need to remember that with engagement will come desire for these new users to have representation on the commission. We must be willing to accept this change and the challenge it may pose to a different way of doing business.
5. From a practical standpoint, any new opportunities for recreational users, such as a new registration fee for mountain bikers, may create an additional burden on our park rangers and district wildlife managers to enforce.
6. The key to the future is in being creative. We must challenge ourselves to think about new funding models developed with new user groups.

Registered Attendance

Alabama

Christine Easterwood, Keith Gauldin, Wade Stevens, Chuck Sykes, Melissa Vinson

Alaska

Matt Ernst, Christopher Estes, Herbert Frost, Eddie Grasser, Raymon Hedges, Joel Helm, Jim Johnson, Gary Larsen, Misty Libby, George Parish, Aaron Poe, Kristy Rouse, Mark Sledge

Alberta

Evelyn Merrill, Travis Ripley

Arizona

Aaron Alvidrez, Josh Avey, Paul Beier, Debbie Brewer, Chris Cantrell, Clay Crowder, Douglas Cummings, Jim deVos, Al Eiden, Randy English, Carolyn Enquist, Tom Finley, James Goughnour, Ty Gray, Jim Heffelfinger, Janet Johnson, Nick Kainrath, Kent Komadina, Scott Lavin, Richard Lawrence, Jim Odenkirk, Ryan O'Donnell, Chris Parish, Jeremy Pennell, Betty Phillips, Joanne M. Roberts, Matthew Ruiz, Daniel Steward, San Stiver, Hannah Telle, Kellie Tharp, Bill Van Pelt, Larry Voyles, Kevin Wakefield

Arkansas

Chris Colclasure, Charles Davidson, Allison Fowler, Ashley Gramza, Dana Hardage, Natasha Harrison, Dalton Hills, Tabbi Kinion, Jason Olive, Robert Pike, Jennifer Sheehan, Justin Stroman

Armed Forces Pacific

Noah Burrell, Erica Cunningham, Sandra Gibbons, Dana Lujan, Valerie Vernier, Yoshitaka Yamaguchi

British Columbia

Jennifer Psyllakis

California

Steven Albert, April Andujar, Sandra Baldwin, Bill Berry, Brian Boroski, Tim Bradley, Shannon Bryant, Walter Christensen, Kirsten Christopherson, Damien Cie, Penn Craig, Kathryn Curtis, Russell Elswick, Rhys Evans, Paige Farrell, Nancy Ferguson, Robert Fisher, Tamara Gallentine, Geoffrey Geupel, Jason Gibbons, Jessica Groves, Misty Hailstone, Suzanne Hall, Jacquelyn Hancock, Stacie Hathaway, Brian Henen, Mark Hennelly, Cynthia Hopkins, Paula Jacks, Seth Jerue, Dawn Johnson, Sarah Kotecki, Dawn Lawson, Colin Lee, Stafford Lehr, Benjamin Leslie, Ryan Lockwood, Robert Lovich, Jeanne Mayer, Kyle McCann, Chadwick McCready, Michael Moore, Michelle Ocken, Glenn Olson, Christopher Reddin, Nathaniel Redetzke, Michael Robinson, Thomas Sabol, Bob Schallmann, Clint Scheuerman, Shannon Shea, Vanessa Shoblock, Roland Sosa, Paul Souza, Mendel Stewart, Barbara Sugiyama, Sherri Sullivan, Lisa Talcott, Carl Thelander, David Tran, Brian VanDelist, Deanne Weber, Tiffany Whitsitt-Odell, Todd Wills, Lauren B. Wilson, Christy Wolf, Larry Zimmerman, Alisa Zych

Colorado

Michael Amato, Jennie Anderson, Ed Arnett, William Austin, Aparna Bamzai, Bob Baron, Andrew Beavers, Adam Beh, Christine Bern, Brock Best, Zach Bodhane, Susan Bonfield, Sandy Boyce, Jonathan Boydston, Timothy Brass, Christopher Breidenbach, Elizabeth Brown, Jocelyn Brown-Saracino, Jacqueline Buchanan, Amy Burzynski, Elizabeth Caldwell, Lew Carpenter, Dustin Casady, Patricia Champ, Tony Chapa, Mark Chase, Cory Chick, Larry Clark, Mindy Clarke, Neil Clineman, Coralie Cobb, Roy Cook, John Cornely, Kelly Coy, Harry Crockett, Kendra Cross, Helen Davis, Russell Davis, Thomas Deliberto, Reid DeWalt, Andrew Don Carlos, James Dubovsky, Matt Dunfee, Duncan Eccleston, Matt Eckert, Crystal Egli, John Eisemann, Gwynn Ellis, Mary Emmons, Clint Evans, Dwight Fielder, Christi Gabriel, John Gale, Seth Gallagher, Jim Gammonley, Luke George, Scott Gilmore, Ed Gorman, Tracy Gripp, Asma Hanif, Nancy Hannaway, Amanda Hardy, Becky Ralston Hawkins, Chris Herron, Matt Hogan, Marty Holmes, Jon Holst, John Howard, Heather Hubbard, Andrew Jensen, Clark Jones, David Jones, David Kelley, Jody Kennedy, Greg Kernohan, Aaron Kindle, Julia Kintsch, David Klute, Robin Knox, Deon Kuhl, Brian Kurzel, Katie Lanter, Charlie Lawton, Elaine Leslie, Steve Lohr, Robert Look, Angela Lortie, Martin Lowney, Patty Maher, Patrick Malone, Alicia Marrs, Tom Mathies, Jake Matter, James McDermott, Megan F. McKenna, Craig R. McLaughlin, Rebecca Meyer, Brian Mihlbachler, Kacie Miller, Michael Miller, Randall Miller, Elizabeth Mojica, Ken Morgan, Melia Nafus, Priya Nanjappa, Josh Nehring, John Nelson, Matt Nicholl, Dale Nolte, Suzanne O'Neill, Eric Odell, Emily Orbanek, Arvind Panjabi, Jody Patterson, Garrett Paul, Robyn Paulekas, Nick Payne, Gaspar Perricone, Kristen Philbrook, Jenny Powers, Mike Quartuch, Brian Reichert, Lisa Reynolds, Richard Riddle, Sarah Rider, Terry Riley, Matthew Rodgers, Melanie Roth, Eve Schauer, George Schisler, Matt Schulz, Ward Scott, Robin Sell, Natalie Sexton, Jennifer Sieracki, Michael Simon, Doug Skinner, Jordan Spaak, Pam Sponholtz, William Sprouse, Casey Stemler, Jodi Stemler, Gene Stout, Bethany Straw, Jason Suckow, Margaret Taylor, David Tazik, Tara Teel, Kirk Teklits, Therese Thompson, Gary Thorson, Dave Trevino, Thomas Tripolone, Mark Truax, Lauren Truitt, Nicole Turner, Mark Vandever, Jeff Ver Steeg, Tammy VerCauteren, Shannon Voggesser, Noreen Walsh, Judith "Lynne" Wanderscheid, Chris West, Madeleine West, Bill Whitacre, Gary White, Melissa Whittingslow, Tammy Whittington, Bryan Wilfong, Melanie Woolever, Mike Wrigley

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Nancy Mathews, Judy Stokes Weber, Steve Weber, Scot Williamson

Virginia

Wendy Adams, Jennifer Allen, Eric Alvarez, Taylor Austin, Terry Bashore, Jessica Bassi, Emily Beach, Doug Beard, Eric Beckley, Craig Benjamin, Paul Block, Laura Busch, Robert (Bob) Byrne, Emmett Carawan, David Chanda, Peter Churchbourne, Pete Crum, Bob Curry, Stephen Czapka, Joe Daigneau, Alison Dalsimer, Verl Emrick, Amy Farak, Gregory Fleming, Chris Gerecke, Derrick Golla, Lissa Grimes, Healy Hamilton, Steve Hanser, Leslie Hartsell, Elsa Haubold, Julie Henning, Camille Hopkins, David Hoskins, Doug Howlett, Glenn Hughes, Stephanie Hussey, Kelly Ingebritson, David James, Michael Jean, Anne Jewell, Brent Keith, Mona Khalil, Anne Kinsinger, Cynthia Kolar, Jarrad Kosa, Aneil Kumar, Alison Lanier, Mike Leonard, Christopher Lotts, Brandon Martin, Tessa Martin-Bashore, Thad McDonald, Ruth Musgrave, Christa Nye, Sean O'Brien, Liz Ogilvie, Thomas Olexa, John Organ, Ryan Orndorff, Chris Petersen, Frank Peterson, Kurt Preston, Susan Recce, Kelly Reed, Jacqueline Rice, Ken Richkus, Dolores Savignano, Megan Scanlin, John Schmerfeld, Joel Snodgrass, Michael St Germain, Melanie Steinkamp, Michael Streight, John Thompson, Benjamin Tuggle, Donald Turner, Jeff Underwood, Blake Waller, Kevin Walter, Robert Wells, Jessica Wilkinson, John Wilson, Travis Wray, Michael Wright

Washington

Mary Anderson, Corinne Barker, Dennis Buckingham, Craig Burley, Margen Carlson, Eric Gardner, Dennis Gurney, Steve Holmer, Katherine Jesser, Rebecca Johnson, Colin Leingang, Cole Lindsey, John Mankowski, Nick Miller, Matthew Ridgway, Randi Riggs, Tiffany Selbig, Rick Spaulding, Brett Tiller, Jeff Villnow

West Virginia

Steve Chase, Paul Johansen, Gina Main, Christopher O'Bara

Wisconsin

David Beckmann, Aaron Buchholz, Justine Hasz, Scott Hull, Megan Kruse, Steve Kuennen, Eric Lobner, Nick MacDonald, Duane Meighan, Michael Rader, James Raiten, Bryan Richards, Steven Rood, Jonathan Sleeman, Mike Spors, Ollie Torgerson, Nathan Tucker, Keith Warnke, Mark Witecha

Wyoming

Doug Brimeyer, Angi Bruce, Nephi Cole, Brad Jost, John Kennedy, Larry Kruckenberg, John McKinley, Dirk Miller, Robert Model, Brian Nesvik, Alan Osterland, Martin Piorkowski, Tom Ryder, Alex Schubert, Scott Smith, Amanda Thimmayya, David Willms

Other

Jim Ball, Sarah Ball, Brian Batts, Richard Bentz, Kristie Blevins, Christine Decker, Daniel Decker, Tim DeGraff, Vicki deVos, Carol Faulstich, Rose Geleynse, Dorothy Gibb, Meghan Gilbart, Dolores Goughnour, Denise Gudlin, William Haldeman, Kathie Hubbard, Mike Kasunic, Joji Komine, Ron Lester, Guozheng Li, Jeff Libby, Chris Madson, Gerri Martin, Noe Marymor, Nora Marymor, Charidy Melder, Bill Moritz, Bryon Muniz, Shawna Nieraeth, Sylvia Pena, Samantha Probst, Kim Rader, Suzanne Richardson, Liz Rose, Mike Rouse, Daniel Shyles, Jorge Silva, Brian St. George, Paula Stevens, Vicki Vargas-Madrid, Howard Vincent, Mark Vondebur, Gabriela Zaldumbide