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Welcome and Opening Remarks

Steve Williams
Wildlife Management Institute
Gardners, Pennsylvania

Welcome to the 74th North American Wildlife and Natural Resources Conference. As has been our tradition, we meet in Washington, D.C. following each Presidential election. I am particularly pleased to be joined here today by the Secretary of the Department of Agriculture, Tom Vilsack, and the Senior Advisor to the Secretary of the Department of the Interior, Will Shafroth. We look forward to hearing from both of them as they embark on their new responsibilities. The work of the Departments of Agriculture and Interior is of paramount importance and interest to the participants in this conference.

The theme of this year's conference is, "Refining the Relevance of Resource Management." The theme makes extraordinary sense as we learn the new administration's approach to conservation. Some of us had the good fortune to talk with the Obama transition teams before the inauguration. We appreciated the opportunity to discuss issues of importance to the community and look forward to a productive relationship with the new administration. We also look forward to learning of the new appointees who will assume agency leadership positions and the teams that they bring to Washington to help improve the relevance of resource management.

During the transition team discussions, we highlighted some of the major issues that confront fish and wildlife conservation. There is no shortage of advice for the incoming administration. I'm not sure if that is good news or bad news. The Sporting Conservation Council prepared a 79-page document entitled, "Strengthening America's Hunting Heritage and Wildlife Conservation in the 21st Century: Challenges and Opportunities." The American Wildlife Conservation Partners developed the third version of "Wildlife for the 21st Century III: Recommendations to President Barrack Obama." The Association of Fish and Wildlife Agencies also produced an agenda entitled, "Furthering Conservation in the Public Trust." The Green Group developed a very comprehensive, 391-page document, "Transition to Green." The Bush Administration provided a document entitled, "Facilitation of Hunting Heritage and Wildlife Conservation." This document flowed from Executive Order 13443 issued in August 2007.

Actually, the good news is that there is a great deal of consistency in these documents with respect to the major issues confronting fish, wildlife, habitat and the agencies that manage these resources in trust for the American public. I have relied on portions of each of these documents to prepare this opening address. I would categorize the issues into seven major topics: climate change, habitat conservation, funding, Endangered Species Act, energy development, federal and state coordination, and our hunting and outdoor heritage.

Climate change may prove to be the biggest issue facing fish and wildlife conservation simply because we currently cannot predict impacts at a fine enough scale to accurately or precisely prepare for the future. However, coarse scale model predictions certainly do not portend well for fish, wildlife or their habitats, and we cannot wait to take decisive action. Federal agencies have established work groups and task forces to prepare for the future. The U.S. Climate Change Science Program is attempting to integrate the science and science needs among federal agencies. The U.S. Geological Survey, on Monday, conducted a listening session for the National Climate Change and Wildlife Science Center, and the U.S. Fish and Wildlife Service has recently released a draft strategic plan and five-year action plan to address climate change on lands under their jurisdiction. Other federal agencies involved in climate change monitoring and planning constitute a veritable alphabet soup: NASA, EPA, NOAA, BLM, USFS, NAS, NPS and more.

State fish and wildlife agencies are literally all over the map in their planning for climate change. Much of the activity at the state level involves updating or revising State Wildlife Action Plans in response to predicted climate change impacts and potential federal legislation. I continue to worry about our relative lack of knowledge about the distribution and status of thousands of species for which there is inadequate survey and monitoring information. How will we know there has been an impact if we have not established baseline information? Although there is much we do not know about climate change and its effects at a local or even landscape scale, we do know that the current state of knowledge, resources, techniques and conservation programs will be inadequate to adapt to ecosystem changes that will occur on a national, continental and worldwide scale.

Conservation organizations have done an incredible amount of work preparing information for the public and Congress regarding climate change impacts. The Bipartisan Policy Center enlisted the Wildlife Management Institute (WMI) and seven other organizations to co-author, compile and publish a book last year, entitled *Seasons' End*, targeted at hunters and anglers, to explain to these national hunting and fishing groups the potential impact on the resources and activities that they are so passionate about. This year, the same organizations will produce a book, a sequel to *Seasons' End*, that will provide examples of the steps necessary for resource management agencies to respond or adapt to climate change. It will explain in laymen's terms why Congress should dedicate substantial funding to fish and wildlife resources when there will be a myriad of other competing requests for adaptation funding. Yesterday's climate change workshop, sponsored by the Bipartisan Policy Center and the National Wildlife Federation, focused on this very issue.

Climate change impacts on habitat will occur over a relatively long time period. However, habitat conservation is an issue of importance today and for each of the years to come. Enactment and implementation of the innovative National Fish Habitat Action Plan is a critical step to ensure that Americans can enjoy fish, their habitats and ultimately the clean water that they provide the public. There is no shortage of federal statutes and regulations that define planning and management practices for federal lands. Each of these well-intentioned efforts to protect and conserve public lands serves a distinct purpose. The patchwork quilt of federal lands, particularly in the American West, and different guidance documents for their management, complicates landscape-scale management. In addition, conflicting statutory and regulatory guidance within and between federal agencies has made effective habitat conservation difficult if not impossible.

Without a comprehensive effort to bring these laws and regulations into coherence, habitat conservation will suffer, especially given the overlay of climate change impacts. In that regard, Congress must finally address the jurisdictional status of the Clean Water Act to protect and conserve the isolated wetlands and intermittent streams of this nation. We need to improve the effectiveness and efficiency of habitat conservation in order to enhance species sustainability for the thousands of species that inhabit public lands. I look forward to Secretary Vilsack's comments regarding the conservation provisions of the Farm Bill because of its pre-eminent importance in fish and wildlife conservation on private lands.

Although I have touched on funding as it relates to climate change adaptation, there are immediate and previously deferred needs for assured and adequate funding for fish and wildlife conservation now. The drastic cuts to the budgets of federal land management agencies over the past few years are well documented, and their impacts are felt across the nation and will be for years to come. The President's Budget Request and the American Recovery and Reinvestment Act should provide some temporary relief to construction, resource management and wildfire budgets. The ability to maintain and increase funding for these programs will be sorely tested as Congress wrestles with budgets, budget deficits and a struggling economy. Of course, state fish and wildlife agencies are faced with their own budget difficulties, although states do not have the luxury of deficit spending which compounds the problem at the state level. The Sport Fish Restoration and Boating Trust Fund must be reauthorized this year to assure that this critical funding source will be available to benefit the 30 million Americans who fish and millions of boaters who enjoy the nation's water bodies and waterways. Despite a strong advocacy effort, the Stimulus Bill provided no relief or assistance to these state agencies. "Shovel-ready" projects abound at the state agency level; I have experienced that fact firsthand for 17 years. Let us hope, if there is a Stimulus Bill II, the much-needed funding for state-level projects associated with State Wildlife Action Plans and the Land and Water Conservation Fund are not left behind again.

I applaud Secretary of the Interior Salazar's recent affirmation of the U.S. Fish and Wildlife Service's decision to delist the gray wolf in the western Great Lakes and portions of the Northern Rocky Mountains. Following years of criticism leveled at the previous administration regarding its track record on the Endangered Species Act (ESA), it was heartening to see the Secretary acknowledge the scientific proof that wolves have exceeded recovery goals for several years in both areas of the country. This announcement should send a message that when federal and state agencies and private landowners shoulder the burden of recovering a species and that effort meets recovery goals, the ESA has been successful. Just as we celebrated the delisting of the bald eagle and grizzly bear, we should celebrate the return of the wolf to sustainable levels and to state management. The decision to retain the U.S. Fish and Wildlife Service's consultation with other federal agencies appears to be a wise decision until or if a more deliberate and transparent regulatory process proceeds. The decision to list the polar bear generated intense debate, but I hope we all agree that the ESA is not the ideal vehicle to drive energy or climate change policy. No doubt, administration of ESA will consume much of the Department of the Interior's time and effort and will remain a contentious issue until a genuine and bipartisan effort is undertaken to adapt and learn from 36 years of successes and failures.

Last year, I discussed my concerns about the pace and manner of energy development in the West. I think we all agree that energy development is essential for economic and domestic security. However, the apparent fast track and unbalanced approach to this development on public lands has created concern among much of the conservation

community. Some multiple-use public lands seem to be dominated by a single use and I do not mean wildlife or recreation. To date, I have seen some signs that the Administration is willing to take a more deliberate approach to nonrenewable (oil and gas) development. However, this year, I wonder if the push to develop renewable energy on public lands will minimize or compound the impacts on fish and wildlife resources. Consider the potential impacts associated with the effective footprint of economically viable wind turbine farms, solar panel arrays and biomass plantations. Now consider the necessity of routing hundreds if not thousands of new transmission lines across the nation. Public land will be a magnet in order to avoid private property. Do we need additional energy sources? Yes. Should those energy sources be carbon neutral? Yes. Do we have assurance that we can learn from our past successes and failures with nonrenewable energy sources in the siting and operation of renewable energy sources and their transmission facilities? Time will tell. There are lots of shades of green.

Overall, the relationship between federal and state fish and wildlife resource agencies appears to be civil and productive. This partnership should be the model for cooperative relationships between all state and federal agencies. After all, both parties are concerned about long-term conservation, we work with each other on a routine basis, it is a relatively small profession (we probably sat side-by-side in classrooms together), and we all care deeply, first and foremost, about fish and wildlife conservation. However, there is a lot of room for improvement. The coordination among federal and state agencies and tribal governments appears to be largely a function of the personality of local staff on the ground, rather than institutional mechanisms to require and recognize productive relationships (the Natural Resource Conservation Service's State Technical Committees may provide a model). There should be regular and routine meetings where federal and state resource managers collaboratively establish population and habitat goals and track progress toward those goals. Without this level of coordination and cooperation, landscape-scale conservation will not be achieved.

Finally, conservation will only be valued and successful if the public understands and appreciates the resources which we conserve. We have to get serious about the whole "Children and Nature" effort. It is no surprise that, when 80 percent of the U.S. population lives in an urban environment, we cannot garner enough political support to fund essentially rural activities--fish and wildlife conservation. Establishing a connection between people and the natural resources on which they depend should focus on the entirety of ecosystem services associated with fish and wildlife habitat rather than just fish and wildlife. The public understands and desires clean air and water. Those outcomes are provided by forests, rangelands, grasslands, wetlands, streams and lakes. The public understands the beauty of wild and open places. We need to do a better marketing job than we have in the past. Our rural customers have moved to the city. But just like any good business, let us not forget our loyal and best paying customers--the hunters and anglers. Even their numbers have diminished, but we can take informed and immediate efforts to recruit and retain their numbers. We have a marketable commodity--abundant and diverse fish and wildlife populations and incredible landscapes distributed throughout the continent. We help provide opportunities to enjoy sunrises, days afield, sunsets and good times outdoors with family and friends.

The many challenges facing the Obama Administration are daunting. They have several blueprints to follow as they build their conservation legacy. The blueprints differ slightly, but the end product will involve the same components, wise policy toward: climate change, habitat conservation, funding, endangered species protection, energy development, agency cooperation and coordination, and the nation's rich and unique outdoor heritage. The participants in this conference want and expect to be partners as we move forward together to construct a better future for fish, wildlife, habitat and the citizens of North America.

Keynote Remarks

The Honorable Tom Vilsack
Secretary of the Department of Agriculture
Washington, D.C.

I really feel honored to be here this morning, and I want to thank the Wildlife Management Institute for its dedication to wildlife management, conservation and biological diversity. You all need to be congratulated for your commitment to our natural resources and to habitat advancement. I want to acknowledge that I am speaking on the same dais with Will Shafroth, and I want to acknowledge the work he has done in Colorado. Secretary Salazar is very fortunate to have him as a special assistant. And Secretary Salazar and I are working very closely to make sure that we integrate our activities at USDA and the Interior.

The topic of this morning's conversation is Refining the Relevance of Resource Management, and I wanted to spend just a few minutes talking to you this morning about climate change. I think that is one of the critical issues facing the United States Department of Agriculture and, for that matter, facing our nation. You all are probably familiar with the statistics about climate change: we are seeing CO^2 levels at their highest in 1,300 years, and have now seen the warmest century in the last 600 years and the warmest decade in this country in the last 100 years. And I suspect that you know better than I do the impact and effect that climate change is already beginning to have. We know that if we fail to respond to climate change the consequences will be quite severe. The United States government has recently done 21 different climate change studies. The average temperature increase from those studies is roughly 3 degrees. If we do very little or any mitigation of climate change, we are liable to see temperatures rise somewhere between 7 and 10 degrees. The reality is significant changes in weather patterns. It means higher sea levels, more severe storms, more adverse weather conditions and more intense weather conditions, which will have obviously an impact on habitat. And so, we are faced with a need to respond.

There is much discussion in this nation today about the mitigation response. Invariably, you will hear people talk about the necessity for us to be more efficient with the energy that we have, so that we use less of it, so we, in turn, emit less into the atmosphere the gasses that are produced when we produce power for our homes and our businesses. You will hear a great deal, I am sure, about the need for focus on renewable energy and fuel. Certainly, USDA is very much involved in expanding opportunities for biofuels and renewable energy as a strategy to mitigate the impact of climate change. You will hear a great deal about clean technologies, whether it is clean coal or opportunities to expand nuclear energy or new ways of producing power. You will hear quite a bit about that, and you will hear about the economic impact of those strategies on creating more jobs in an economy that is in need of more jobs.

You will hear hardly any discussion, except perhaps in the context of conferences like this, about adaptation. The realities are that we will have some impact as a result of what has already occurred and what is already in the atmosphere. And the question for all of us in government and those of us who are concerned about conserving our natural resources and habitat is how do we, in fact, adapt to what is likely to occur, regardless of how efficient we are with energy, how well we expand renewable energy and what great new clean technologies we can devise. And we have to do this in the context not just of our own activities, but globally. We can do all the right things and, if our friends in China or India do not follow suit, it will all go for naught. So we have to have an adaptation strategy.

You all know about the many programs that USDA is involved in in an effort to try to expand and encourage conservation. You know about the Conservation Stewardship Program. We expect a signup this spring. Our hope is that we reach the nearly 13 million acres that can be enrolled in this program, and encourage private landowners to do the right set of steps with their property, which in turn will increase habitat opportunities. You all know about the Conservation Reserve Program (CRP). You may be concerned about whether with high fuel costs and low commodity costs, there will be a desire to farm those CRP plots once again. We are actually concerned about the opposite impact. It may be that Congress didn't provide enough authority for us in terms of the number of acres that may be reenrolled in CRP. We obviously want to encourage a continuation of CRP. We think it has been a successful program.

The Wetland Reserve Program is now focused on helping 2 million acres to be restored, and hopefully gets to the cap of 3 million established by the recent farm bill. You know about the Wildlife Habitat Incentive Program that is dealing with about 400,000 acres, and the Healthy Forest Reserve Program, which is dealing with another 700,000 acres. And you know that the Forest Service has control of about 190 million acres of land owned by the federal government and works with state and private landowners to impact another 500 million acres. So, there is a great deal of activity taking place.

What I think has been missing from our efforts is a strategic vision of how to incorporate all of those programs, and all of the activities of the Department of Interior, and all the activities of state and local governments, and all the activities of nonprofit organizations that are out there promoting conservation. How is it that we integrate and coordinate all of these programs with a compelling strategic vision that is focused on not just mitigating the impacts of climate change but also providing adaption strategies? Here is what we are going to do at USDA in order to work through this process. Rather than task an Undersecretary of Natural Resources and Environment with the responsibility of coming up with a strategic vision, while that individual is dealing with the day-to-day activities of operating 190 million acres of land, partnering on 500 million acres of land, and working with the Natural Resources Conservation Service, I am actually going to designate a Special Assistant in my office. That person, who will be most likely announced in a week or two, will be charged with a specific responsibility to create a strategic vision on climate change for USDA. That strategic vision will be focused not just on mitigation but perhaps more importantly on adaptation as well.

I want to visit with you for just a few minutes about what I see for the strategic vision. First of all, the Special Assistant is going to be given authority to work across all of the missionaries of USDA, and authority to reach out in an effort to solicit information from all the missionaries so we will know precisely what we have currently, what tools we have in the tool box, what may be missing, what needs to be better emphasized and, in terms of resource allocation, where our resources need to be allocated. He will be given permission to go into those missionaries and delve deeply into what we are currently doing. He will be asked to create a participatory process.

The Obama Administration is very clear about values. The President has been particularly clear about three fundamental values that should guide all of our work. He expects us to be transparent, to be open so that the public knows precisely what is happening. He expects his Administration to be participatory, which is to say that we need to reach out to our local and state friends and work with them. And he wants it to be collaborative.

So, as it relates to the participatory piece of this, the Special Assistant will be charged with reaching out to all of the 34 organizations that are represented here and to state and local officials in an effort to make sure that what we are thinking about doing in USDA intersects and connects well with all of the activities that are taking place throughout the entire country. We want this to be very integrated. The Special Assistant will also be charged with reaching out to other federal agencies and, I suspect, Will and this individual will have a great deal of time together to make sure that what USDA is doing does not counteract what the Department of the Interior is interested in doing, and vice versa.

For that matter, it is imperative that we coordinate with the Department of Energy, the Department of Commerce and all the other departments of the federal government. We want this to be collaborative. We want to ensure that we connect at the lowest possible level of government to make sure that this strategic vision makes sense. And we need to recognize that one area of the country may be very different in terms of adaptation strategies from another area of the country. We want to work with the tribal governments; we want to work with state governments; we want to work with local folks to make sure that we create a strategic vision that makes sense in all parts of the country. And we want this process to be result oriented.

We want to be able to articulate very specifically what our expectation is if this strategic vision is implemented, what we will see different than what we see today. How will we be able to see communities better capable and better able to adapt to adverse weather conditions? What will we see in terms of habitat increases and in terms of their capacity to adapt? What will we see in terms of the economic impact of all of this? We will be very specific about the results that we expect from this effort. My view is that, if we have a strategic vision that is participatory, collaborative and results oriented, we will have a much better adaptation strategy than we have today, and it will combine with the mitigation strategy that is receiving so much publicity.

Now, you may ask yourself how can you possibly do this during a time of enormous financial crisis. You probably get up in the morning as I do. I make the mistake every morning. Every morning, I turn the television on. Big mistake. I hear these chattering folks on those cable shows talk about the dire circumstances in this country, and can we survive, and how are we going to get through all of this process, and trying to find out who the villains are. That irritates me. It irritates me because I think such commentary fails to recognize the greatness of this country or why we respond so well in a crisis circumstance and situation. And I think it misrepresents the folks in this room. You all have an attachment, a connection to community--a community of 34 different nonprofit organizations, nongovernmental organizations, state and local government officials, and federal agency people who work in a variety of capacities. You have a community that is dedicated to conserving and increasing wildlife habitat in this country because you recognize the importance of biodiversity. Not just for hunters and anglers; it is important to all of us. It is critical to all of us. But you are also connected to a larger community. I think sometimes we forget the power of community in times of crisis.

Let me share with you briefly, in conclusion, a story that I have been telling folks as I have traveled around the country. I was in church not too long ago in Dubuque, Iowa—a beautiful town along the Mississippi River. I got there a

little bit early, which is unusual for me. I am early and sitting in the back pew. The priest came out and told me that, during the mass, he was going to explain the gospel so that the children in attendance understand it. And I thought to myself, well, this will be good. Maybe I will understand it, because sometimes I have a hard time with the homilies. He said it would be the story of the loaves and the fishes. You all know the story–5,000 people there, and Jesus is giving a sermon. He sees that the folks are hungry and tells his disciples to go feed the people. The disciples kind of look around and see they have five loaves of bread and two fish. And Jesus wants them to feed 5,000 people. We can't possibly do this, they say. Sort of like those naysayers on television–we can't possibly get through this, it is a terrible time. Jesus said, have faith, pass the baskets. And they passed the baskets and, sure enough, all 5,000 got fed. And when the baskets were returned, they contained more food than they started with. The priest explained it to the kids this way. He said what Jesus did in that story was remove the fear of sharing.

I would suggest to you, that that is precisely what we are faced with in this country today. In a time of crisis, the natural reaction of most folks is to look inward, to hang on to what they have. The challenge for us is to recognize that the strength of getting through a crisis like this is actually in community. The opportunity for us to share. The opportunity for us to give. You all do this in your day-to-day work. You are constantly sharing your talents in order to create a stronger community. You are not fearful of biodiversity. You are not fearful of the programs that you all are involved in. You believe in this concept of community. I will tell you that, if we have a strategic vision that creates and supports a sense of community, a connection between ordinary folks regardless of where they live, whether they live in the largest of cities or the smallest of towns, or the most rural areas in America, we will feel a connection to our natural resources and we will be a stronger nation. And we will emerge from this crisis a much stronger nation, a much more powerful nation, a richer and better nation, and a better people. That is the work that you all are involved in.

I want you to know that we are anxious to have USDA be a partner with you. We recognize the importance of your work. It is not just about natural resources. It is not just about climate change. It is about health care. It is about connecting that sense of community, so that we all understand and appreciate our natural resources and take care of them because they have been a tremendous gift to this country. And they will continue to be a tremendous gift with our work, working together.

Keynote Remarks

Will Shafroth
Deputy Assistant Secretary for Fish Wildlife and Parks
U.S. Department of the Interior
Washington, D.C.

It is good to be here and among friends in the nonprofit and public agency community and others who care as I do about the future of our nation's wildlife and their habitat. I am very impressed with Secretary Vilsack; I have had a chance to talk with him on the phone a few times but have never met him. It is safe to say that we all have a great partner in him.

Thank you, Steve, and the Wildlife Management Institute for putting on this conference. I want to also acknowledge a few folks here from the Department of the Interior, particularly Rowan Gould, Acting Director of the Fish and Wildlife Service. All the people at the Fish and Wildlife Service have been incredibly welcoming of those of us appointees in the Department of the Interior, helping us come up to speed on the many, many issues that are out there in the system and helping us chart a path forward.

First, I want to acknowledge the importance and value that we place at Interior on the partnership with all of you. No matter which organization or agency you represent, we, like Secretary Vilsack, feel strongly about that relationship and want to take care of it. I know it has not always been one that has felt valued, but we are new in town. We want to tell you that we do care about it. We want to work with you. I certainly have appreciated the work that I have been able to do with all of your organizations and your entities during my time in Sacramento working closely with the California Fish and Game Department and with Colorado's Wildlife Commission and Division of Wildlife.

Working with wildlife and conservation interests has also been a hallmark of Ken Salazar's career, and I want to talk a bit about Secretary Salazar since he can't be here today, which he regrets. He is in New Orleans, over the ocean in a helicopter. I will tell you more about that later. He spent a number of years early in his career as Governor Roy Romer's chief counsel, and a lot of what he focused on there was natural resources and water issues. Governor Romer then appointed him to be the Director of Colorado's Department of Natural Resources in which capacity he oversaw the Division of Wildlife. During his time at the DNR, he created Great Outdoors Colorado. In creating GOCO, he gathered input from many people around Colorado–city officials, county officials, sportsmen's organizations, conservation groups, park and recreation organizations, etc., and tried to find out what was needed in Colorado over the next 50 years, to preserve the places and the values that we care so much about. He asked what citizens wanted their state to look like for generations to come.

Ken Salazar gathered that input for about a year and then came up with an idea to redirect our state's lottery funds for investment in parks, wildlife and open space. His intention was not to backfill existing programs and existing budgetary resources, but to have the new program make investments that were over and above existing funding, and to fund those kinds of things that were not funded on an annual basis. In the context of wildlife, it was funding for species conservation, habitat protection, watchable wildlife and wildlife education--those things that were routinely zeroed out in the state budget. Today, Colorado's Division of Wildlife receives an additional $15 million per year of funds to invest in those programs. As you can imagine, those funds are leveraged many times over. Through Ken Salazar's vision, somewhere on the order of $150 to $200 million has been invested in wildlife conservation efforts in Colorado. It has made a huge impact. Partnerships between and among local governments, the state Division of Wildlife, U.S. Fish and Wildlife Service and the nonprofit community have been revitalized and strengthened through this process. One exceptional example is the success in wetlands conservation. Partners within the wetlands community, Ducks Unlimited, The Nature Conservancy, many local governments and other land trusts have worked since 1995 with the Division of Wildlife and the Fish and Wildlife Service to preserve wetlands throughout Colorado.

In his subsequent political career as attorney general and senator, Ken Salazar carried on his commitment to conservation. That nearly 20 years of working on these issues have given him many ideas that he has brought with him to Washington—ideas that have been reflected in his early thinking about what he wants to accomplish as Secretary of the Interior. One of his major ideas is to create that kind of legacy that he provided in Colorado, a legacy that is reflective of President Teddy Roosevelt and President Kennedy's Interior Secretary, Stewart Udall. It is a legacy of preserving the treasured landscapes in our country and preserving our national icons. We are in the process of forming that idea. The point is that this Secretary is thinking very big. He is thinking about a significant transformation of our landscapes and looking at things in a much broader context--looking at things at a landscape level, an ecosystem level, so that whatever investments we make for our wildlife and habitat and land, are lasting and significant. These investments will also be in the context of climate change, as Secretary Vilsack elucidated, and how we are going to adapt to this new reality.

Let me just say a couple of other things about kind of what we are up to now. Steve Williams actually took a little bit of my thunder, and he articulated almost identically the same challenges we face in the Department of the Interior on energy and climate change and wildlife habitat fragmentation and decline, and population growth and energy development. I will give you a little bit of an update about our work, and then I'm going to make myself available for some questions, if we have some time.

First, as you can imagine, when a new Administration comes in the door, it has to review a lot of the things that happened before. Part of our daily list of things to do is to consider decisions made by the previous Administration now up for review. We do not have a preconceived notion that everything the last Administration did was bad, but there are some policies that we do not agree with and we are making some changes. Secretary Salazar already has withdrawn some leases on Bureau of Land Management (BLM) lands in Utah and Colorado and we are reviewing many leases in other places. We think that many of the leases did not adequately address impacts on wildlife, on national parks and cultural resources.

The Secretary is actually down in New Orleans today because of his interest in taking a second look at the outer continental shelf and the proposed timeline the previous Administration had on that. We have established a set of public meetings around the country in April to take a look at that and, frankly, to emphasize renewable energy to a much greater degree. Yesterday, the Secretary and the head of the Federal Energy Regulatory Commission (FERC) announced a decision to stop a four-year squabble over jurisdiction of the outer continental shelf. The Interior Department will now have jurisdiction over solar and wind, and FERC will have jurisdiction over wave and tidal energy. We cannot let bureaucratic squabbles get in the way of our commitment and our execution of renewable energy in this country.

Within the past two weeks, the President signed an Executive Order directing federal agencies to consult anew with the Fish and Wildlife Service and National Marine Fisheries Service on projects in which they are involved relative to the Endangered Species Act. That is contrary to what the previous Administration did toward the end of their time. We think a clear and cooperative policy is the way to go. All of the looking back is taking a fair amount of time, but it's very much worth getting the policies and processes right as we move forward.

Another important issue has to do with America Recovery and Reinvestment Act of 2009. There are $280 million of new funds that the Fish and Wildlife Service now has for investment, including many projects that will generate jobs. In a meeting yesterday on this issue, I was astounded that the current fiscal year the Fish and Wildlife Service effectively had $2 million in its capital budget--$2 million for an agency of that size and the diversity issues. I can tell you there will be a quantum leap in funding for capital projects that are going to make dramatic improvements to the National Wildlife Refuge System. Frankly, that is long overdue. This Administration is committed to working with the Service to make sure that the refuge system becomes the first-class, world-class system that it is. The Secretary has actually already been out to three refuges. He has told me that he wants to get out more and see some things, so I invite you to give me an idea where he might visit. The Recovery Act includes money for restoration work, so we are going to see a substantial investment in the recovery and restoration of our refuges as well. Dollars are going on the ground--a great investment. We have $3.5 billion to spend through the Department of the Interior, including $920 million for the National Park Service and another $280 million for the Fish and Wildlife Service. We have our hands full to make sure those dollars are invested wisely. It is a pretty intensive process to make some decisions on these things, so we are working around the clock with Rowan and his team to get that done.

The last thing is that we are beginning a process for the big initiative that Secretary Salazar has in mind. And I've talked about treasured landscapes that he envisions as a legacy. Energy efficiency and renewable energy are a huge priority for him. We are going to need your help and advice about what I anticipate will be a pretty substantial expansion of our renewable energy footprint in this country. Some of that will be on BLM lands and other federal lands. We need to do that in a way that has minimal impact on our wildlife resources. We are going to need the best thinking from everyone in this room as we begin to look at siting solar and wind and geothermal facilities as well as the grid, so that we do that in a way that has the least amount of impact on wildlife resources. Frankly, some of the mitigation dollars generated from those activities could be invested wisely in adapting to climate change.

Let me say another couple of things about *how* the Department will be running. This is as important to Secretary Salazar as what we are doing. I have known the man for fifteen and a half years and worked closely with him. One word sums up for me how he approaches his work, and that is integrity. I think you are going to see a real focus on the integrity in the operation of the Department of the Interior. The very first thing that Ken Salazar did when appointed was deal with ethical issues. Every Interior employee has been asked to sign an ethics pledge, which the Secretary beefed up in a substantial way. The Department has had many ethical issues and challenges over the last number of years, and Secretary Salazar wants to make sure that everyone understands there is a new sheriff in town. We are operating under a new set of guidelines and in a way that is ethically based.

Second is science. Secretary Salazar is committed to the use of science and good information in his decision making. I have been in a number of briefings with him since I've been here and, as noted earlier, I have worked with him since 1994. And I know how he thinks and I know his decision-making process. He relies on science. That, I think, is a welcome change.

Last is process. The Secretary insists on having a process that is inclusive, very much like the one that Secretary Vilsack described. It will engage the broad diversity of stakeholders. Jonathan is here with me today from the Office of Intergovernmental Affairs because we want to reach out to every possible organization and interest in every issue area that we are dealing with. We want to make sure that we are considering their viewpoints in our decision-making process. How we do things is as important as what we are doing.

In closing, I would like you to know that you have friends at the Department of the Interior. I consider myself a friend of what you are doing. I know Secretary Salazar is. And so is our Chief of Staff, Tom Strickland, who has also been nominated by President Obama to be Assistant Secretary for Fish and Wildlife and Parks. We are people who bring a long-standing interest in the business of managing natural resources. We are not coming to this new. I have worked on these issues for more than 28 years. Secretary Salazar has a similar length track record. Tom Strickland has been involved at a personal level on a number of boards committed to these issues.

For me, at the end of the year, I look back on key indicators of success. One of the key ones is whether I've had to purchase a fishing license in more than 5 states. Now that makes for a good year. So, my commitment to conservation not just professional, it is personal. I was mentioning to folks at a conference last night that I grew up at the south end of the Denver metropolitan area. At that time, it was just a few scattered houses adjacent to something called the High Line Canal, which filled seasonally with water. We would float our inner tubes down it. We hunted snakes and crawdads. We also lived near a slough that contained the same kinds of things. I remember sneaking out there and hanging out in the cattails, listening to redwing blackbirds singing. When there are about 50 or more of them, it is an amazing chorus. At a very young age, those kinds of experiences–fishing with my dad in the mountains, camping, hiking--touched me in a very deep way. It is the appreciation of those experiences that I bring to this job.

Thank you again for your time and for all you do to conserve our nation's and world's wildlife resources.

Session One.
Mixed Messages: Media and the Environment

Introductory Remarks

Phil T. Seng
D.J. Case & Associates
Mishawaka, Indiana

My name is Phil Seng. I am vice president of D.J. Case & Associates, an 18-person firm of communication specialists in natural resources conservation. Every day, we work with state and federal natural resources agencies and private conservation organizations around the country, helping them communicate with their publics and constituents about natural resources issues.

I am one of the co-chairs of this special session. The other chair is Tim Zink, director of communications for the Theodore Roosevelt Conservation Partnership.

We'd like to start by thanking the Wildlife Management Institute and the Conference Program Committee for including this topic. We believe it is critically important, and getting more important every day.

What did the Conference Program Committee have in mind for a session called *Mixed Messages*?

At D.J. Case & Associates, we work with natural resources agencies and conservation organizations around the country every day, so I feel confident telling you that, in general, the natural resources management community does not understand the media or the outdoor entertainment industry and is not well equipped or prepared to work effectively in that world. There are notable exceptions, of course, but in general, we have a long way to go in this arena and, in many instances, we don't even realize it. George Bernard Shaw once said that "the greatest obstacle to communication is the illusion it has actually taken place." I think we have that illusion all too frequently in our community.

Increasingly, public opinion about environmental issues and perceptions of conservation are being driven by the media's treatment of these issues. And here I use the word "media" in its broadest possible context, from the "traditional" media—print, radio and television news, to movies, television, and cartoons—to Web sites and social media. People by the millions are being "informed" about and forming opinions about conservation without ever hearing a word from us—from *you*—the people who work on this stuff every day. And yet, many of us within the community are backing further and further away from *any* media contact, let alone working on building a meaningful relationship with the so-called Fourth Estate.

I cannot tell you how often I have had agency staff tell me a story that goes like this: "That reporter misquoted me, so I'm done messing with them. I clearly stated that our estimate of deer in that area was 39 deer per square mile, but the article in the paper said 38." Okay, that example may be a bit of an exaggeration, but the point is that to the biologist, who lives and breathes the precise numbers every day, this is a big deal, and the thought of the wrong number being seen by his or her peers is very troubling. But, in plain fact, to the vast majority of the audience who read the piece, the misquote was immaterial. Unless the incorrect information would naturally lead to different conclusions, the actual number—or whatever piece of information was shared—may not have been the important thing to the reporter or the reporter's target audience. Or there could be a host of other reasons for the miscommunication that have nothing whatsoever to do with the media "trying to make the agency look bad," which is often what agency staffers believe. However, if the net effect is the agency recoils from working with the media, everyone loses.

So, why does this happen, and more importantly, what can we do about it? That's really what this session will try to address.

Lorna Domke with the Missouri Department of Conservation is going to lead off and give us the state agency perspective—successful strategies for working with the media and maybe some that have not succeeded, and how to tell the difference.

Bob St. Pierre, with Pheasants Forever and Quail Forever, will show us the view from the conservation organization perspective, along with specific tips on how to give the media what it needs to help us get our messages across.

Bill Miller with the North American Media Group will give us an insider's look at the business of outdoor television and how the conservation community can help communicate its key messages within this extremely competitive field.

And Jon Marshall, who works with me at D.J. Case & Associates, will give us a glimpse into where this whole thing is headed as the media converge and the Web continues to explode with communication opportunities and possibilities.

Wherever you “fit” within the conservation community, our fervent hope is that you will take a hard look at how your agency or organization works with the media, and beyond that, how it communicates to the public at large, and make a commitment to take at least one thing you learn from this session and incorporate it into how you do business.

State Agencies and Media: Friends or Foes

Lorna Domke
Missouri Department of Conservation
Jefferson City, Missouri

The beauty of empirical science is its repeatability, predictability and reliability in dealing with the real world. The dark side of empirical science is its lousy record of describing and dealing with human behavior. I am here to talk with you about that dark side—especially as it relates to us—conservation agency people—and how we communicate, or not, with those whose job is communication.

As someone trained as an anthropologist and journalist, and someone who has spent 25 years working to share ideas and values about conservation with the public, I appreciate the challenges facing both journalists and conservation agency staff.

What I am going to share with you is based on the experiences of seasoned conservation professionals from a variety of agencies. They are people like you and me, whose goal is to create healthy habitats, resilient natural places that will continue long past our lifetimes to provide sustainable resources, enjoyable outdoor experiences, and long-lasting, diverse life on this planet.

So, to the heart of considering the topic of "Friends or Foes," I'd like to pause here to take a poll. How many have found that more often than not, your relationship with media is adversarial? Raise your hand if you've found media tend to be friendly? I don't have tables of statistics to share with you on this subject. But I do have some stories of those engaged in the everyday challenge of working with the media. The hope is to save you some pain … to help you get the word out without shooting yourself in the foot.

Before I share some contrasting experiences with you, I think it's important to know whom we're talking about here. I am focusing on traditional news media, those connected to a newspaper (whether in print or now online), TV or radio program. More and more, you can get your message out directly through online social media. But the news media still play a critical role in reaching audiences and highlighting information. With more than 7,700 messages bombarding each of us every day, we need all the help we can get to cut through that clutter. Two other factors to consider: most of the time what we offer is not really hard news geared to the front page, and as agencies we can't afford what it would take to buy space and advertise to reach a wide audience. So, the media as gatekeepers, whether friends or foes, are essential. We need them.

As biologists, you know it is important to understand the habitat needs of fish and wildlife if you are going to work with them. In the same way, it is important to understand the needs and interests of news media. The common goal for many news professionals is typified by the Society of Professional Journalists, the nation's most broad-based journalism organization. A key part of its mission is to promote "the free flow of information vital to a well-informed citizenry…." Getting the word out to the public is its members' job. They need and feed on information. At the same time, however, they are not just conduits that are going to take anything. It has to be perceived as something of value and interest to their audiences. You need to be aware also of the challenges they face: increasingly fast turnaround, 24/7 coverage, dealing with staff reductions and ratings. Many times a reporter is a generalist and doesn't have the background knowledge that someone who worked a particular beat for years once did. And many times, what agency staff perceive as adversarial is really just reporters not knowing any better and having to produce a product without the time to dig deep enough to perfect it.

Hunter orange is a very good thing. It has saved lives. Nevertheless, some people opposed it, because they thought they could outwit game better without it. In the same way, some people mistakenly believe they can get things done by working hidden away from the public eye. In fact, a good portion of natural resource professionals got into their careers because of the appeal of working out in the resources and away from people. Even though the intention may not have been literally to hide anything but rather was based on the idea that science knows best and managers can get the job done most efficiently by going it alone, that way no longer works in this country. Any vestiges of that mindset have been obliterated in the past few years by public expectations for open and transparent operations. And on a practical level, if you don't tell your story, your story will be told for you. Let me repeat that: if you are not at the table to help tell your story, then others will tell it however they see fit. And then you really are in a bind.

I am going to share a few real-world state conservation agency experiences--case studies you might say--that highlight very different approaches to news media and the outcomes of each. The first involves a study on lethality of a game bird in which researchers were trying to use a scientifically rigorous method that involved collecting the birds out of season. Initially, some staff recommended that they invite outdoor media to the table. "Absolutely not" was the overriding response of others who happened to be in charge. So, one year later, just two days before the season, the

collecting of the birds began. As it happened, this was in a popular part of the state for that particular bird, and a nearby landowner who heard the out-of-season shooting happened to be a good friend of an outdoor news writer. Horrible headlines ensued. As is most often the case, when a state agency makes the front-page news, it is not good news. The collecting was stopped, which understandably disturbed the biologist/researcher. To make matters worse, personal attacks on the biologist began. It took time and work to sort things out and rebuild relations.

The same state agency considered that a lesson learned, however painful. And it did change its strategy when another challenge arose. As it happened, it was doing a major restoration effort on bighorn sheep. Part of that effort included shooting aoudad sheep—and that had to get done in a short timeline to meet a grant deadline. Leaders of the agency's wildlife, outreach and parks divisions jointly issued a news story about the "incredibly successful bighorn sheep reintroduction and the newly approved restoration plan." They also worked on talking points so the commissioners and director were all informed. In that news release, they noted nine strategies in the plan. One of those was to reduce the numbers of exotic and feral animals, with removal of aoudad sheep as just the first step. Getting the talking points to the right people and framing the action in the context of this very positive story led to positive coverage and good awareness.

People usually do not like surprises, especially when it means a change in their hunting and fishing permit prices, and most especially when it means they have to pay for something that was previously free. In my own agency, we recently failed to push the word out early both to the public and through media on proposed changes in permit pricing and regulations. A year's work on a comprehensive review and analysis of our permit-pricing structure—meant to help us face the decline in hunter and angler numbers—basically went up in flames. Or maybe it would be better to say the effort sank as a flood of negative response from the public deluged us. In previous significant regulation changes, such as changes to a four-point antler restriction, we had engaged the media and public. In this case, the suite of proposals was initially passed by our commission and then opened for a public comment period. By the time we engaged key outdoor writers, they were already being bombarded themselves. It was a perfect storm, too, in that the preliminary approval for the changes occurred just as our economy took a sharp decline last fall. Although many people could have accepted general permit increases, those increases, coupled with the change in free landowner permits without more discussion, were unacceptable to many.

As soon as the commission chose not to enact the change in free permits and to put a hold on most price increases, I called one reporter with the news. He said that he had never been more relieved and wanted more than anything to get the word out. He had never had so many angry calls on any subject.

Our lesson? The news media are essential in helping us communicate our messages. Newspapers in particular may be in a world of hurt, threatened by declining readership and revenues, but they still play a critical role in getting the word out in a rapid and reasonable way. However, the more important point is that the public should be seen as part of the solution. Having citizens understand the issues we were grappling with, and what programs the money was needed to support, would have helped immensely. The commission's response overturning some of the regulations was favorably received. But the issue of revenue will need to be revisited in the future. And I am quite sure we will involve the media and the public in open discussion along the way.

My last case is a conservation agency that is putting lessons they learned into practice. In fact, their communications director did research on best practices of managing agency reputations. One of the recommended 10 best practices? Let the media tell your story. Get them involved, invite them to attend controversial meetings, develop a level of trust and program understanding that they in turn can share with the public. Recognize that good reporting is balanced reporting. Don't take offense when they present both sides of an issue.

An example of putting these ideas into practice was the last time that agency redid a big game management plan. They included an outdoor writer and a mainstream news writer in a group of 30 stakeholders. They included people who were apt to be critical in this group, too. The result was that all could see directly the challenges the agency faced in balancing many diverse interests. They could see the kind of data gathered—the science at work. The journalists involved were then able to write about it all in independent stories. And they were able to convey the complexity of it all.

But what about the people who are less than professional, who happen to be writers and have access to media outlets? They are not the people who honor the missions of the professional organizations. Yet, they speak in newspapers, TV or radio and seem to attract an audience that is willing to believe whatever they say, no matter how much they warp or disregard the truth. Sadly, I have no best practices to share with you on this, but I do have some suggestions from colleagues. First, you cannot react, no matter how unprofessional they are; you must take the high road. This is where your other positive relationships with media can be invaluable—they often will take up the cause for you. Continue to provide factual information through the positive media contacts you have made through your Web sites, through your staff, through your general news releases and through new social media techniques. Keep an open and honest dialogue, and rely on those professionals to help you cut through the noise of the others. There is a great deal of research that

suggests that natural resource agencies are seen as being very credible to a majority of the public. It is important to remember that when you are being attacked by a nonprofessional person in the open media.

The bottom line is that the working relationships you build with professional media will help you get conservation done in the long run. So, is it friends or foes? I would say neither. Both agencies and media have jobs to do, and sharing information helps us both do those better. Friends or foes? It is up to you.

Making Our Conservation Message Interesting to the Media

Bob St. Pierre
Pheasants Forever, Inc. and Quail Forever
St. Paul, Minnesota

As natural resource professionals, a unique opportunity lies before us today. There is a movement afoot, the dawn of a new age, the "greening of America." It is important for all of us to embrace this new age and take advantage of this energy for the benefit of all the things we care so much about--wildlife, water, soil and air. The American public wants to know about the things you have spent your careers focused upon. In tandem with the green movement is the proliferation of media. Any form of information you can dream of attaining is available to us--on demand.

You Have Influence over a Positive Communications Outcome

Unfortunately for many of us in the natural resources profession, the prospect of doing an interview or building a relationship with a reporter conjures up feelings of angst and fear. To move forward, we have to suspend that belief that the media are "out to get us." As Lorna just mentioned, media relations is a two-way communication in which you do play a role influencing a positive outcome. I would like to go into a little more detail about how you can make your messages appealing to journalists, while also helping you overcome some of the hurdles you may have encountered in previous efforts.

First, do not treat reporters as a funnel cloud ready to send your world into the "Land of Oz." Relax, listen to where they are coming from and what angle the reporter has in mind for a story, take a moment to recognize this for the opportunity it is.

At its heart, media relations is the art of matching your key messages with a reporter's interests. In order for you to master this art, it is up to you to listen very carefully and understand your role in this relationship as well as the needs of the reporter to accomplish his or her job.

Your Role and Responsibility

The reporter has called you, a natural resources professional, because of your expertise in the area of interest. It is important that you do not answer questions outside your area, and it is equally important for you to connect the dots for the reporter. Do not simply provide a name and send him on his way. It is up to you to provide a personality for your agency or organization. Your willingness to be helpful paints your entire organization in a positive light and starts you out on a good foot. It is also your responsibility to know and understand your agency's key messages. It is not at all rude to ask the reporter if it is okay for you to call him back after finding out his deadline and time frame for the story. After hanging up, contact your communications person and go over your key messages. Then, it is important for you to reconnect with the reporter promptly. The more accommodating you can be, the easier it will be for you to become a media resource over the long haul, and that is a good thing!

The Reporter

Members of the media have jobs, families, bills and lives like any of us. They have bosses to answer to and readers who give them praise as well as grief. It is their duty to find interesting stories with all the necessary components--stage setting, conflict, resolution and an outcome. Their job is not to tell your story, but to give an unbiased perspective in a manner that is interesting to their audience and accurately based on the information at hand. To accomplish their task and appease their boss and readers, they have to meet deadlines, answer who, what, when, where, why and how, talk to all the key sources, and provide a story that's fair and interesting. They have a sizeable task with each story, but the toughest part may be finding the story that constitutes news.

What is News?

There are seven traits to look for in a story to see if it constitutes news: consequence, timeliness, proximity, prominence, uniqueness, human interest, and controversy and/or conflict. Many stories have more than one of these characteristics, which helps determine if it is front page material or will run on page 15.

Consequence

Stories exhibiting consequence often are national or international in scope with major implications. Examples include avian influenza, the Farm Bill, ethanol and endangered species.

Timeliness

Stories with timeliness take advantage of current events of the day. We have all seen the stories about the environment hitting the news on Earth Day or the stories about the Conservation Reserve Program (CRP) when the contract expiration day hits. But what about emerald ash borer on baseball's opening day? For decades, America's favorite pastime has relied upon ash trees for baseball bats. Unfortunately, something as seemingly unrelated as a tree disease is having a profound impact on major league baseball. Your ability to tie conservation issues to popular culture and society in a broad sense will help you reach new audiences with your messages. These unique twists to timely connections are surefire ways of attaining media coverage.

Proximity

The surest way to get your story in print is for it to be local. As the media expands through the Internet, newspapers are looking to serve the best local news to their readers. So, the more often you can find ideas happening in your own back yard, the more success you will find in earning coverage. Likewise, another aspect of the art of media relations is taking a national story and finding the local connection or angle. How does the new Farm Bill impact Joe Farmer in your county?

Prominence

In news, *who* says it often can be more important than what is said. Athletes and movie stars often whine about being "treated unfairly" by the media. Well, they are right. Fame, fortune, position and past history do provide people of prominence with a public platform the rest of us do not readily have available to us, for better or worse.

Uniqueness

Finding the story that hasn't been told before is both a thrill and an almost certain way to gain coverage. The easy ones to find are milestones and records, such as the millionth acre of habitat improved in a state or the first CRP SAFE acre enrolled. A little more difficult are the stories of firsts and oddities, such as the first all-women's chapter or the 18-year-old that started a Quail Forever chapter in Texas. The hardest ones to find are the incongruities, such as the person who bucked the conventional wisdom and achieved greatness.

Human Interest

For some reason, the idea of a human interest story is the most difficult for people to get their heads around. Just because a story involves a human and is interesting to you doesn't make it a human interest story. A human interest idea takes a story that has one of the prior characteristics and puts a face to the issue. These are stories of the man watching his premature baby fight for his life and escaping into the field with a Pheasants Forever chapter for a day of camaraderie away from the daily hospital battle. These are the stories of the man who lives every day to create habitat or hunt for the Hungarian partridge or the family that wants to create a public wildlife area in the name of their fallen son soldier. These are the stories that make us laugh and cry.

Controversy and/or Conflict

Often, stories that involve controversy and/or conflict are the ones that generate fear and angst. It often is our perception that the reporter is "out to get us." But think back to the reporter's job. It is their job to tell the news of the day in a fair and accurate manner. It is your role to be a professional and understand there will be opportunity for both sides of the debate to be heard. When stories about conflict arise, it is just as important to understand your opposition's perspective as it is to understand and convey your key messages. Topics such as wind energy's impact on prairie chickens, corn-based ethanol versus cellulosic ethanol versus oil versus biomass, and food plots versus nesting cover all are relevant controversial topics that generate news coverage.

Validation

One word of caution: always temper your enthusiasm to the people involved in the story you are pitching as news to the media. Often, people look for validation of their efforts through media coverage. It is important to convey the fact

that a lack of media coverage does not make anyone's accomplishments more or less worthwhile. This, for instance, is a tough one for Pheasants Forever and Quail Forever chapters. We have 650 Pheasants Forever chapters and 110 Quail Forever chapters doing wonderful things for habitat and youth education around the country every year. They all would like recognition for their efforts, especially their youth mentor hunts. They feel a tremendous amount of pride in their role of introducing youngsters to the outdoors; youth mentor hunts are all-around feel-good events for them. Unfortunately, on their own, youth mentor hunts are not unique, and attracting media attention to them it can be a challenge. They happen in every community almost every year. However, that doesn't make these activities and efforts any less important. While the trick to generating news coverage may be in finding what's unique about the youth mentor hunt, it is imperative to make sure these good chapter members feel validated for their efforts regardless of media attention.

After the Pitch--Key Messages

Once a reporter has bitten on the idea for a news story, it is important for you to tell your story through your key messages. Your staff's communication person will be a great resource for you to identify the key messages you want to communicate about a given issue. These messages should be statements you want repeated about your organization; they should highlight areas of differentiation, correct a misperception and/or compensate for a weakness. Essentially, think of it as if you only have 30 seconds to communicate (which, in fact, may be all you do have), the key messages are what you would say. Think of it as your elevator story--you have only enough time to get everything important across during an elevator ride. Additionally, it is useful to have a strong supporting point ready to go after a key message.

An example is the idea of food plots for pheasants. Pheasants Forever's top three key messages would be: (1) the primary limiting factor for pheasants across virtually their entire range is not food, but nesting cover (w*ith a supporting point:* diverse native grasses in vast expanses really can have a major impact on pheasant reproduction); (2) food plots can be a great ingredient in the habitat recipe if they are located in close proximity to winter cover (w*ith a supporting point:* while pheasants rarely starve to death in a harsh winter, food plots can help bring hens through a tough winter in stronger condition making them more productive during spring nesting season. The closer food plots are to winter cover, the less vulnerable hens are going to be to the elements and predators); and (3) food plots often are important as the "gateway project" to bigger and better projects down the road (w*ith a supporting point:* food plots are areas where hunters can easily see the rewards of their habitat conservation efforts in the fall. It is during these times when Pheasants Forever has an opportunity to educate landowners about nesting cover and winter cover for larger population gains).

The Interview

Everything you have done up this point has prepared you for a successful interview experience. You have talked with your communications staffer, and you have identified your key messages. Now, it is important to think about the questions you do and don't want asked. Identify ways you can answer both and bring those answers back to one of your key messages. Remember, the art of media relations is matching your key messages with the reporter's interests. Listen, think, then respond. Do not blast to your key messages without listening to the reporter closely, thinking about how the question relates to one of your key messages, then responding in a thoughtful manner.

The Medium Can Make the Message

Finally, it is important to recognize the strengths and weaknesses of each medium before an interview.

Print publications have the advantage of going into greater detail, but it is harder for print to capture personality, tone, spirit and other nonverbal messages.

Television does capture more personality, but your message often is limited to just seconds of incomplete information. That is where it is critically important to use your key messages liberally, because you may only get a few seconds in the final cut. Bill Miller will talk more about the television medium in his presentation.

Radio is instantaneous, which makes it exciting. There certainly is more opportunity for message and personality than television, but be careful not to go on and on and on. Also, it is very important to be able to hear clearly to do radio. Refrain from driving down the road doing a radio interview on your cell phone. Find a quiet place with a steady land line and focus.

New mediums such as Web sites and blogs have massive reach and closely resemble print media. Jon Marshall will have a lot more to say about new media in the last presentation of this session, so I will leave this topic to Jon.

Conclusion

In summary, we have before us a vast audience interested in our efforts on behalf of fish, wildlife, hunters, anglers, endangered species, game species, soil, energy, water and society. It is up to all of us to take advantage of this reinvigorated interest in our efforts. Media relations is a critical component of those efforts. Remember, identify the newsworthy stories in your agency or organization, relax, listen and master the art of matching your key messages with a reporter's interests.

Inside the Business of Hook-and-Bullet Television

Bill Miller
North American Media Group, Inc.
Minnetonka, Minnesota

My company, the North American Media Group, Inc., has been in the outdoor media business for 31 years under various names, but the best known probably are North American Hunting Club and *North American Hunter* magazine. Although we have expanded to incorporate a total of 12 lifestyle interest clubs with nearly 5 million members, the North American Hunting Club was our foundation and still is our largest club with 850,000 members. *North American Hunter* magazine is published eight times per year. We also operate the North American Fishing Club with 400,000 members and publish *North American Fisherman* magazine seven times per year.

A natural offshoot has been the production of outdoor television programming which mushroomed during the last 20 years. We broke into this business in 1990, with programming on ESPN–before there was an ESPN2, Outdoor Channel, OLN (Versus) or any of the other specialty cable and satellite channels–many of which have come and already gone since then.

During that time, we produced "North American Outdoors," "North American Hunter," "North American Fisherman," "Shoot More, Shoot More Often," "The Shooting Sports," "Central Florida Outdoors," "Tales of the Hunt," "Fishing Club Journal," "Bonjour Quebec," "The Professionals" (a Florida sport fishing show), "Wingshooting the World with Chris Batha," and "Tarpon of Boca." Our shows have aired on ESPN, ESPN2, Outdoor Channel, Versus, Comcast, Fox Sports-Net, The Sportsman Channel and WildTV in Canada.

Currently, we produce and air "North American Hunter" and "North American Fisherman" on Versus and "Tarpon of Boca" for The Outdoor Channel.

All that is simply to say we have been around this game for awhile and worked under the guidelines, rules and restrictions of a lot of different programming directors. I hope to provide a glimpse inside the business of outdoor television production and share the hidden opportunities that exist for you to share your conservation story with 114 million television households in the United States!

Inside the Business

"Outdoor" television is not the same as "real" television. Let me explain.

In real television, a producer comes up with an idea for a show series, then pitches to a network. In essence, the producer is seeking a contract from the network to produce a certain number of episodes of a show. The network pays the producer for the show, then undertakes to sell the sponsorships to advertisers. That is where the network makes its profit, by selling those commercial spots.

While this arrangement happens occasionally in the world of hook-and-bullet outdoor television, it is the exception rather than the rule. In the outdoor game, a production company approaches the network to *buy* the airtime for the show they own. Airtime prices are all over the board, depending on the network, the size of their audience, the time of day and day of week, the number of times the show will air per week, and the number of weeks it will air. Once the price is struck, part of the agreement will include the number of 30-second spots (30s) the producer is buying within the airtime for the show. To keep the math easy, let's say that is 10 spots, which is not an uncommon number in a 30-minute program block.

Now it is up to the producer to go out and sell sponsors on buying those spots. However, the producer actually is somewhat in competition with the network, which retains a few 30s within the airtime as well–let's say six spots. So, in effect, the 30 minutes of airtime purchased actually is whittled down to 22 minutes of editorial content. That also must include an open, billboards, credits, teases, etc., which reduce real content time to less than 20 minutes.

Obviously, the network can afford to sell their retained spots much less expensively because they already have been paid once for that time. To compete, the producer sells a "relationship" with the show–something a sponsor cannot get simply buying spots within the show from a network. The relationship includes things such as "category exclusivity." For example, our ammunition sponsor for "North American Hunter" is ATK/Federal Cartridge. Our agreement with them is that we will exclusively use, show and reference Federal Ammunition in the show. Same with Thompson/Center firearms, Mossy Oak camo, Polaris ATVs and UTVs, etc.

Let's take a quick look at the numbers.

The exact terms of airtime contracts and pricing are proprietary, but we will use $1.00 of revenue that an outdoor television company takes in and look at how it is spent to cover costs.

Starting with $1.00, 70 cents might buy the airtime. Another 16 cents pay talent, salaries, freelancers, etc. The next 4 cents are for overhead and equipment costs. Another 4 cents go to travel, accommodations, meals and location expenses. That leaves 6 cents or 6 percent for profit. That is not much, and it can be eaten up fast by shoots gone bad because of bad weather, no fish or game, or whatever.

The bottom line is that television production is a business with tight margins. The production company may want to tell your story, but if it cannot turn a reasonable profit, the show and the production company will go away. Shows must get attention and attract viewers. We have all seen shows sensationalize or perhaps misrepresent conservation values or hunter/angler ethics in order to "make a sale."

Your Conservation Message

Despite this, and because of it, there is an incredible opportunity for state agencies and their partners to work with hook-and-bullet television to share your conservation message or success story with those 114 million television-viewing households.

We are here today to cover some ideas that can help us help you, and vice versa. The results, when we work cooperatively, can be outstanding.

When things go well, we get good stories that our audiences want to see and sponsors pay to air. And you—or, I should say, all of us—get messages delivered to our community and beyond that help inform and ultimately create responsible stewards of our natural resources.

Here are some of the most important tips on working with television producers and some ideas on assistance you may be able to offer that will make your story too good to resist.

Understand the Opportunity

A great time to get your message out to the public via television is when there has been a policy change or improvement or a new regulation that may need to be explained. For example, perhaps your jurisdiction has implemented a new slot limit on several lakes. Hosting a television crew to produce a show on those lakes will provide the opportunity to explain the reasoning and the goal behind those limits surrounded by exciting fishing action. It can shine a positive light on what might be a controversial issue.

Know the Show You Are Contacting

Watch it, study it, do a little research before you decide if it is the right place for your message. "North American Hunter" focuses primarily on big game hunting and especially whitetail hunting. That is because those subjects drive the best ratings and they translate most directly to the message of our sponsors. While the conservation message you have to share may not be related specifically to big game hunting, consider how it could be spun to interest a big game hunting audience. Or if it cannot, you will know to look for another show to which the story you have to tell is more directly applicable.

High Probability of a Show

The adage "time is money" is at least as true to outdoor television production as it is anywhere else. Because we are operating on such thin margins, we cannot afford trips when there is less than a 60-percent chance we can come away with a show–better yet, multiple shows. Giving us the inside scoop on hot lakes or areas, finding the "prime time" to be there and offering multiple contingency plans in case Plan A doesn't work helps us help you.

Contacts with Locals

On a recent trip to the Shawnee National Forest in southern Illinois, the U.S. Forest Service office put us in contact with the local National Wild Turkey Federation (NWTF) chapter. A member volunteered to spend a morning showing us around some locations that were good prospects for turkey hunting. We hunted on our own, bagged a bird and covered a turkey nesting habitat restoration project being done in cooperation with the Forest Service and NWTF. It was a win/win/win that didn't cost anybody anything but a few phone calls and a retired farmer one morning of his time.

Contacts with Local Sponsor Affiliates

Say "North American Fisherman" might come to tape a show on a reclaimed reservoir about which your agency is justly proud. It is a story that needs to be told. However, it is 2,000 miles away from home for our team. We can bring the tackle, but our exclusive boat/motor sponsors are Ranger and Yamaha. We are going to need contacts with local marinas, dealers or guides who run that combination so that we can make arrangements for a rig from which to fish. Same would apply to "North American Hunter" for Polaris ATVs and UTVs.

Contacts with Cooperative Guides/Outfitters in Your Jurisdiction

We generally do not pay for guide or outfitting services. The publicity the show generates for good operations frequently books many new clients. We also provide copies of the show for them to use in their promotions. We tip based on the value of the trip, the service provided, and the number of talent and crew. If you can hook us up with a good guide or outfitter who is willing to work with us, your location becomes that much more enticing.

Offer Assistance with Trip Logistics

We are always seeking top destinations, because they provide better stories and greater efficiencies. Any recommendations we can get for great destinations are always of help. Perhaps your jurisdiction has campgrounds with cabins right in the hunting or fishing area. Could you find room there for the crew? Could you offer them for free? Maybe you can acquire the "state rate" for stays at local hotels. We shoot a ton of stuff in South Dakota because it is close to home and game rich, *and* because the state tourism department there also either pays for or subsidizes accommodations and meals. Interagency cooperation to promote a conservation message is a win for everybody.

Tags and Licenses

To wrap your message in exciting action and a great story, we need to give the viewer an exciting experience they want to watch. For hook-and-bullet television, that means an exciting, dramatic or poignant hunting or fishing adventure. Particularly with hunting, licenses can be difficult and/or expensive to acquire. We recognize this is a sensitive issue and not a possibility for some agencies, but using your influence or dipping into an allotment of tags your agency may have can be a major enticement for a production crew to come to your area.

Commit Your "Best Person" to the Program

You have sold us on your story and convinced us there is a high probability of success for an exciting television show. We believe yours is a destination that viewers are going to want to hear about and will visit once they do. The most important enticement that will put us over the top is if you commit someone from your agency to us for the entire time we are covering your story. While it is important that it be someone who has thorough knowledge of the area, project or program, it is equally critical that the person assigned be good on camera and *likes* talking on camera. Remember, he or she will be telling your story and representing your agency. And we need that person devoted to the project, unencumbered by any other problems for at least one full day plus a contingency day for bad weather. "Giving" us that person and letting us get comfortable with him or her through contact prior to the trip will push us over the top almost every time. We recognize that this is asking a lot of agency staff who already have full plates, but the more time you can commit to the effort, the more likely it is that both of us will get the product we want to deliver to the audience.

Conclusion

I cannot speak for every hook-and-bullet television production company, but in our outfit, we really like it when we can put together a show that has a great hunt or fishing trip *and* delivers a meaningful conservation message as well. *We* know what we need to produce a show that will sell to the audience and to the sponsors. *You* are the experts on the conservation stories that need to be told. Working together, we can deliver a product that will help ensure that these activities we hold dear will be around for our grandchildren to enjoy.

YOU Are the Media (and So Is Everyone Else): The Exhilarating New Landscape of Social and Converged Media

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Most of us in this room today started our careers long before the World Wide Web was even a widely known concept. And, even among those of us who were early adopters of the Web, few envisioned the full potential and wildfire-like spread of this massive global network.

I recall discussions with former colleagues in the mid-1990s at the Indiana Department of Natural Resources about the potential for online license sales. At that time, commercial entities were just beginning to venture online. The concept of online shopping had not yet caught on in any significant way. We concluded (wrongly) that it would likely never be a secure way to transact a hunting or fishing license. And more importantly, sportsmen and women would never be likely to access the Web regularly.

Now, roughly a decade later, many of us paid for this meeting–our hotel and conference registration–online. It is likely that we would be frustrated if this functionality was not available to us. Once this conference is over, you will be able to go online and download the transcripts of presentations here today. There will be no hard copies published. Even as a group of fairly late adopters (demographically speaking), much of our daily business and communication now depends on the Web.

Web 2.0

You have probably heard the term "Web 2.0" to describe the state of the Internet today. Many of us have not really come to grips with Web 1.0, and the next generation of the Internet is already here. In case you have not heard the term, or you have heard the term and don't know what it means, I will provide a brief definition and etymology.

The term Web 2.0 emerged in 2004–five years ago, which is ancient history in the rapid pace of the Web. It was coined by Dale Dougherty and popularized by publisher O'Reilly Media and its MediaLive International conference. It provides a useful, if imperfect, conceptual umbrella to describe the new generation of Internet applications that were emerging to form the "participatory Web." Think blogs, wikis, social networking, podcasts, etc.

One way to envision where we are in the evolution of the Web is to think back to the emergence of other media. Each new medium (radio, cinema, television) was first used to produce content equivalent to that found in existing media. The classic example is radio, which was first used to broadcast radio plays — content based on the familiar medium of theater. As radio technology changed and the unique strengths of the medium were discovered, radio rapidly evolved and still is evolving and changing today.

Like radio, the Web first mimicked other media. Newspaper content was published online much in the same way it was put on newsprint. Print documents were repurposed and republished online, often in the same basic format and presentation that they were delivered in hard copy.

But the unique strengths of the Web medium–one of the greatest being its quality as a massive social network–have rapidly changed Web content and usage into an experience that was never possible before. Web 2.0 is that stage in the evolution of the Web as a medium.

My time is short today, so I won't dwell on individual examples of new media and Web 2.0 applications–Facebook, Google Maps, Twitter, Flickr. The Web is evolving so rapidly, in fact, that the examples I provide may just be out of date by the time you leave this conference. Instead, I will focus on what this rapidly evolving medium may mean to your agency's communications strategies and tactics and, potentially, personnel management.

Many government agencies operate under the primarily one-way communication tradition of "getting the word out" through news releases, magazine articles, television programs, etc. Adoption of Web technology has largely been taking these same communication tools–the same media–and publishing them in online formats. Such tactics certainly are a valuable way to expand your audience and cheaply distribute content. Putting your television show online is a great way to get more viewers. Publishing news releases is a very good means for getting information out to media outlets and all of your stakeholders, and it is a far better means of reaching pre-disposed-interest audiences than having to go through the filter of a newspaper reporter and editor.

The Web has afforded, like never before, the ability for agencies to get information directly and inexpensively to customers through Web postings and e-mail blasts.

As an agency, you *are* "the media." You may now control the message and delivery (something that was very difficult to do when most of us started our careers). Now, here is the challenging part . . . so is everyone else. Anyone who has a few hundred dollars for a computer, a coffee shop with a wireless connection and the desire to communicate *is* "the media."

The emergence of global communications systems is fundamentally changing how people interact in the marketplace and in governance. In the next few years, the "voice" of agency mission statements, marketing pitches and news releases will seem as contrived as the language of the 18th century French court. In fact, it is already somewhat archaic today.

I would like to introduce you to a book that was written with private sector business in mind, but many of its key messages should resonate with agency leaders. The *Cluetrain Manifesto* explores the ways in which the Web is changing communication or, as the book proposes, returning society to its foundation of communication through markets and trade route networks.

The term "cluetrain" came from a comment made to one of the book's authors by an acquaintance from a company that was free-falling out of the Fortune 500. He said, "The cluetrain stopped there four times a day and no one ever took delivery." The term caught on and has been a regular fixture online since the book's publication in 2001.

The book opens with 95 theses. Many of the theses have direct application to government communication and community involvement. Here are just few cluetrain deliveries to consider:

"1. Markets are conversations." We all deal in markets of some kind. Whether we are marketing our agencies' programs or serving primarily as regulators, we are involved in increasingly far-reaching "conversations."

"3. Conversations among human beings *sound* human. They are conducted in a human voice." While there is certainly a place in government agencies for legalese and science-speak, Web communication styles call for a simpler approach, which is often harder for us to do. As Lorna Domke mentioned earlier, "if you don't tell your story, your story will be told for you." Similarly, if you don't tell your story in a way that will resonate with your audience, someone else will tell it for you. And you might not like the interpretation. I frequently hear agency staff lament that their "story" is not being told accurately or fairly. Some of these same people are trying to tell their story with massive technical reports, tables, and cryptic, bureaucratically voiced news releases.

"34. To speak in a human voice, companies [agencies] must share the concerns of their communities."

"35. But first, they must belong to a community." We stress the need to market to new constituencies and reach nontraditional audiences. First, we must be part of these communities. The Web offers a relatively simple way to connect with new and diverse communities.

"83. We want you to take 50 million of us as seriously as you take one reporter from the *Wall Street Journal.*" Professional media reporters and editors are important. They are a critical part of any communication strategy. Like never before, so are the potential millions of individual bloggers, Facebookers and networkers who can help carry your message. A well-placed blog or YouTube video can reach millions in just a few days.

"85. When we have questions, we turn to each other for answers. If you didn't have such a tight rein on 'your people' maybe they'd be among the people we'd turn to." Lorna Domke and the Missouri Department of Conservation (MDC) have embarked fairly recently on an effort to encourage key MDC staffers to create and maintain their own blogs. Although not part of any official policy, a number of staffers, including Lorna, a private lands biologist, agents, ombudsman and the MDC's Web outreach supervisor publish their own personal blogs about the work that they do and about agency programs (examples: http://common-nature.com, http://blogs.mdc.mo.gov/blog/). Lorna told me that the approach does not replace traditional techniques such as newsletters and news releases, but it does, as she said, "demonstrate that there is a human face behind" the agency, and that it is "more personal."

Lorna said that the blog experiment met a lot of resistance at first, but the approach was not out of line with the rest of the agency's communication model of counting on key staff to talk freely with customers. Lorna's blog, titled *Fresh Afield: Serving Up A Slice of Conservation*, averages about 282,000 page views each month.

In the age of ultra-fast communication, you don't have time to circle the wagons. You need to have people who are able to respond quickly, and in a human voice.

"94. To traditional corporations [agencies], networked conversations may appear confused, may sound confusing. But we are organizing faster than they are. We have better tools, more new ideas, no rules to slow us down." Networked conversations are growing. They are huge, scary, amorphous communication blobs to many of us. Yet, they can do our agency communications missions great good or great harm. As an agency, you need to understand

the networks and communities that are thriving – Facebook, Twitter, and specialized forums for hunters, anglers and wildlife enthusiasts.

"95. We are waking up and linking to each other. We are watching. But we are not waiting." There are now millions of "reporters" online. Increasingly, your constituents will demand not just information, but conversations. You don't need to know HTML, CSS, PHP, Javascript, AJAX, ColdFusion, .NET or any other Web coding to understand the essence of Web-based communication, but, in order to stay viable in your communications and outreach programs, you do need to understand that Web-based communication requires a different strategic approach. You need far more than a good Web designer and programmer to use the Internet effectively. If you have strict communication controls, you may need to rethink your policies and practices. Tear down the firewalls that inhibit conversations.

At the very top of government, this is happening. Despite archaic rules and regulations at the federal level, the Obama administration is beginning to tear apart restrictions for Web-networked conversations, which were a hallmark of Barrack Obama's election campaign. A conversational approach at the top is likely to quicken the pace of change. Be prepared for new expectations and rapidly evolving online communities.

The cluetrain is stopping at your agency. Don't miss it.

Session Two.
Making the North American Model More Relevant to More Americans

Opening Comments

John F. Organ
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Welcome to this special session focused on the relevance of the North American model of wildlife conservation to Americans. When I began my career in wildlife conservation in the 1970s, the term "North American Model of Wildlife Conservation" did not exist. The idea that wildlife conservation in the United States and Canada is practiced differently than in most other places in the world certainly did exist in the psyche of wildlife conservationists and was, in fact, a major driver in the model's development as indicated by Theodore Roosevelt, George Bird Grinnell and Aldo Leopold in their arguments for a more democratic approach.

The concept that wildlife conservation in North America could be described as a model was first articulated by Valerius Geist (Geist 1995, Geist et al. 2001) who was born and raised in eastern Europe and knew firsthand about their systems. After immigrating to Canada and doing landmark studies on mountain sheep (Geist 1971) that gained him international acclaim, Geist developed a program at the University of Calgary in Environmental Design. He also began to apply his profound understanding of evolution and interest in history to studying the development of wildlife conservation policies, and coined the term "North American model of wildlife conservation."

The concept was further developed by Shane Mahoney (2004), who has done more than anyone to both scrutinize and popularize it. Today, the model has become the basis for policy for the Association of Fish and Wildlife Agencies (Prukop and Regan 2005) and The Wildlife Society (The Wildlife Society 2007) and was the key underpinning for Executive Order 13443 that led to the White House Conference on North American Wildlife Policy (Sporting Conservation Council 2008a) and the Recreational Hunting and Wildlife Conservation Plan (Sporting Conservation Council 2008b).

A technical review of the model is in development by The Wildlife Society, and this session is designed in part to contribute to that effort. This raises the obvious question as to why we don't have a North American model of fisheries conservation? Some have added "fish" into what has already been articulated as the North American model of wildlife conservation, but there are potentially inherent conflicts between fisheries conservation and certain pillars of the wildlife model, most notably in the commercial aspects of fisheries. I challenge our colleagues in fisheries conservation to explore the concept of a model and identify commonalities and differences. More than ever, we need to speak with one voice where appropriate and to understand where differences lie.

Despite the traction that the model concept has gained in a relatively short period of time, a number of vulnerabilities have been identified (e.g., Geist and Organ 2004, Organ and Batcheller 2009, Organ and Mahoney 2006). Jeff Crane and Gary Kania of the Congressional Sportsmen's Foundation developed this special session to explore and seek solutions to what may be the most fundamental of the vulnerabilities--the fact that the model may seem irrelevant to most Americans, not to mention the fact that most Americans are likely completely unaware of such a concept. The model owes its origins to hunters (Geist et al. 2001), but will hunters have the political and financial capital to sustain the model in the future? If not, will the model even be recognizable in the future? Do most Americans really care enough about conserving wildlife to politically and financially support a model? The answer may be "no," but Americans likely care about their quality of life related directly to ecosystem services generated from management programs and advocacy of sportsmen and women for clean air, clean water and undeveloped managed landscapes that support healthy, viable populations of fish and wildlife. Perhaps we need to hitch our wagon to what people truly care about.

We have gathered a group of thinkers and doers to help us understand why it is important for more Americans to care about the model and what we can do to ensure they will. We will begin with some background on the model and the unique funding mechanism of the United States, and identify gaps in the model that need to be filled and threats that need to be addressed. Next, we will look at why all Americans should care, why they do not and the institutional barriers that hobble us in our efforts to achieve greater support. We then will look outside the box from the perspective of a marketing professional to explore how we can make more Americans care about the model. Finally, we will look at what is being done in public policy to sustain the model so that it will not only stand the test of time, but endure the political arena.

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North American Model of Wildlife Conservation and the American System of Conservation Funding

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The abundant and diverse wildlife that roams the North American continent exists because of the deliberate efforts of thousands of individuals and organizations. Hunters and other conservationists led the early efforts through their writings and political advocacy (Reiger 1975, Trefethen 1975). The wildlife conservation movement and policy developed on this continent was unique in the world (Geist et al. 2001), a combination of European and New World ideals. Coined the "North American Model of Wildlife Conservation" (Model), this Model has served conservation well throughout the past century, generating both sustainable wildlife abundance and economic diversification. As time and issues passed, new challenges and conflicts arrived that threaten the continued existence and spirit of what was carefully constructed over many decades. These challenges or conflicts occur separately within states or provinces or, in some cases, across the entire continent. A major challenge both in the United States (U.S.) and Canada is funding. Funding for conservation has always been an imperative for the Model's operation. In the U.S., the American system for conservation funding also is unique, deriving from direct hunter and angler expenditures. In recent years, a number of Canadian provinces have been experimenting with this financing approach, but the main conservation dollars in Canada derive from general revenue sources.

Sportsmen and women continue to provide political and social support for conservation throughout the continent. In the U.S., for the past century, hunters and anglers have provided the primary financial support for state conservation efforts. This financial support, more than $1 billion annually, consists of license and permit fees paid directly to state fish and wildlife management agencies (Poole 2007). Each state has passed assent legislation to ensure that these dollars are used only for administration of the state fish and wildlife agency. In addition, excise taxes levied on the manufacturers of sporting firearms, ammunition, archery equipment and fishing equipment are collected and apportioned to the state agencies for fish and wildlife management. A portion of motor boat fuel taxes also is distributed to state agencies. This year alone, these excise taxes generated $741 million for state conservation programs (U.S. Fish and Wildlife Service 2009). These direct payments to state fish and wildlife agencies provide the primary means of financing research, development, management and conservation efforts for thousands of fish and wildlife species, both hunted and nonhunted.

In addition, hunters and anglers contribute charitable donations, more than $280 million annually, to a myriad of conservation organizations (Poole 2007). These organizations may focus on a single species, groups of species, habitat preservation or conservation in general. Hunter and angler expenditures do not just contribute to the well-being of wildlife and its habitat. In a single year, hunters and anglers had direct expenditures of almost $77 billion to the U.S. economy. Other wildlife-associated recreationists contributed nearly $46 billion to the economy (U. S. Department of Interior and U.S. Department of Commerce 2006). The business of conservation and its clients have a significant impact on our conservation model and our economy (Mahoney 2009).

Historical Roots of the North American Model

The historical roots of the Model are planted in Roman legal codes that date back to A.D. 529. These codes designated resources that were common property and could not be legally owned by individuals. The rise of feudalism resulted in ownership of wildlife and other resources by landowners and royalty rather than by common interest. The Magna Carta, written in 1215, paved the way for centuries of evolution away from private to public ownership of wildlife. Nowhere did the evolution flourish more than on the North American continent. In 1842, Supreme Court Chief Justice Roger Taney, in the *Martin v. Waddell* case, established the doctrine that we now refer to as "public trust." That is,

certain natural resources are common property and are held by the state rather than the individual. This public trust doctrine is the very underpinning of the Model. Case law in the 20th century strengthened this doctrine and defined resources held both at the state and federal levels of government (Geist et al. 2001). Recent case law threatens the public trust doctrine (Organ and Mahoney 2007) and has, in part, prompted this special session.

Components of the Model

As described by Geist et al. (2001), the Model has seven major components or principles: (1) wildlife is a public trust resource; (2) markets for dead wildlife should be eliminated to protect vulnerable species; (3) wildlife should be allocated to the public by law rather than by market, land ownership or special privileges; (4) wildlife should only be killed for legitimate reasons such as food, fur, and personal or property defense; (5) wildlife, especially migratory species, are international resources; (6) science should provide the information used to allocate wildlife resources to the public; and (7) hunting is an activity open to all citizens and managed through a democratic process with no special privileges assigned to any group of individuals.

To be sure, wildlife has flourished under the banner of the Model. Many of us hold this unique conservation heritage in awe. We have proclaimed that our system of conservation is the envy of the world and believe that to be true. However, we must become a bit more introspective with regard to the Model. Economic, social and political challenges facing our nation surely will test our individual resolve and the resolve of the public when it comes to wildlife conservation. As we proclaim the genius of the Model, we also must admit that current, presumably accepted, activities are in conflict with or provide a challenge to the seven principles of the Model (Sporting Conservation Council 2008). Our intent here is to identify these issues or threats in order to provoke a serious and formal discussion within the conservation community. We also examine other elements that further support or enhance the Model. We do not intend to pass judgment on these activities or issues. We do raise legitimate questions for further discussion. That discussion should occur in a much wider audience that may consider the relative compatibility or incompatibility of current practices with the Model's principles, the necessity to amend the Model, and actions that may strengthen the Model in the future. We believe there is a shared sense of urgency on many of these matters.

Challenges to and Conflicts with the Model

Perhaps the greatest threat to the Model is our lack of historical perspective on one hand, and our unwillingness to examine critically and to challenge some of the principles of the Model on the other hand. The two are linked. What has enabled success in the past may not be an assurance for the future. Some of the Model's principles may need to be modified, clarified or strengthened. The following discussion draws heavily from Geist et al. (2001), Geist (2006), and Organ and Mahoney (2007).

Wildlife as Public Trust Resources

The privatization of wildlife stands in direct conflict with the public trust doctrine. Game farms and ranches exist across the country. In many states, these entities fall under the legal jurisdiction of departments of agriculture, treating wildlife as a source of agricultural production rather than ecological production. High-fence operations that hold captive wildlife and/or enclose free-ranging wildlife effectively reduce those individuals to private property. The genetic manipulation of big game populations in captivity to maximize private profit on the wildlife market is advertized on the Internet. Genetically "improved" lines of deer now have trademarked names conferring private property rights.

The privatization of access and opportunity to wildlife is a common and growing threat to managing wildlife as a public trust resource. Land leasing for hunting, fee hunting, trespass laws, private property rights and shooting preserves pose challenges and conflicts with the current Model's principles. Further, reserved permits for guides and outfitters and raffled permits are a common occurrence in the U.S., but they do serve to limit hunting opportunity for the public. Does privatization of access conflict with the public trust doctrine?

Although we commonly think of hunting's role in conservation when discussing the Model, its utility for all fish and wildlife taxa conservation is seriously limited. The principles are quite apparent in the context of small and big game mammals and game birds. However, the utility of the Model is restricted with respect to nongame mammals and birds, reptiles, amphibians, and fish and wildlife habitat.

Furthermore, the pivotal role sustainable use constituencies have played in launching and supporting the Model undoubtedly has led to greater emphasis being placed on the concerns of hunters and anglers by fish and wildlife agencies.

This perhaps understandable reaction does have implications for how engaged other groups are in the conservation process and how well represented their views are in wildlife program decisions. The "public trust" is inclusive. Have programs been commensurate in this crucial regard? How has the Model performed here?

Elimination of Markets for Wildlife

There is a thriving trade for reptiles, amphibians and fish. In addition, some game species, which we would expect to fall under the principles of the Model, are actively traded. Deer, elk, pheasants, quail, chukar and more exotic wildlife species are commonly bought and sold. A Google search for the phrase "wildlife for sale" returned about 15,000 results. Related to wildlife markets are the contests and tournaments that are common in rural areas of the country. Big buck contests, coyote hunts, crow hunts and numerous other commercial contests imply a market-based hunting situation. The sale of furbearers, seal fur, antlers, reproduced antlers and a variety of other wildlife parts needs to be considered in light of the elimination of markets component of the Model. Of course, there is a robust market for access to wildlife occurring across the country in the form of leases, reserved permits, shooting preserves, etc.

Allocation of Wildlife by Law

Clearly, well-defined laws exist regarding the seasons, bag limits, methods of take and areas in which seasons apply. What is not as clearly defined is the applied enforcement of these laws. Enforcement priorities often depend on available resources and societal desires. Does the out-of-season take of a skunk merit the same level of enforcement as a trophy elk? Although state authority over the allocation of resident game species take is well defined, county, local or housing development ordinances may effectively supersede state authority. De facto decisions regarding hunting opportunity and access routinely are made at a level below that of state government. Further, decisions on land use, even on public lands, indirectly impact the allocation of wildlife due to land-use changes associated with land development. Competing land uses that effectively exclude wildlife habitat supersede the notion of allocation of wildlife by law. We have seen examples where multiple-use public lands have been dominated by one or more uses, thereby reducing their wildlife value and allocation to the public.

Wildlife Can Only be Killed for a Legitimate Purpose

The current examples of broad-scale prairie dog shooting and crow hunting raise the question of legitimate purpose. Unless these individuals are killed for food and/or property protection, how do we reconcile this practice with the current Model? Pheasant-stocking programs that, in effect, create artificial populations may qualify for evaluation in the context of the Model. The management of overabundant species (e.g., white-tailed deer and Canada geese in urban settings) is an accepted management practice, but how does it align with the Model? How do long-standing predator removal or control programs fit within this context? How precisely evaluated are the concerns over property protection, and how well justified should such interventions be? Are trophy hunters who secure only the cape, antlers or horns consistent with our understanding of the Model's history and intent?

Wildlife Are Considered an International Resource

Several international treaties exist that prescribe cooperative relationships and management programs between the U.S. and other countries. However, there are other opportunities for international treaties to address species that cross borders into Canada or Mexico. Exporting components of the Model to other countries, in particular Africa, has proven to be successful in some cases, yet very difficult and time consuming to implement. Complex permitting processes, traditional economies and cultures, as well as travel and firearm restrictions stand as barriers to sharing the successful Model and American system of conservation funding with other nations.

Science Is the Proper Tool for Discharge of Wildlife Policy

Although the United States has led the way in advancing the wildlife profession, the profession appears to be increasingly politicized. The rapid turnover rate of state agency directors, the makeup of boards and commissions, the organizational structure of some agencies and examples of politics meddling in science have challenged the science foundation of our profession. Examples of the lack of rigor in surveys and analyses, advocacy, and misuse of science have prompted The Wildlife Society to undertake a technical review that is now in progress. The multitude of environmental and conservation organizations include some organizations that appear to be more focused on developing membership than on the proper use of science to advance wildlife policy.

Democracy of Hunting

Roosevelt and Leopold, preeminent conservationists, envisioned a nation in which all citizens had an opportunity to engage in conservation and hunting (Roosevelt et al. 1902, Meine 1988). Animal rights organizations work tirelessly to shift the political debate to exclude hunters and hunting at national, state and local levels. State agencies differ dramatically in their support and effort to recruit and retain current hunters and anglers. Without the political, social and financial support of hunters and anglers, how will these agencies deliver effective conservation programs in the future? Ballot initiatives that often do not include adequate opportunities for public information and debate are offered each election cycle. Our profession has taken a dim view of this form of policy development. Are these ballot initiatives undemocratic or do they lack the deliberative process necessary for sound, long-term conservation policy?

Finally, access to firearms and gun-control restrictions directly impact the public's ability to hunt. This was recognized in the early 1900s when new immigrants in eastern industrial states heavily hunted songbirds. Some states, including Massachusetts and Pennsylvania, passed laws forbidding immigrants from owning firearms or hunting (Trefethen 1975). If such laws were universally commonplace across the U.S., the development of the Model and the funding mechanism for conservation itself may have been altered. These laws were later repealed, but their direct purpose was related to the availability of firearms for inhabitants of a state. More recently, federal gun-control regulations in Canada have posed challenges for hunters there and led to widely expressed concerns, coming as they do at a time when other impediments to hunting are increasing in that country.

Clearly, the majority of North Americans do not hunt. We believe that our current pluralistic democracy is necessary for the Model's survival. Without secure gun rights, what would happen to the average person's ability to hunt? What would happen to the Model?

Strengthening the Model

The Model faces challenges described above and perhaps many more. As our profession continues to embark into the 21st century, we are using a conservation model that matured throughout the 19th and 20th centuries. We believe that a robust discussion must take place among wildlife management policymakers and practitioners. We may decide to embrace the current model and dismiss some of the challenges and conflicts outlined above as irrelevant. We may decide to eliminate the challenges through enactment of new laws, regulations and enforcement activity. We may decide to amend the Model to bring it up to date with current practices. We may decide that a combination of these approaches is appropriate. Or, we could simply ignore the foundation of our profession and continue on as we have for the last few decades and let society blindly dictate the future of wildlife management. We offer a few recommendations in this regard. First, we believe we must engage in a campaign to inform and educate the public about the history that has led to abundant and diverse wildlife on this continent. This campaign should target academic and political elites in both Canada and the United States. Aspiring wildlife professionals enrolled in universities across the continent must understand and appreciate the ramifications associated with the Model's principles and how they currently drive the policy and practice of wildlife management. The public needs to understand that fish and wildlife conservation is not an accidental process, but the exercising of a method with established protocols and proven results.

Second, the Model must be expanded to include all fish and wildlife species and their habitats. We discuss the three-legged stool of conservation as fish, wildlife that is hunted or trapped, and nongame species. Currently, the Model is largely a one-legged stool. If the Model has been responsible for advances in wildlife management, it should be examined in the context of comprehensive, all taxa, fish and wildlife management.

Third, as scientists, we rarely engage in advocacy. And when we do, we are not particularly adept. In this case, we believe that we must advocate a few key issues. Legislation should be developed, where necessary, to define better public trust responsibilities, authorities and jurisdictions over free-ranging and captive wildlife, clarifying any confusion, strategic or otherwise, between such animals and domestic livestock. Similar legislation should be developed to articulate clearly the state's authority to set seasons, bag limits and locales in coordination with local authorities. We should ensure that firearms and ammunition are not regulated in a manner that discourages individuals from hunting or diminishes the financial support that commerce in sporting firearms and ammunition provide conservation programs. We must also advocate for financial support and use of science in policy decision making. Although we are hesitant to challenge some organizations, we must insist that policy emerges from scientific debate, not a need to attract members and dollars.

Finally, because hunters remain the primary source of conservation funding at the state level, we must actively engage in recruitment and retention programs. We must continue to search for a mechanism to encourage the nonhunting public to contribute financially to conserve fish and wildlife resources that they enjoy and have an equal responsibility to

protect. We must secure assured and adequate funding to conserve all fish and wildlife species, recognizing the responsibility our profession has for biodiversity in the most inclusive sense.

Conclusion

The legacy of the North American Model of Wildlife Conservation surrounds us. It is evident in the fish and wildlife that abound across this continent, in the fields, forests and streams, in the national parks and refuges, in the federal and state resource agencies, and in the laws, regulations and rules that conserve wild animals and wild places. The architects of this Model are now gone. We have been handed a treasure that needs constant care and attention. We have a responsibility to those that came before and to those who will come after us to make wise decisions while we are here. Celebrating the Model is understandable, examining the Model makes sense, strengthening the Model is imperative.

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Why Should All Americans Care About the North American Model of Wildlife Conservation?

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The wildlife conservation movement in America is a dramatic story of success that has been largely unheralded in our popular culture. Recent estimates are that 71 million Americans observe wildlife for recreation (U.S. Department of the Interior and U.S. Department of Commerce 2006) thereby directly benefiting from the movement and the model that led to its success. Although the funding source for these achievements has been primarily hunters, clearly those who do not pay but benefit should care for and appreciate the model and those who fund it. We suggest it is time for them to do more, and we recognize this will only happen if we are willing to engage people with multiple interests in wildlife.

This is an urgent matter. The wildlife conservation movement in North America is again facing daunting challenges. With all due respect to historical accomplishments, wildlife conservationists are falling behind in the face of the local, continental and global threats to conservation. In a perfect world, all Americans would care about wildlife conservation, as well as the ever-evolving model and associated institution that is the essential machinery of conservation.

We are not Pollyannas about the actual situation. Thus, we reveal up front our perspective: most Americans largely do not care deeply enough and likely do not see a reason to care about the North American Model of Wildlife Conservation (Model). To the extent this assertion is true, the situation it describes represents a problem of high importance for the future of wildlife conservation. Sustaining traditional programs and interests, let alone taking new initiatives, with a declining stakeholder base is not viable without additional broad-based funding (Jacobson et al. 2007). The situation is unlikely to change until the Model energetically embraces more Americans and is regarded, unambiguously, as relevant to their wildlife interests and concerns. It is incumbent upon individuals and organizations already involved in the Model to make it relevant to all Americans. That is, as in the past, those deeply engaged in wildlife conservation need to look to the future and lead evolution of the Model such that it embraces the breadth of American interest in wildlife and results in more Americans caring about it.

Taking the perspective above, this paper discusses three considerations for the future of the Model: (1) why it needs to be expanded to increase its relevancy to Americans; (2) what are some of the likely opportunities for expansion; and (3) who should take the leading roles in strategic expansion of the Model. Ultimately, to be sustainable, we conclude that the Model will have to adapt and evolve to address changing ecological and social conditions (i.e., both current and anticipated) that create the context for conservation. The process of shaping the Model to reflect the desires of American society ought to be informed by all perspectives that care about the wellbeing of wildlife.

The North American Model of Wildlife Conservation—A Success, But Can It Do the Job in the Future?

Wildlife conservation in North America was born of necessity. Prior to the inception of the Model in the late 1800s and early 1900s, wildlife was exploited for economic gain without substantive legal or social consequences. Regrettably, by the time components of the Model were set in motion, Americans had already witnessed extinctions, extirpations and severe declines in populations of a number of wildlife species across the continent. Similar fates were certain for many others if the trajectory of wildlife exploitation and habitat destruction were left unchecked. Ending excessive overuse and restoring many species were urgent matters.

Fortunately for subsequent generations of Americans, dedicated individuals and organizations in the decades just prior to and following the turn of the 20th century mobilized an extraordinary, potent initiative. Facing a daunting challenge, they were able to wield the social and political influence necessary to stem the tide of unbridled exploitation in favor of protecting, restoring and sustaining wildlife as a renewable resource. Originally, these efforts to secure the future of America's wildlife were led primarily by persons aligned with influential hunting organizations, although bird enthusiasts also were among the ranks of change agents seeking to curb the decline. Starting from a newly galvanized

foundation of social and political support that came together 100 years ago, components of the emerging wildlife conservation movement of the time needed to be institutionalized to secure its good effect. Some essential elements of a stable, lasting institution were already in place (e.g., legal recognition of wildlife as public trust resources, democracy of hunting), but others had to be developed (e.g., elimination of market hunting, management of wildlife as a focus of scientific study) or strengthened (e.g., allocation of wildlife by law). Hunters, the primary stakeholders and stalwart champions for wildlife conservation, were principal architects in shaping the Model.

The Model is described as a core set of principles that taken together ensure wildlife is managed as a public trust resource (Geist et al. 2001, Geist and Organ 2004). That is, the Model reflects the authentic American vision that wildlife are not the property of individuals (landowners, wealthy people, etc.), but instead belong to everyone, managed in trust for citizens by their government. Under the public trust doctrine, government manages wildlife (practices or ensures wildlife conservation) for the benefit of current and future generations of all Americans, not any particular group (Geist et al. 2001). The complex institution for wildlife conservation and management that has developed over the last century reflects its roots and continuing support from citizen conservationists with hunting interests. By most accounts, the focus on and association with hunting has served wildlife conservation well for 100 years, but the question on the minds of many today is whether that focus is sufficient to sustain wildlife conservation for another century. We conclude no, it is not. Without widespread societal support for conservation in its broadest sense, the Model as we know it today will be inadequate. This is not a surprising evaluation, because any model operating in a dynamic situation requires adjustments—sometimes transformation—to continue to be relevant and effective. So, the challenge is, how do we compel a primarily nonhunting society to both care about wildlife conservation and understand the importance of a robust model needed to sustain it? We suggest that broadening the embrace of the Model to be more inclusive of contemporary conservation interests is the first step in that direction.

Broadening the "Public" in Public Trust

A philosophical question with practical implications is: should a model to fulfill the public trust doctrine rely on funding originating so heavily from a few "user" groups? Gill (1996: 63) suggested that the narrowly based funding of public wildlife management has "blurred the essential distinction between public interest and special interest and inevitably eroded both scientific credibility and public trust." The resource-dependency perspective of organizational behavior supports this observation. This theory of organizational behavior posits that organizations become dependent on those entities that have control over critical resources, particularly when options for obtaining necessary resources are limited (Johnson 1995). This is one reason why the user-pay/user-benefit funding construct embedded within the Model is not tenable in the long run—it is fundamentally inconsistent with the premise behind the public trust doctrine (Mitchell 1999) and needs to change such that wildlife conservation is funded in large part by all beneficiaries, i.e., the general citizenry via a non-voluntary mechanism. Further, this mechanism should be insulated as much as possible from undue influence of special interests. Funding for wildlife conservation, at least at the state level, needs to be reliable, consistent and broad based. This literally means wildlife conservation for all Americans, not just special interests. But governmental entities that are mandated with management oversight require financial support to carry out their responsibilities as trustees of the common-pool wildlife resource. Funding influences priorities and outcomes in public agencies and private organizations alike. No matter how broadly the mandate for management of wildlife as a public trust resource may be interpreted philosophically or legally, funding source—who pays—for wildlife conservation and management invariably affects focus.

Government agencies and nongovernmental organizations, key actors in the wildlife management institution in America that carries out actions guided by the philosophy of the Model, are predominantly funded directly or indirectly by one core stakeholder group--hunters. This situation persists despite many studies showing the much larger public interest in wildlife (e.g., the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation estimated that Americans spent twice as much on wildlife watching as they did on hunting). Nonhunting interests are not well represented in state-level governance of wildlife and few nonhunting-related dollars are captured to ensure those opportunities are enhanced or sustained. In short, broad public interest in wildlife is not manifest in equally broad financial support of conservation carried out by our state and federal governments.

The Model has been criticized for being "captured" by consumptive-interest groups, primarily hunters (Loker et al. 1994, Beck 1998). Because hunters pay the bills, it is not surprising that they are given much attention and wield a great deal of influence on wildlife conservation policy, governance and programs (Nie 2004, Jacobson and Decker 2006). Arguably, hunters are privileged in the current Model, while other interested stakeholders are underrepresented and

underserved. Some have even suggested that an "iron triangle" relationship exists among wildlife management agencies, traditional user groups (e.g., hunters) and policymakers that "limits access to resource management decision processes to those outside the triangle and creates still more social tension and conflict" (Gill 2004: 37). The iron triangle concept suggests that people with different interests in the wildlife resource and different views about proper use of those resources (e.g., nonhunters) are excluded from equal influence on and access to wildlife decision-making processes, particularly at the state level. This occurs both formally (e.g., by not being legitimized through membership on a wildlife board or commission) and informally (e.g., by lack of access to existing informal networks).

Without arguing one way or the other about the veracity of such claims, it certainly is true that consumptive users, wildlife agencies and some policymakers have strong, interconnected relationships. Such relationships are common in government and often are indispensable for forging policy. The extent to which this triangular relationship is exclusive (i.e., excludes interests in wildlife conservation other than those expressed by the hunting community) likely varies among states. Evidence exists that agencies are creating processes and taking other actions (Aldrich 1999) to include nontraditional stakeholders (Jacobson and Decker 2006). For example, the number and diversity of partners collaborating on the Teaming With Wildlife (TWW) effort demonstrates that the boundaries are expanding, at least in the context of searching for alternative funding mechanisms for wildlife conservation and management (Jacobson and Decker 2006).

Who Should be Concerned about Whether More Americans Care about Wildlife Conservation and the Model?

A core premise of the Model is that wildlife are an integral part of our national culture and legacy. It will take vigilance to sustain this natural heritage, and all Americans should feel some responsibility for passing this heritage on to future generations. Studies conducted in recent decades have documented Americans' affinity for wildlife. Thus, we should expect that people other than hunters should care deeply about wildlife conservation, and certainly many do. Yet, we hazard to guess that very few Americans know much if anything about the seven tenets of the Model as it exists today.

If most people are unfamiliar with the Model and the importance of its continued evolution to the future of wildlife conservation, it is incumbent upon those who are knowledgeable and concerned to inform the majority such that they know to care. Why? Because awareness of the Model is a prerequisite to participating in efforts to influence its future development. The extent to which people care will calibrate their level of motivation to participate in the Model's evolution, and that will affect its fitness or potential to meet their expectations for wildlife conservation in the 21st century. If the majority of Americans who are concerned about wildlife do not engage in or at least knowingly consent to the inevitable, continuing evolution of the Model, whatever direction it may take, they will not support the outcome, thereby putting the durability of the model at risk.

Although many Americans enjoy wildlife-related activities and benefit from ecological services that wildlife provide under the Model, they need to be aware that hunters are a shrinking group of stakeholders in wildlife conservation and will not be able to shoulder the high political and financial costs of wildlife conservation much longer. Further, the Model needs to be modified with involvement of citizens who can reflect the diversity of wildlife interests among Americans. Arguably, and with full recognition of all the good it has achieved, the Model developed in a way that has not been conducive to capturing the total breadth of interests extant among the American public. Rather, a duality has developed—essentially hunters and everyone else. Hunters largely by themselves have been capable of "carrying the water" for wildlife conservation in the past--a deserved source of pride for the hunting community. That situation is changing quickly as the threats to conservation enlarge and the influence of hunters declines. We are at a juncture in wildlife conservation. Breaking down divisions (e.g., hunters and nonhunters) that handicap the effectiveness of any people working for the long-term well being of wildlife, regardless of their particular interest in the resource, is imperative for the future of wildlife conservation. Indeed, recognition of the need for a broad funding base and coalescing interests of hunters and other conservationists was articulated in the 1930 American Game Policy (Leopold 1930). That may have been simply regarded as a noble idea 80 years ago; today, it is a necessity urgently in need of implementation.

So, why should we *want* more Americans to care about the Model? In part because the extent to which they care will determine their motivation for involvement in the ongoing development of the Model, and in turn its potential to meet their expectations for wildlife conservation in the 21st century. Currently, forward-looking leaders and organizations, many of which are among those most heavily vested in the Model as it has evolved, are considering how the Model might capture broader public interests in explicit, easily recognizable and valued ways for a broader base of stakeholders. This is the time to engage those who are deeply interested in wildlife but have felt on the periphery or even excluded from the mainstream of the dominant model for wildlife conservation in America. Those traditionally in the mainstream will need to figure out how to engage these potential allies for wildlife conservation as full partners in evolving the Model of the future.

Wildlife professionals, perhaps especially those in public service and responsible to all citizens inclusively, should encourage as many Americans as possible to care about the Model. Consistent with the public trust doctrine, evidence abounds indicating wildlife professionals have been striving to understand and reflect a diversity of stakeholder interests and concerns in wildlife conservation and management. In their efforts to incorporate the breadth of stakeholders' interests, wildlife managers confront many challenges created by the current wildlife management institution, the foundation of which is the Model. In particular, we should be assessing whether the institutionalized systems of governance and funding mechanisms are sufficiently broad, inclusive and transparent to achieve broader stakeholder trust and engagement. Participation of people reflecting broad stakeholder concerns for wildlife conservation is critical to develop a more inclusive Model that facilitates fulfilling public trust responsibility. A more-inclusive Model, in turn, is needed to garner broad-based funding to support the state and federal agencies that are essential to wildlife conservation.

Are the mechanisms in place for the Model to develop such that it can reflect broader interests in wildlife conservation? If one agrees that the Model must adapt and evolve to be sustainable, the process of continuously reforming to reflect wildlife conservation interests of American society should be informed by input from all interested citizens. Public wildlife managers will be better supported in their work if more citizens care about and influence the ongoing development of the Model and its components. This is indispensable to the durability and sustainability of such a model. For example, American society should be represented broadly and engaged in the process of transforming state wildlife agencies to ensure the next-generation agency is structured (e.g., legal mandates, funding mechanisms, governance structures) to meet the needs and expectations of current and future generations.

Conclusion

Why should *all*, or perhaps more realistically *more*, Americans care about the Model? Because many Americans in addition to hunters have interests, some very deeply held, in wildlife that the Model should reflect. That can only be ensured by caring people involving themselves in the discussion and processes of conservation. During the next few years, the Model, of necessity, will be undergoing evolution that presents a significant opportunity for positive influence on the shape of things to come in wildlife conservation. The opportunity to which we refer is that of rethinking and refining the Model to meet better the needs and interests of a broader swath of American society, both current and future. All Americans should care about this process, and all people, organizations and agencies currently involved in wildlife conservation should work to encourage more Americans to engage in the evolution of the Model, because their political support is needed to pass on our wildlife heritage. Furthermore, their financial support is required to ensure vital conservation work will continue in the face of mounting threats to wildlife.

Americans who care about our wildlife resources should have an awareness of how this important legacy has been sustained. The role of hunters in providing financial and political support for this legacy should be acknowledged and appreciated. Americans also should be aware that this legacy is fragile and that hunter dollars alone will not be enough to sustain it given current and future demands and challenges. A broader base of political and financial support will be required just to meet basic and traditional needs, let alone expanded programs. To achieve such support, a broader suite of stakeholders needs to be engaged. This will necessitate evolution of the Model, but not an abandonment of its core principles or the role of traditional interests. Rather, core principles and interests can be better sustained through a more robust model that, while valuing its roots and traditions, recognizes that wildlife are held in trust for all and, if all are to share in political and financial support, their interests and needs must be addressed as well. Although the Model itself is not about financial support, without such support the principles that have been the foundation for our great wildlife legacy become mere words.

Ensuring more Americans care about the Model and get involved in its evolution should not be left to chance. Stakeholders who have felt left out should not be expected to embrace suddenly an opportunity to become "insiders" without some skepticism on their part. Public wildlife professionals and various nongovernmental organizations almost certainly will need to take initiative to form coalitions to attract and consolidate the public interest in wildlife conservation (much like TWW). The extent to which this causes anxiety among the traditional stakeholders will be directly proportional to the success of the venture, unless great effort and care are taken to ensure that minority interests are preserved in the outcome (e.g., the privilege of hunting for all Americans).

Achieving a new reality in which more Americans care about the Model will be filled with opportunities and challenges for current members of the wildlife profession and others in the wildlife conservation community. The challenges, no matter how insurmountable they may seem, must be overcome to capture the opportunities. Although most

of us hold dear the traditional underpinnings of the Model, we must remain cognizant of the practical realities of sustaining wildlife conservation. Political influence and financial support have been vital, concrete ingredients to effectiveness of the Model. Looking ahead, we can expect the political and financial clout of hunters to contract along with their relative size as a stakeholder group. We will need to grow additional champions to take larger roles as partners in wildlife conservation. For effective partnering to occur, and to avoid competition that could weaken effects of traditional and new conservation champions tackling threats to wildlife, the Model of the future must be sculpted cooperatively and ensure meaningful engagement of diverse interests in wildlife conservation. To do otherwise is to risk failure of wildlife conservation—failure to convey the American legacy of leadership in wildlife conservation to future Americans and citizens of the world who look to North America for guidance in successful conservation.

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How to Make People Care About the Model

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In July 2008, a month before I started my current position as Director of Membership Marketing and Conferences with The Wildlife Society, I was asked to commit to giving this presentation on "How to Make People Care About the Model." I was presented with this request on the premise that I could apply my strong marketing background to a new problem. As a person relatively new to the wildlife profession, it seems, that with some thought, I could bring a new and hopefully useful perspective on how to talk about and promote the North American Model of Wildlife Management (Model).

Quite honestly, at that time, I assumed that the Model was a well-known and fully documented strategy or policy that "everyone" in the wildlife community knew about. In that last few months, however, I have learned that it just is not so. Overall, relatively few people know about the Model, and fewer still have any kind of consensus about what the term stands for.

Over the past few months, I have read a few books and pages upon pages of scientific and popular articles related to wildlife science and management. I also have spent time surfing the Internet, seeking out anywhere that the term North American Model pops up. I am sure it will come as a shock to some here that, in the general non-wildlife public, the Model is almost unknown; it might as well not exist.

So, what can I say to you? I think, in fact, a lot. Clearly, those wildlife experts who have spent time and great thought creating the idea of the Model believe that it is a powerful, useful and important notion. Many ideas that are powerful and important, ideas that change policy and social behavior, start small. The question becomes how to provide a small but potentially powerful idea the fuel it needs to grow into social consciousness and social action.

I want to point out that from a name identification/branding perspective, I discovered an early disconnect with the Model. At times, it is called the "North American Model for Wildlife Conservation," the "North American Model of Wildlife Conservation," the "North American Model of Wildlife Management," and the "North American Wildlife Conservation Model." While this may seem like minor semantics, in this day of Google searches, it is important to stay consistent with the naming of the Model and what we actually call it.

I recently asked a few leaders in the wildlife management movement how they would describe the Model. I received a few responses, and the one definition that I received that I feel works well is, "the Model provides the policy framework that supports scientific wildlife management in the United States and Canada. It employs a sportsmen-funded user-pay/user-benefit strategy to conserve diverse and abundant wildlife populations for public appreciation and recreational use. It is the most successful model of wildlife conservation in the world."

I am not going to go into specifics about the Model and reiterate its seven principles because I am assuming that this audience is aware of them and that some of my fellow presenters today have pretty much written the book on them.

Introduction

In the book, *Where the Wild Things Were*, Will Stolzenburg (2008), once the lead science writer for The Nature Conservancy's member magazine, describes the evolution of wildlife conservation and the current challenges that society faces today, from the escalation of white-tailed deer roaming our suburbs to the debate over the reintroduction of wolves in Yellowstone. This book provided an excellent source of the current lay of the land for a nonwildlifer.

In the *National Geographic* story, "Hunters For Love of the Land" (Poole 2007), the former executive editor of *National Geographic* explains how revenue from hunting and fishing licenses and excise taxes contributes about 75 percent of state wildlife agency revenue. At the state level, this includes $1.22 billion from hunting and fishing licenses and $616 million from excise taxes on fishing and hunting equipment and motorboat fuels. At the federal level, $24 million is collected through the sale of duck stamps. The article praises the conservation efforts that are being done by organizations such as Pheasants Forever, the Ruffed Grouse Society, the National Wild Turkey Federation, Quail Unlimited and others. These organizations are responsible for raising more than $280 million annually for wildlife conservation efforts. The article goes on to point out the restrictions on hunting due to private land access.

The *Sports Illustrated* article "A More Dangerous Game" (Teague 2008) reflects on the decline of hunting and the effect it is having on wildlife populations. The article points out that the one place that hunting is not declining is in the popularity of hunting video games, such as *Dangerous Hunts 2009* and *Legendary Adventures.* Yes, virtual hunting is on

the rise, whereas real hunting is declining. The article addresses some of the innovative programs that states are offering to encourage hunting, such as Alabama opening the deer season two days early for children under the age of 16, Illinois wildlife managers holding hunting lessons for single moms, and a similar program in California called Becoming an Outdoors Woman.

I point out these three articles because each was published in highly consumer-orientated media. As a layperson, I found the writing in each of these texts not just informative, but compelling. The writers made me care about wildlife management, about its issues and challenges, about how wildlife management is done, and why it should be important to me. Only the *Sports Illustrated* article mentions the Model by name, as the North American Wildlife Conservation Model, and to be honest, I am not sure I would have remembered that at all if the article had run in the swimsuit issue.

I went further in searching for references to the Model, or some variation of that word string. Of course, I first went to the big, popular sites concerning public knowledge and information. I started with the online database search engine for a newspaper that is among the most widely read in the United States, *USA TODAY*, and then searched through the databases for outlets that appeal to increasingly urban audiences, e.g., *Chicago Tribune*, *New York Times* and National Public Radio. What did I find? I did find lots of stuff about wildlife management: public trespassing in protected parklands, suspected bear attacks on trials, new species listed as endangered, endangered species saved. However, I did not find mention, no mention, anywhere, of "the North American Wildlife Conservation Model" or "the North American Model of Wildlife Conservation." Even a great and powerful Google search on "North American Wildlife Conservation Model" (and the other variations mentioned above) yielded less than 600 results, including fewer than 25 blogs mentioning the Model. In today's world, these numbers represent less than a drop in the bucket in regard to the loads of information the public gets about issues related to the environment, conservation and wildlife. Put plainly, my investigation provided sad but true evidence that the Model is not on too many radar screens.

So, what is a wildlifer to do? Market, market, market. Get the word out. Make the term a household term. Make people not just know about the Model, make them *care* about it.

Marketing is Education

What does it mean to "market"? Some people have a not-so-good image of marketers. They imagine the Madison Avenue types. Marketing people call you at home and bug you to buy stuff you do not want or give money you do not have. Marketing people are those folks on television who do infomercials. Yuck! I agree with you. Yuck! But those are examples of just one approach, one style of marketing, and certainly not what we would want for the Model. However, another perspective is that marketing is a stylized form of education. All the components of a good marketing campaign, including branding, advertising, messaging, positioning and promotion, are forms of plain old education. People cannot accept or embrace an idea if they don't know about that idea in terms they can absorb and digest. In other words, we cannot make people care about the Model unless, first, it is on their radar screen, and second, they are interested. The harsh reality is that the Model is hardly known, much less understood, in North America. Some writers even claim the concept is considered politically incorrect for much of the urban electorate. Even among wildlife managers, there is a segment that pleads ignorance when asked about it (Geist 2006).

Educating the American public about the Model, much less making them value it, is a formidable challenge. Why? It is a challenge because of changing demographics and because the numbers of hunters and anglers are declining. According to the U.S. Fish and Wildlife Service, the number of hunters aged 16 and older declined by 10 percent between 1996 and 2006, from 14 million to about 12.5 million hunters (5 percent of the adult population). The largest areas of decline were in New England, the Rocky Mountains and the Pacific states. In such populated states as California, Massachusetts, and New Jersey, only 1 percent of the population identify themselves as hunters. Additionally, the number of Americans who fish has decreased by 15 percent, from 35.2 million in 1996 to 30 million in 2006 (Crary 2007).

Younger hunters are entering the field but not in sufficient numbers to replace the old ones who die or retire their guns for other pursuits. In recent national surveys, the niche formerly occupied by hunters and anglers is being filled by a new species of outdoor enthusiast, called "wildlife watching participants" by the U.S. Fish and Wildlife Service. This new group, including nature photographers, traveling birders and stay-at-homes with bird feeders, accounts for 71 million people, more than 30 percent of the adult population (Poole 2007). While this new group may not contribute revenue to the state fish and game agencies through the sales of fishing and hunting licenses, it needs to be made aware of the impact that the Model has on wildlife conservation.

As of 2000, 79.1 percent of the North American population lived in urban areas (Galea and Vlahov 2005); this trend of increase has continued. At the same time, urban areas around the world are responsible for 80 percent of global carbon dioxide emissions. As late as the mid-1990s, air pollution has contributed to an estimated 30,000 to 60,000 deaths per year in the United States. The declining numbers in hunting and fishing are important because they tell us that, first,

we need to concentrate on reaching out to the urban dweller, since that is where the vast majority of the population resides and, second, we need to consider folding in a "back to nature" green message in our marketing of the Model.

Getting the Word Out

There are many methods marketing professionals employ to get the word out to promote ideas such as the Model. One example is the use of "connectors," strong-willed people who spread the word about something good (Gladwell 2000). Connectors are the social gossipers for good causes. Another kind of connector is the "big mouth," a person who takes the stage and takes charge (Zyman 2000). Al Gore is a big mouth for climate change. Barack Obama is a big mouth for hope in tough economic times.

In contrast to social gossipers and big mouths, those of us wanting to promote the Model may want to explore the use of "tribes" to communicating the Model. Tribes form when all the stakeholders are involved on working for a unified goal (Godin 2008). It is when you get a whole town involved. Remember those commercials when a whole town got to use Nikon cameras, or the recent marketing campaign that the Las Vegas Convention and Visitors Authority did when they invited nearly half of the population of Cranfills Gap, Texas, to Las Vegas (Brown 2008)? Think of the power of a Girl Scout troup out to sell the most boxes of cookies in their area. Those young ladies could sell Thin Mints to the town's best bakery. Think of mega-churches and Amway dealers, members of these tribes are all evangelists promoting ideas or products they believe in.

Another way to promote the Model is the use of viral marketing. One of the best examples of viral marketing is the e-mail service Hotmail. Simply putting "Get a free Hotmail account" at the bottom of every e-mail that their users sent out made Hotmail one of the largest e-mail services. By creating a URL with a landing page, we can bring attention to the Model on every e-mail that we send out, be it to hunters, anglers or the general public.

The video, Opportunity for All, was produced in cooperatively by Conservation Visions and the Rocky Mountain Elk Foundation (RMEF). In it, Shane Mahoney does a wonderful job telling the story of the Model. The DVD is promoted on the RMEF website. While I do not have any complaints about the video, my one comment is that it is totally geared toward the hunter and/or angler. While I understand that RMEF was the main underwriter for the video, for the Model to gain traction in the general public, videos like these must be geared to engage the general public. Preaching to the choir is not going to get a song into the top global 100! In the age of YouTube, segments from the video should be uploaded so the public gets an understanding of the Model. I would also add that Shane is a prime example of a connector.

The past two years, we saw what an organized and disciplined grass roots campaign can achieve. The Obama presidential campaign has set the gold standard for any organization or movement in regard to promoting its message. How did Obama do it? Back in 2000, Obama (2006) did not even have credentials to enter the Democratic National Convention. In 2004, he was selected to give the keynote address at the Democratic National Convention, and that put his name in the public consciousness. When Obama launched his presidential campaign, he embraced a simple, rational message–c*hange*. He also created an emotional and empowering call to action–*Yes We Can* (Bondy 2009). Do members of the tribe supporting the Model have a one-line sentence or elevator speech that describes the Model to the general public?

Obama broke new ground by capturing and empowering his political base; he did this through the use of the Internet (Bondy 2009). Obama was the big mouth, and he used today's networks of social and media marketing to create and grow a tribe. He left no stone unturned, and he pulled out all the stops.

Not only did Obama raise millions of dollars online, he created a vibrant and active community. The community was created by the use of social networking sites and Web 2.0 tools, such as Facebook, LinkedIn, Twitter, MySpace, wikis, blogs, Flickr and YouTube. Why are these sites so important? YouTube, MySpace, Facebook and Wikipedia are currently the third, fourth, fifth and eighth most visited Web sites in the United States (Alexa 2009). By having social media sites, we can listen and engage with the public to find their opinions. Additionally, social media marketing is geared toward one-to-one conversations. It should be noted that in researching sites mentioned above, I was unable to find any reference to the Model.

Consider the example of Twitter. Twitter is a social networking service for friends, family and coworkers to communicate and stay connected through the exchange of quick, frequent answers to one simple question: What are you doing? It is a free utility that provides up to 140 characters per message. As a wildlife manager, you could tell followers what you are currently doing out in the field and how it relates to the Model. Twitter has the ability to transform an urban kid into a virtual wildlife intern by following you around online.

The Internet allows highly active management of the customer relationship, moving along this path from soft to hard support, developing the relationships and building brandwidth through a constant, intuitive interaction, constantly

customizing and personalizing the service, transferring ownership to the consumer (Zyman 2000). Writing about and promoting the Model online are free or inexpensive ways to build support for the Model that, over time, will gain the attention of the general public.

The Obama campaign also did well by doing good (Bondy 2009). The campaign was successful in raising money online because it embraced social responsibility. The Model is very democratic in its principles, and we need to tell its story. One of the greatest achievements of the Model is the public involvement with wildlife, including a large blue-collar segment of society, in contrast to primary involvement of the elite in European societies (Geist 2006). The Model promotes social responsibility, biodiversity and sustainability, and these pillars also need to be promoted.

In addition to all the online resources, there are other ways to promote the Model. With newsroom staffs being cut back due to declining newspaper circulation figures, newspapers are looking for inexpensive quality content. Articles and especially op-eds are ideal ways to publicize the Model. For example, a story about the economic impact that wildlife generates would be of interest to the general public. In 1996, some 77 million U.S. citizens spent in excess of $100 billion in wildlife-related activities (Geist 2006).

With the decline in the number of hunters and anglers, the focus on hunting and fishing should be expanded to include other uses of the outdoors. Wildlife photography, biking, hiking and rock climbing are activities that are increasing in use. Getting the message of the Model to this constituency would benefit all involved in outdoor recreation.

Making People Care about the Model

A key factor in promoting the Model to the general public is making them aware that fees from hunting and fishing licenses not only support the bulk of the operating budget for state fish and wildlife agencies, but that the fees from the licenses, firearms, ammunition and fishing tackle finance the protection and management of habitat. In the tough economic times we are now facing, it needs to be promoted that the revenue hunters and anglers generate has resulted in a national conservation program that is self-funded.

In creating a message that will be relevant to the general public, we should consider the use of T.H.E.M.E. (Gilmore and Pine, 1999), which stands for:

T- the experience
H – harmonize impressions with positive cues
E – eliminate the negative cues
M – mix in memorabilia
E – engage all five senses

I am not sure if we can make people care about the Model. We need to get the word out about the Model and educate the public about its benefits. By focusing on just the hunter and angler, the wildlife organizations promoting the Model are missing out on getting their message across to the public. the Model needs a tribe of believers to succeed and grow. Utilizing online communication tools to promote the Model, will have the largest impact in terms of number of people reached, as well as being cost effective.

One final question: Who or what organization is the distributor of information about the Model? Is it The Wildlife Society, Ducks Unlimited, Boone and Crockett Club or the National Wild Turkey Federation? Well, I can tell you that The Wildlife Society (2007) has issued a position statement on the Model, but it does not have the financial or staffing resources to promote the Model to the general public. The best solution is a cooperative agreement between wildlife scientific societies, the large number of sportsmen's organizations that actively pursue the welfare of wildlife, and state and federal fish and wildlife agencies. For a successful campaign to work, a unified coherent message is imperative. This three-way arrangement will benefit all stakeholders involved in the benefits of a long-standing successful North American Wildlife Conversation Model . . . or is it the North American Model of Wildlife Conservation?

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A Policy to Sustain the North American Model of Wildlife Conservation

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In 1846, the New York Sportsmen's Club drafted a model game law. Before 1900, every state in the United States was enforcing protections and regulations for wildlife (Trefethen 1975, Reiger 2001). Their work became a cornerstone of wildlife conservation in the United States--the state regulation of wildlife. Sportsmen in following decades added other features by securing federal land reserves, funding species restoration, joining the campaign to reduce pollution and many other achievements. As their agenda evolved through periodic reviews of their challenges, hunters' consistent strategy for action was to organize themselves, build coalitions with other interests and secure political positions (Trefethen 1975, Reiger 2001).

By these means, the North American Model of Wildlife Conservation (Model) took shape. By the same means, hunters today will sustain the Model. The specific policies that uphold and advance the Model appear in the *Recreational Hunting and Wildlife Conservation Plan* (Council on Environmental Quality 2008). This Action Plan is the most current comprehensive agenda of new and improved laws, rules and programs to promote wildlife based on science. The effective advocacy required to achieve anything listed in the Action Plan requires another sort of policy. Hunters themselves must have a policy to continue organizing, building coalitions and positioning themselves.

Hunters Today

The Action Plan shows who hunters are today and how they are better organized than they have ever been. Most of the hunters involved in the Action Plan gathered from positions in U.S. society that have become well-known in the last few decades. Federal, state and tribal agencies, Congress, and private groups all contributed. Also, central to this teamwork is a new entity--the Sporting Conservation Council (SCC)--a federal advisory committee chartered under the U.S. Federal Advisory Committee Act (5 U.S.C., App.) as a formal unit of federal government authorized to advise federal officials. The U.S. Department of Interior originally chartered the SCC in 2006 and, in 2008, the U.S. Department of Agriculture cochartered renewal of the SCC.

The President of the United States and the White House Council on Environmental Quality (CEQ) played leadership roles. These contributions, along with the SCC in federal advisory committee status, established hunters in the Executive Branch of the U.S. federal government to complete the network already well-developed in the private sector and in Congress.

This level of organization itself is an accomplishment and proper cause for reflection on who we hunters are today. Starting with the first hunting clubs in the early 1800s, and continuing with national hunters' groups such as the Boone and Crockett Club and Izaak Walton League later that century, hunters have been grass roots advocates (Trefethen 1975, Reiger 2001). Hunters have also been a formal national presence since at least the founding of the National Wildlife Federation in 1937. We are focused through species groups such as Ducks Unlimited, Pheasants Forever, Ruffed Grouse Society, National Wild Turkey Federation, Rocky Mountain Elk Foundation and others that conserve habitat. We are members of Congress who created the Congressional Sportsmen's Caucus in 1989 and recently began organizing caucuses in state legislatures. We are a team that, in 2000, enhanced our effectiveness by forming the American Wildlife Conservation Partners--a networking alliance enabling fast, collective action on issues of mutual interest. When we gathered at the home of President George W. Bush in Spring 2004, hunters had reclaimed and deepened our footing of 100 years ago when the President himself was a hunter of historic accomplishments--Theodore Roosevelt.

Writing the Action Plan

Mindful of the history and the opportunity, President Bush issued Executive Order 13443 in August 2007, directing CEQ to develop the Action Plan to facilitate hunting and wildlife conservation. He ordered the federal government to work with hunters through the SCC. White House staff, the secretaries of Interior and Agriculture and their senior staff met with congressional, state, tribal and private counterparts to scrutinize the practice of wildlife conservation for challenges and improvements.

The SCC organized the review among teams of professionals assigned to major issue areas. Each team researched, debated and produced a white paper on each topic, describing its problem, opportunities, challenges and

recommended actions. SCC delivered a set of draft white papers to CEQ at a reception at the U.S. Department of the Interior on May 15, 2008--the anniversary of President Theodore Roosevelt's Conference of Governors in 1908.

CEQ continued the process by holding a policy workshop in June 2008, at which the authors of each white paper presented their findings and engaged attendees in further discussion and review. Next, the Congressional Sportsmen's Foundation hosted a meeting with congressional leaders at the Capitol on September 16, 2008. Finally, the process concluded with the White House Conference on North American Wildlife Policy, October 1-3, 2008, at which hunters from around the country refined the discussion and advised CEQ, Interior and Agriculture on final improvements to the topics for the Action Plan.

As the SCC explains in the final white paper report (Sporting Conservation Council 2008), this was the latest of similar periodic reviews over the last 100 years. Earlier reviews included the White House Conference of Governors in 1908, the American Game Policy presented by Aldo Leopold in 1930, and the North American Wildlife Policy presented by Durward Allen in 1973.

The Action Plan and the Policy for Sustaining the North American Model

The Action Plan presents seven goals, 22 objectives and 58 actions in descending order of specificity (Table 1). Execution of this plan calls for the same policy of organizing, coalition building and positioning that hunters have used successfully in the past.

The seven goals appear as chapters, such as those pertaining to increasing funding, improving habitat and expanding access to hunting lands (Table 1). Each chapter comprises two or more objectives describing more specific steps. Each objective comprises a set of specific actions with enough detail to guide advocates and policymakers in drafting (or, in some cases, negotiating unresolved details for) specific proposals. The work requires commitments in Congress and state legislatures, in federal and state agencies, and in the private sector. Organization will be indispensable.

Table 1. Main goals of the Recreational Hunting and Wildlife Conservation Plan (Council on Environmental Quality 2008).

1. Increasing Public and Private Funding for Wildlife Conservation
2. Improving Wildlife Habitat Conservation
3. Expanding Access to Public and Private Lands
4. Educating, Recruiting and Retaining Hunters
5. Coordinating Federal, State, Tribal and International Action
6. Understanding Climate Change and Wildlife Effects
7. Conserving Wildlife and Developing Oil and Gas on Public Land

Alliances are necessary and likely. The prominence of habitat conservation, which appears both as a chapter and a recurring topic throughout the Action Plan, affirms that hunters' focus concerns a fundamental area of common ground among nearly all environmental and conservation groups. Other common-ground objectives and actions involve climate, wildlife viewing, outdoor recreation, shooting sports, and youth activities and problems such as the Nature Deficit Disorder coined by Richard Louv (2006) and addressed by such programs as Pheasants Forever's No Child Left Indoors™ Initiative (Pheasants Forever 2009).

The Action Plan aims to secure hunters' political position. Action 1 calls for a bill in Congress to charter the SCC for 10 years to guarantee its direct role for the entire 10-year horizon of the Action Plan. The advice of hunters through this formal channel is indispensable, as hunters come and go from the key posts at Interior, Agriculture and the White House.

Next Steps are Underway

Our approach is already beginning to work. To continue, we must negotiate politics and commit to priorities. Our political prospects are favorable. Our bipartisan profile makes us a pivotal voice as the political parties need each other to win votes in Congress. We have an opportunity for real policy debate and decision on our own issues and related issues that we choose to engage.

Also, hunting policy stands nearly alone as an issue moving in the same direction this year as before last year's election. The changes in Congress and the White House are shifting other policy in polar directions. Politicians today emphasize breaking with the past administration. Yet, hunters' message remains both in rhetoric and policy proposals. The new White House agenda says, "We must forge a broad coalition if we are to address the great conservation challenges we face. America's hunters and anglers are a key constituency that must take an active role and have a powerful voice in this coalition" (The White House 2009). The President's budget promises, "To help preserve the national traditions of hunting and fishing [through] funding to help States . . . encourage young people and minority populations to responsibly hunt and fish" (Office of Management and Budget 2009: 78).

This is a valuable, though preliminary accomplishment, and it will be our last for this Administration unless we negotiate agendas with the Administration and Congress and respect how small we are in comparison.

The new Administration has named jobs, energy and climate among its active issues. Our proposed action agenda, therefore, might focus on new funding or authorities to produce biofuels from forests, or assuring that road and infrastructure jobs contribute to habitat values (Table 2). Other plausible targets include extending tax incentives for donations of conservation easements, securing more descriptive and useful climate science for managing effects on wildlife, and improving landscape assessments that inform oil and gas development on public lands.

Table 2. A proposed action agenda for 2009 based on actions listed in the Recreational Hunting and Wildlife Conservation Plan (Council on Environmental Quality 2008).

1. Produce more biofuels from public forests (cf. Action #15)
2. Assure habitat improvements through road and other infrastructure job programs (cf. Action #19)
3. Extend tax incentives (cf. Action #2)
4. Specify climate science to describe effects on wildlife (cf. Actions #36-38)
5. Improve landscape assessments to inform oil and gas development on public lands (cf. Action # 47-48)

As noteworthy as we have proven to be as an interest in American politics, we also are very small and therefore unlikely to accomplish anything unless we work together. In 2006, 8.5 percent of Americans both hunted and fished (U.S. Department of the Interior and U.S. Department of Commerce 2006). So, even though we outnumbered other resource-dependent groups such as farmers, keep in perspective that farmers still have their own committees in Congress and there are many more people who care about wildlife than just hunters. We are not big enough that a faction within our group could have any meaningful power.

Our small but noteworthy political stature also demands that we commit to priorities. We cannot escape the press of business and scarcity of time. Our priorities should be those few actions we can undertake this year on which we have the strongest agreement among ourselves and that comport with the agendas of the Administration and Congress. We must form a short list from our common list of 58 actions in the Action Plan and our longer lists of each hunting organization's agenda. As more of us combine efforts on an issue, we increase our chances of winning that issue.

We have a far more detailed and diverse agenda than did our forebears of centuries past. Yet, we have the same enduring and proven strengths of organization, appeal and position. If we pursue the Action Plan together, sharing responsibilities, in alliances with others, and from our strong positions inside the government as well as outside, then we can, in the first decade of the next century, sustain the Model built in the last century.

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Closing Remarks

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Thank you to my colleagues and fellow presenters for all the hard work and preparation that went into producing your papers and participating in this session.

The United States and its neighbors in North America have an abundance of fish and wildlife for all citizens to enjoy. Our system of conserving those wildlife populations is the most successful in history, envied throughout much of the world.

Known as the North American Model of Wildlife Conservation (Model), this system provides conservation funding for wildlife and fisheries to ensure a diversity and abundance of species. Hunters and anglers contribute the majority of funds and, therefore, deserve enormous credit for conservation achievements. A percentage of money from the purchase of licenses and equipment related to hunting and fishing forms the core of the Model and the American system of conservation funding. These monies allow state fish and wildlife agencies to hire professional managers who make scientifically sound decisions that benefit wildlife and habitats.

Today, the number of hunters and anglers supporting this system is in decline, which creates a two-fold challenge. First, we need to find new funding sources that are permanent and dependable. Second, we need to inform and engage the estimated 71 million Americans who participate in some form of wildlife recreation and directly benefit from conservation funding.

We should update and improve communication concerning the North American Model to increase public awareness about how it benefits wildlife conservation. Members of The Wildlife Society and other wildlife professionals concerned about species and habitats should strive to make the Model more relevant and develop new strategies to reach the millions of citizens who also have a stake in the survival of the Model and the current funding system.

We also need to ensure that the American public shares more of the cost of natural resource conservation so the burden does not continue to rest largely on the traditional hunting and fishing communities. This might be accomplished through potential additional funding sources for the Model through broad-ranging energy and climate legislation. No matter what steps are taken, we clearly need to expand the number of seats at the conservation table while ensuring that traditional hunting and fishing interests retain a prominent voice.

John Organ noted that the Model needs to be modified with the involvement of citizens who reflect the diversity of wildlife interests among Americans. Perhaps the Model does not need substantial modification, but instead to become part of a larger, more diverse group of conservation interests. The future may show that it might be more expedient and productive to "hitch our wagon" to the concerns of urbanites rather than lead with our concerns. Greg Schildwachter spoke today of a group of policy recommendations that should be implemented to further our goals, including reauthorization of the Sporting Conservation Council. Steve Williams identified the development of Recreational Boating and Fishing Foundation analogue for recreational hunting and shooting.

As we go forward, we need to address many of the concerns raised here today, including explaining the Model to a wider audience, as Darryl Walter observed. We need to be able to address these issues not only for our own community's understanding, but also to generate the needed tribe of believers to succeed and keep the Model and the American system of conservation funding as key players in the future of conservation.

One challenge we face is that a majority of Americans do not claim a direct interest in hunting, fishing and other outdoor activities. Urbanization is partly to blame: Approximately 85 percent of our citizens now reside in metropolitan areas, where there is often little direct interaction with the resources the Model is designed to protect. Therefore, the future of the Model will depend in part on making it relevant to nontraditional interests. This could be accomplished by underscoring the importance of how funds derived from wildlife recreation help sustain ecosystem services, such as the quality and quantity of clean air and water, and how responsible, controlled harvest of game species helps reduce overpopulation of ungulates, such as white-tailed deer, which are causing human health and safety concerns.

Another vital task that we all face is to increase public understanding of and support for science-based fish and wildlife management. This is true even within traditional interest groups, which genuinely care about the proper management of natural resources. We must better explain the role that science-based management can play in wildlife conservation and the unintended consequences well-intentioned but ill-conceived management can impart. For example, it is well known today that natural wildfires were nature's way to affect and often rejuvenate natural landscapes. Yet,

modern efforts to control and suppress wildfire have resulted in fuel loads greater than historic norms, as well as insect infestations, disease outbreaks and the spread of invasive plants, all of which threaten millions of acres of forests, rangelands, wetlands and nearby communities, which, in turn, threaten our ability to sustain productive wildlife habitats.

If we are successful in these endeavors, the Model and science-based management will continue to be an integral part of the future of conservation in the United States. The time for talk on these action items is over. We all need to walk the walk.

Session Three.
The Coursework of Conservation: Are University Curricula on Target

The Changing Face of University Wildlife Programs

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The question of whether or not college and university wildlife programs of study are meeting the current and future needs of employers, typically state and federal agencies but increasingly the private sector as well, has been a recurrent topic of discussion within our profession. In just the past two decades, a series of papers has been published on the topic including the Fall 1989 issue of *The Wildlife Society Bulletin*, a special session at the 2000 North American Wildlife and Natural Resources Conference and another special section in the Fall 2000 issue of *The Wildlife Society Bulletin*, as well as individual papers and presentations in the intervening years (and, of course, prior to 1989). This 2009 session builds on the work of an *ad hoc* committee established by The Wildlife Society (TWS) to assess where curricula stand with regard to meeting the needs of students, their future employers and the profession. Given the diversity of schools offering wildlife-related courses and the ongoing changes affecting our profession, we believe it is appropriate to reexamine this issue periodically.

As Wallace and Baydack (2009) indicated, more than 400 colleges and universities in the United States currently offer wildlife-related courses. Many offer some form of natural resource major or concentration, scores offer a wildlife or wildlife and fisheries major or concentration, and 110 have student chapters of TWS, indicating some level of faculty and institutional support for wildlife education and interest on the part of students. Although hundreds of schools may offer a course containing some wildlife-related content, many of those are relative newcomers to the field, and students graduating from those schools would not be considered "wildlife biologists" by most definitions. In addition, graduates of some schools that do offer a degree in "wildlife" (variously defined) do not meet the minimum standards for certification by TWS or the federal government criteria for employment in the Wildlife Biologist series. Certainly, in many of the latter schools, careful planning around the minimum curriculum will result in a student meeting the credit hour requirements for TWS certification and/or government employment. However, students need the guidance of a counselor or faculty member to ensure that they understand essential class requirements if those professional opportunities are important to them. Often, they must be willing to spend more time and money to achieve those objectives.

A common lament in those earlier perspectives, and in many informal hallway discussions, was that incoming students had increasingly less exposure to the outdoors and consumptive activities (i.e., hunting, fishing, trapping) than previous generations of students, as Miller et al. (2009) noted. In each case, this likely was true, and it continues to be as students entering wildlife programs reflect the changing demographics in our society. Kelker (1944) described a course in "winter woodcraft" taught in 1942 at Utah State University, based on "a distinct need to train many wildlife students and others how to live outdoors…," so this is not a completely new fear. However, the internal pressures at colleges and universities to reduce the credits required for graduation and, thus, costs to customers (students), large class sizes, and a decreasing tolerance for any kind of risk in society in general all contribute to there being fewer formal opportunities to obtain field experience during classes, as opposed to simply hearing how things are done (Hafner 2007). Thus, at a time when more students than ever before likely would benefit from hands-on opportunities during their formal education, there are fewer of those experiences to be had.

Objectives and Methods

Our charge for this paper and as part of the TWS committee was to look at the changing face of university wildlife programs. This assignment could have taken several directions: to look at the composition of students in programs over time, the faculty in programs and their specialties and degrees of self-identification as wildlife biologists, the content of the programs, or various combinations of these factors. Other subcommittees focused on the needs of employers, the value of TWS certification, the factors driving observed changes, and the appropriate blend between theory and practice .We chose to focus on an examination of how some of the long-standing wildlife programs at universities in the United States have evolved over time. We conducted a nonrandom survey of 30 colleges and universities that house U.S. Geological Survey Cooperative Fisheries and Wildlife Research Units (Coop Units), as these are primarily land grant schools that we expected would have reasonably long histories of offering wildlife-related courses, if not degrees. To minimize intrusion, we first examined the program websites to see if information on the history of the program was presented; four schools had sufficient information on their websites that we did not follow up with direct contacts. For schools without sufficient historical information on their websites, we made direct contact with known colleagues to solicit information on the history of their programs. We asked for information on first faculty hires dedicated to wildlife, in which school, department or college the "wildlife" program was housed over time, when the first courses were offered, trends in student numbers through time, and program name changes. We were able to gather useful information for 24 schools using both methods, but not all of the information discussed above was provided by each school. Some of the information, particularly on student numbers and numbers by gender, was only readily available for the past 10 to 20 years, so our discussions on some topics will be limited.

Lone Wildlifers in the Beginning

Cornell University was selected by the American Game Association to begin a program of "professional training in game farming and management" in 1917 (Ogelsby and Brumsted, Cornell Department of Natural Resources website http://www.dnr.cornell.edu/mission/history/ accessed February 23, 2009). This program was directed by the ornithologist Arthur A. Allen, alone, for 30 years. The other early wildlife programs, those with identifiable roots in the 1930s, tended to follow one of two models. The first was along the Cornell line, in which a single faculty member was hired to teach courses in "game management" in a forestry or agriculture school or department, often remaining the sole wildlife faculty for several years or even decades (e.g., University of Massachusetts, University of Wisconsin, North Carolina State University). This single faculty member would teach a variety of management-oriented undergraduate or graduate courses, without much specialization. The second model involved the establishment of a Coop Unit in a forestry or biology department, which resulted in wildlife management beginning as a graduate program, and often staying that way for decades (e.g., Pennsylvania State University, Virginia Tech). There were some exceptions, such as the University of Wisconsin, for which regular faculty members (in this case, Aldo Leopold) were hired in the 1930s long before a Coop Unit was established but wildlife degrees were only at the graduate level until 1967.

Early undergraduate courses often were designed to fill a need in the context of agricultural or forestry programs. Thus, courses were along the lines of "Grazing and Wildlife" (University of Florida in the School of Forestry), "Vermin Control" (North Carolina State University Wildlife and Fisheries Program), and various takes on "Game Management" or "Wildlife Management," using Leopold's 1933 *Game Management* as the key (or sole) text. Others were offered through Biology or Zoology programs (e.g., University of Missouri), where courses in wildlife conservation were developed alongside those of mammalogy, ornithology and entomology (e.g., University of Minnesota). Students with one of these other majors often were able to have a concentration in game or wildlife. For example, the first course in "Conservation of Natural Resources" was taught in 1938 at South Dakota State College (now South Dakota State University) and "Conservation and Management of Wildlife" first appeared in the college catalog as a branch of study in 1939. However, the program was housed in the Entomology-Zoology Department, and the Department of Wildlife Management was not formed until 1963.

Several wildlife programs were created during the 1950s through the early 1970s, either as concentrations in a Forestry Department (University of Vermont), Animal and Range Sciences (New Mexico State University) or as part of a larger interdisciplinary program (University of Washington, University of Arizona). These programs displayed similar patterns of development as those that were established earlier, growing slowly from a single faculty member to greater numbers as enrollments increased and the wildlife program became more independent.

Student Demographics and Numbers

Few of the historical documents obtained contained information on the gender of students in the early years of wildlife programs, but most of the anecdotal evidence confirmed that students were nearly all males, although some women were noted in programs as early as the 1930s. In at least one school (the University of Massachusetts), women were not permitted to enroll in the wildlife major until the late 1950s, although they could take introductory classes (J.S. Larson, University of Massachusetts, personal communication: 2008). Because most wildlife programs were relatively new during the 1930s, and often limited to graduate study, numbers of students were low at most schools, with just a handful of degrees awarded each year. During the second World War, some schools awarded no wildlife-specific degrees as enrollments declined. As expected, most schools reported increases in student numbers in the immediate postwar years, as veterans took advantage of GI Bill benefits. This student population continued to be almost exclusively male.

Regional trends in natural resource program enrollment have been consistent, with peaks in all regions and majors in the mid-1990s, followed by a decrease to a lower level and then a leveling off, with wildlife enrollments perhaps increasing slightly in recent years not far below their peak (Sharik 2008). In the wildlife programs for which we had information, we did not detect a convergence of trends or cycles of enrollment through time, particularly for the period 1980 to present. Some programs followed the regional pattern described above, e.g., the University of Massachusetts had about 270 undergraduates in 1995 and about 75 undergraduates in 2005. Other schools reported peak student enrollments during the 1980s or 1990s but are near historically low numbers at present, e.g., the University of Arizona had 162 undergraduates in 1981 and 79 in 2006, and the University of Wisconsin-Madison had 208 undergraduates in 1995 and 104 in 2007. However, other programs are at or near their historic enrollment peaks, e.g., South Dakota State University had 89 undergraduate students in 1982 and 263 in 2008, or experienced peak enrollments in the mid-1970s after the first Earth Day (Oregon State University) and have maintained lower but relatively consistent student numbers since that time. Thus, regardless of the consistent regional trends in natural resource enrollments, wildlife programs specifically have not seen their enrollments move in unison.

The consistent theme we did notice (and expected), whether actual numbers were provided or simply through the direct experience of our contact person, was a tremendous change in the ratio of men to women in wildlife programs over the past several decades. Several schools reported women outnumbering men in the undergraduate or graduate programs as early as the 1980s (e.g., University of Wisconsin, University of Massachusetts); that trend has continued at those schools with annual variability around 1 to 1. However, there are some apparent regional differences, with some schools, particularly in the Midwest, reporting women at 35 percent or less of the undergraduate enrollment since the late 1980s.

As part of the TWS ad hoc committee, Edge and Petersen (unpublished data) explored the drivers of change in university fish and wildlife programs and focused in part on the characteristics of students entering these programs. They reported on the body of literature on this cohort of students and described several characteristics that affect the types of instruction to which the students respond most readily, make them less adapted to fieldwork and result in less-direct personal experience in the outdoors. Although these students are more technologically savvy and open to various ways of thinking and problem solving, the overall impression of the current cohort that enrolls in wildlife programs with less inherent outdoor knowledge than previous generations appears to be confirmed (McDonald and Woytek 2005, Willis and Jenks 2009).

Trends in Faculty and Program Identity

The numbers of faculty members in wildlife programs increased through time and across all the programs for which we had information. As noted above, many of these long-standing programs were comprised of a single faculty member for a long period of time, and this person taught a wide variety of classes without much regard to specialty. Thus, in many cases, increases in faculty from one to two and from two to three were spaced over a number of years, and recent increases have happened at shorter intervals. Most programs reported that they were currently at or near peak faculty numbers, regardless of trends in student enrollment. Several programs reported 10 or more wildlife faculty (e.g., University of Wisconsin, Oregon State University). Along with the overall increases in faculty were increases in the number of women faculty members, although, in almost every case, women comprised less than 50 percent of the wildlife program faculty. The increased faculty also has permitted greater specialization. The historic information we received from most schools discussed the additions of mammal specialists, extension specialists and habitat specialists, which allowed for manageable divisions of the class load. The recent histories included much broader additions among the

faculty, with quantitative biologists, landscape ecologists, geneticists and human dimensions specialists added in the larger programs, along with a concomitantly broader array of courses (e.g., Conservation Ecology).

This broadening of faculty interests and specialties also has coincided with a change in how most programs, whether housed in their own department or as concentrations within other larger departments or schools, self-identify. Thus, most programs have undergone a series of name changes that sought to portray how the programs viewed their content and missions. Changes have moved uniformly away from such names as Game Management or Wildlife Management to those such as Wildlife Conservation, Wildlife Ecology and Natural Resources Conservation, confirming Scalet's (2007) observations on the subject. To be sure, some schools have had such broad names for decades, but even within those historically broader schools, the name of the wildlife concentration or degree has changed along the same continuum from an explicit management orientation to a less descriptive conservation title.

Because the types of program histories we received varied tremendously from year-by-year accounts of events between the 1930s and the present to much shorter timelines of events or trends in enrollments, we can only provide what might be considered an annotated outline of how wildlife programs have evolved. We recognize the bias associated with only surveying schools with Coop Units (and that wildlife programs at some schools predated the Coop Units by decades) but believe that was a reasonable filter to use to focus on programs with the longest histories. In addition, we either were unable to contact each school with a Coop Unit or did not receive a reply from each school contacted. As informal and lacking in rigor as our methods were, we believe we have compiled the type of supporting information that Scalet (2007) envisioned would confirm his personal observations on the shifts that have occurred in university wildlife programs.

Where Do We Stand?

Our primary objective was simply to describe the paths that some of the wildlife programs followed to reach their current structure and to describe broad trends in student and faculty numbers. However, we thought it necessary to touch on a number of subjects that others in this special session will explore in greater detail and offer more perspective. A number of schools discussed the blend of experiential learning or "camp-type" courses compared to standard lecture-laboratory classes and noted that they either required or offered these as electives, although we also know that other schools have curtailed or limited the number of camp-type courses they offer. During a symposium at the 2005 TWS conference on the value of experiential learning in natural resources education, presenters discussed the range of different programs available to students, from summer-long courses based on campus to short, one- or two-week field trips. These classes provided students an opportunity to put into practice many of the skills they learned during the lecture and laboratory sections of campus-based courses. Invariably, the presenters mentioned that surveys of alumni revealed the field courses to be among the courses that students valued most highly and in which they thought they learned most.

Some of this sentiment likely stems from the sheer enjoyment of doing the physical things these students went to college to learn how to do. Yet, Bennitt (1946), Peek (1989) and White (2001) all cautioned against the temptation to view a wildlife program as merely the opportunity to acquire a specific set of field skills. These authors noted that a sound, general education and the development of critical thinking skills are of more long-term value to the graduate of a wildlife program and their future employers than merely having learned the mechanics of a trade. In a TWS committee report on the proper training for wildlife work, Leopold (1939) noted, "The student who likes the woods but dislikes to study should be skeptical of his fitness" as a wildlife professional.

The use of summer camps and courses to provide technical skills holds appeal, but some programs avoid the use of such requirements because they limit the potential for students to obtain summer jobs or internships with agencies and universities. Taking a course that provides one-time experience in biotelemetry likely is not as valuable as working for the entire summer as a technician on a telemetry study. For example, at South Dakota State University, most undergraduate students obtain work experience from May to August, and many vary their experiences across the three or more summer seasons occurring during the undergraduate degree program.

Bennitt (1946), in assessing the student's responsibilities in a university education, noted that "The serious student expects to acquire a good deal of knowledge, even technical knowledge, apart from his courses." But Edge and Petersen (unpublished data), in the TWS *ad hoc* committee report, commented that a characteristic of the current "millennial" generation of students is to study less and lack self-direction in learning. So, it may be that we are finally at a "this time is different" point, at which incoming students are, on average, so lacking in basic natural history skills and field savvy that university programs, working with employers, need to provide formal training in matters that both Leopold (1939) and Willis and Jenks (2009) noted previous generations of students were simply expected to have as part of their basic makeup. Yet, as Hafner (2007) and Miller et al. (2009) noted, university programs not only are not geared to do what

might be considered remedial natural history and techniques instruction, but they are being moved by many forces farther away from that goal, if it is a goal at all.

The New Face

Our nonrandom survey of wildlife programs provided a sense of the general evolution of this field of study from strongly utilitarian and management-oriented, often as a concentration in a forestry or agriculture program in which one or two men taught other men, to today's interdisciplinary, ecology-oriented programs in which women often outnumber men among the students and are taught by a larger and more diverse faculty, though still dominated by men. Other factors that separate today's programs from those of the past are the existence and growth of distance education and increasing numbers of nontraditional (i.e., older) students. Although the postwar era (i.e., World War II) saw large numbers of what would be termed nontraditional students, many of them shared the common experience of the military and almost all were men. We expect that neither of those conditions dominates the field today, although there has been an increase in students with a military background as a result of conflicts in the Middle East. Distance education was something not often reported on in the responses to our queries, but that we know exists. For example, a Master's of Science degree in Wildlife Science is offered through distance education by Texas A&M University (http://distance.tamu.edu/futureaggies/distance-degrees/master-of-wildlife-science.html) while Oregon State University now offers online coursework and degrees in fisheries management (http://ecampus.oregonstate.edu/online-degrees/graduate/fisheries-management/). Such programs certainly will influence the workload distribution for faculty members, especially given the interest in distance education displayed by some upper-tier university administrators and the increased workload typically associated with online courses.

Given the regularity with which the subject of how best to educate wildlife biology students is visited, we do not pretend to offer the last word. We do believe that our profession may have finally moved into the long-anticipated and perhaps dreaded era in which incoming students must be assumed to have little experience with the physical tools of fieldwork, poor understanding of wildlife/habitat relationships and scant exposure to consumptive or nonconsumptive uses of wildlife (or their habitats). The shared perception among faculty is that many of the Millenials entering wildlife programs have acquired more pseudo-experience of nature via television programs and other media than direct experience via muddy boots and chore-calloused hands. Thus, university programs will need to work closely with the potential employers of their graduates to design curricula and extracurricular activities to fill these knowledge gaps and still provide an education worthy of a four-year (or more) university degree. Such activities will require some adjustment on the part of specialist faculty and university administrators to develop more management-oriented courses for both game and nongame organisms and to include more life history information in existing courses. Academic advisors also will need to stress to those students who intend to have a career in wildlife biology and management the importance of acquiring knowledge and skills outside of the classroom to complement and better contextualize their class-based education.

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The Diversity of Options for Wildlife Education

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In December 2007, The Wildlife Society (TWS) Ad Hoc Committee on Collegiate Programs (Committee) was established and charged with assessing current wildlife programs in North America, their change over time, theory versus practice and the role of hands-on training, the importance of TWS certification, and what the "ideal" wildlife program should look like. This task was driven by concerns over wildlife programs, the type of education that students are receiving, the quality and experience of students entering the job market, university enrollments, and the role of TWS certification. Listing of wildlife programs on the TWS Web site, maintained by TWS staff and supplemented by voluntary additions from TWS membership, included only 108 programs.

We present a summary of our inventory of current programs in the United States and Canada. Detailed data on a program-by-program basis have been provided to TWS and are expected to be made into a searchable on-line database.

Methods

For U.S. universities and colleges, we used a commercial Web-based source to identify programs offering wildlife-related courses in North America. We included all programs listing wildlife in course titles, descriptions or as career outcomes for their graduates. This included Bachelor's of Science (B.S.), Master's of Science (M.S.) or doctoral degree (Ph.D.) programs in fields such as wildlife science, wildlife management, natural resources management, environmental science and other similarly titled programs. We did not include programs offering only Bachelor's of Arts degrees in environmental studies or similar subjects. We followed up this search by contacting programs that did fit our criteria with an email questionnaire to determine what their programs offered. For those programs for which we received no response to our questionnaires, we attempted to reach the contact person identified on the program Web site by phone. Finally, where no contact could be made, we scrutinized the information provided on the program Web sites to ascertain what we could of the desired information from those sources.

Most questions simply required confirming contact information, reporting on numbers of faculty, courses, membership in the National Association of University Fish and Wildlife Programs (NAUFWP), and whether the program supported TWS student chapters or met certification requirements. However, respondents also were asked to report on average enrollment, whether it was changing over the past 5 to 10 years and to estimate the percentage of courses in their curricula that had "hands-on" components. "Hands-on" was defined as including labs, significant fieldwork and/or field trips. Data reported for these categories were the respondents reported "best guess" and included biased perceptions of the state of their programs.

For Canadian universities and colleges, we relied on data provided by the Association of Universities and Colleges in Canada (AUCC) and the Environmental Careers Organization of Canada (EcoCanada). These agencies track academic programming in Canadian postsecondary institutions of higher learning. Their information then was verified through Web site searches and telephone calls to selected departments. The first step in searching Canadian programs was to identify all courses with the word "wildlife" in their course titles. Any program offering such a course then was scrutinized to determine if it offered any programs or specialization at the undergraduate, graduate, diploma or certificate level for their students. Only programs that were identified as science-based programs were included, thereby eliminating any B.A. or Bachelor's of Environmental (B.Env.) Studies offerings. Unlike for the U.S., no attempt was made to differentiate programs as to their primary affiliation to categories such as wildlife, environment or natural resources, since many Canadian programs offer all degree possibilities in different departments. University programs also were generally assessed for their ability to meet TWS certification requirements and whether they had a TWS Student Chapter.

We compared results across programs and among TWS sections: Northeast (CT, DE, MA, ME, NH, NJ, NY, PA, RI, VT, WV); Southeast (AR, AL, FL, GA, KY, LA, MS, NC, SC, TN, VA, WADC, WV); Northcentral (IN, IL, IA, MI, MN, MO, OH, WI); Central (Mountain and Prairies) (CO, KS, NE, ND, SD, UT, WY); West (CA, HI, NV); Southwest (AZ, NM, TX); and Northwest (AK, ID, MT, OR, WA). Canada included all provinces and territories (AB, BC, MB, NB, NL, NS, NT, NU, ON, PE, QC, SK,YT).

Results

U.S. Programs

We examined more than 3,413 US university Web sites listed on http://www.univsource.com/ (accessed January 1 through May 30, 2008) to make our initial assessment of programs that offered wildlife-related courses. Of these, we identified 526 programs that we then contacted with our email questionnaire. Eventual response rate by email or phone was 39 percent (n = 173) of the 442 programs from which we eventually gathered data provided in the database to TWS. We confirmed NAUFWP membership (n = 61) and presence of Wildlife or Fisheries Cooperative Research Units (n = 40) from records maintained by those organizations.

An interesting relationship we found was the Au Sable Institute of Environmental Studies, which runs 4 field campuses (Great Lakes, Pacific Rim, South Florida and India) that teach field ecology courses to 62 partnered small Christian universities across the United States. Although not included in the data summarized here, these programs often are advertised as providing curricula and training leading to careers in wildlife. Other U.S. universities have similar linkages to research stations or field programs, and many bachelor's programs in environmental studies (also not included in this inventory) claim they train students for wildlife careers.

We identified 334 programs offering B.S., 184 M.S. and 99 Ph.D. degrees in wildlife, related natural resources or environmental sciences in the United States. In addition, there were 20 Associates of Applied Science, 57 Associates of Science degree programs, 26 programs with minors (only) and 19 with a master's degree other than an M.S. Programs (n = 408) offering wildlife or fisheries, natural resources or environmental sciences that include wildlife-related courses are summarized by state (Table 1), along with the number of wildlife or fisheries courses and faculty they have.

Table 1. Summary of wildlife (or wildlife and fisheries), natural resources and environmental schools offering degree programs in the United Sates, by state, during 2008. Included also are the number of wildlife and/or fisheries classes and faculty listed for programs offered by those schools.

		Schools			Classes[e]	Faculty[f]
State	Schools[a]	WLF/FISH[b]	NR[c]	ENV[d]	WLF/FISH	WLF/FISH
Alaska	4	2	1	2	3	3
Alabama	12	10	2	4	6	3
Arkansas	7	5	1	1	6	6
Arizona	5	1	1	1	3	4
California	13	5	6	2	9	6
Colorado	7	4	3	1	6	6
Connecticut	6	0	2	1	3	3
Delaware	3	1	0	1	2	1
Florida	5	2	0	2	4	4
Georgia	9	5	0	3	6	4
Hawaii	4	*	*	*	*	*
Idaho	7	4	3	2	4	4
Illinois	11	5	3	3	10	11
Indiana	11	3	1	6	6	2
Iowa	6	1	3	3	5	2
Kansas	10	6	2	0	5	7
Kentucky	7	3	1	3	5	4
Louisiana	9	6	1	1	6	5
Maine	4	2	0	2	3	2
Maryland	8	2	4	2	7	3
Massachusetts	7	2	0	3	6	3
Michigan	11	4	4	1	10	9
Minnesota	10	4	1	4	8	6
Mississippi	5	2	0	3	4	3
Missouri	10	7	3	1	9	7
Montana	4	2	4	1	6	5
Nebraska	7	5	0	2	6	6
Nevada	3	1	0	0	1	1

New Hampshire	3	1	0	1	2	2
New Jersey	10	0	1	5	4	4
New Mexico	3	3	0	0	2	3
New York	26	2	4	9	9	7
North Carolina	17	4	3	7	8	5
North Dakota	4	4	0	0	4	4
Ohio	16	4	0	3	6	6
Oklahoma	5	3	3	0	5	5
Oregon	4	4	3	1	5	4
Pennsylvania	23	11	11	13	11	11
Rhode Island	1	1	1	1	1	1
South Carolina	6	4	2	4	4	3
South Dakota	4	2	1	0	4	2
Tennessee	12	7	2	2	7	5
Texas	23	11	2	2	19	11
Utah	3	0	0	0	3	3
Vermont	4	1	2	1	4	4
Virginia	10	1	1	4	5	1
Washington	14	3	3	7	9	8
Washington, D.C.	1	0	0	1	1	1
West Virginia	4	2	3	3	3	2
Wisconsin	6	2	0	4	3	2
Wyoming	4	4	0	0	4	4
Total	408	168	88	123	272	218

[a] Number of schools with Wildlife (or Fisheries), Natural Resources, or Environmental degree programs.
[b] Number offering Wildlife (or Wildlife and Fisheries) degree programs.
[c] Number offering Natural Resources degree programs.
[d] Number offering Environmental Sciences or Management degree programs
[e] Number of schools offering classes in wildlife or fisheries.
[f] Number of school with faculty designated as wildlife or fisheries faculty.
* Unable to discern numbers of programs in Hawaii.

In the United States, kinds of programs offered (Table 2) were not independent (χ^2 = 87.98; 12 df; $P < 0.000$) of region of the country. In the Northeast section, 57 percent of programs were in environmental sciences, followed by the West, Southeast and Northcentral sections, all about 30 percent environmental science programs. In other regions, environmental programs represented less than 18 percent of what was available. In the Central Mountains and Plains, wildlife and fisheries programs still represented 62 percent of offerings, followed by the Southwest (56 percent) and Northcentral (53 percent). Wildlife programs represented only 29 percent of available programs in the Northeast.

Surprisingly few U.S. programs offering courses (Table 3) require students to meet TWS certification requirements (n = 44; ~10 percent). Although not quantified, more programs (perhaps another 25 percent) offer classes that would allow students to become certified but were not required for graduation. Only 102 (~25 percent) programs connect students to TWS by supporting student chapters. However, it appears that all NAUFWP members and programs supporting Coop Units sponsor student chapters and require or provide courses to meet TWS certification requirements.

A proportion of surveyed programs in the United States (33 percent; n = 144) provided information on undergraduate enrollment and the proportion of their curricula that involved hands-on labs or field trips. Variation among U.S. programs was high, as many were modifying the hands-on components of their curricula to address perceived needs during the 5- to10-year period in question so trends reported here were not statistically different ($P > 0.05$). Programs (n = 59) with increasing undergraduate enrollment reported that hands-on opportunity in their programs was increasing or stable, averaging 67 percent, and none reported a decrease in hands-on curricula. Programs (n = 23) with declining undergraduate enrollment averaged 53 percent hands-on curricula and those with the highest percentage hands-on indicated that it had decreased in the past 5 to 10 years. U.S. programs (n = 51) with stable enrollment averaged 62 percent of their courses with hands-on components, and only one institution reported that percentage was decreasing. Size of programs (number of students enrolled) was not well correlated (r = -0.067) with percentage of hands-on curricula reported. A disturbing pattern was that, of those reporting (n = 132), the traditional wildlife programs (NAUFWP

members) had a lower (students t = -3.5509, 130 df, $P = 0.0005$) percentage of hands-on curricula (49.0 ± 22.2) than did non-NAUFWP programs (67.5 ± 26.2). Nearly 24 percent of traditional programs reported declining enrollment; only 13 percent of nontraditional programs reported declines. However, there was no difference ($\chi^2 = 2.592$, 2 df, $P = 0.274$) in enrollment trends reported between NAUFWP and non-NAUFWP members.

Table 2. Distribution of schools and kinds of degree programs by region of the United States. Data presented are total number of schools (university and college) and degree programs offered. Degree programs are classified by name or major subjects described during our 2008 survey.

Region[a]	Number of schools	Wildlife and fisheries programs	Natural resources programs	Environmental programs
Northeast	87	35	17	68
Southeast	113	84	55	60
Northcentral	81	73	26	40
Central	39	60	26	11
West	20	12	10	10
Southwest	31	35	22	5
Northwest	33	38	30	15

[a] Regions follow The Wildlife Society designation for sections, with: Northeast (CT, DE, MA, ME, NH, NJ, NY, PA, RI, VT,WV), Southeast (AR, AL, FL, GA, KY, LA, MD, MS, NC, SC, TN, VA, WADC), Northcentral (IL, IN, IA, MI, MN, MO, OH, WI), Central (Mountains and Plains) (CO, KS, NE, ND, SD, UT, WY), West (CA, HI, NV), Southwest (AZ, NM, TX), and Northwest (AK, ID, MT, OR, WA).

Table 3. Number of programs offering classes in wildlife or fisheries who meet The Wildlife Society requirements for certification, have a student chapter of TWS, are members of the National Association of University Fish and Wildlife Programs(NAUFWP) or supported a US Geological Survey Cooperative Fisheries or Wildlife Research Unit during 2008.

State	TWS certification[a]	Club[b]	NAUFWP[c]	Coop[d]
Alaska	1	1	1	1
Alabama	1	1	2	1
Arkansas	1	3	2	1
Arizona	1	4	1	1
California	1	2	4	1
Colorado	1	3	1	1
Connecticut	0	1	1	0
Delaware	0	1	0	0
Florida	1	2	2	1
Georgia	1	2	1	1
Hawaii	*	*	*	1
Idaho	1	2	1	1
Illinois	1	2	2	0
Indiana	0	1	1	0
Iowa	0	1	1	1
Kansas	0	1	0	1
Kentucky	0	3	1	0

Louisiana	2	2	2	1
Maine	2	1	1	1
Maryland	1	1	1	1
Massachusetts	0	2	1	1
Michigan	2	6	2	0
Minnesota	1	3	2	1
Mississippi	2	2	1	1
Missouri	4	5	1	1
Montana	0	2	2	2
Nebraska	0	4	1	1
Nevada	0	0	0	0
New Hampshire	0	1	1	0
New Jersey	0	2	0	0
New Mexico	0	0	1	1
New York	2	5	2	1
North Carolina	1	2	1	1
North Dakota	0	2	1	0
Ohio	0	2	1	0
Oklahoma	0	0	1	1
Oregon	0	1	1	1
Pennsylvania	1	4	1	1
Rhode Island	1	1	0	0
South Carolina	0	0	1	1
South Dakota	0	0	1	1
Tennessee	4	4	2	1
Texas	5	9	4	1
Utah	0	3	2	1
Vermont	1	1	1	1
Virginia	1	1	1	1
Washington	1	2	1	1
Washington, D.C.	0	0	0	0
West Virginia	1	1	0	1
Wisconsin	1	2	2	2
Wyoming	1	1	1	1
Total	44	102	61	40

[a] Reporting programs whose requirements for graduation meet the TWS requirements for certification as an Associate Wildlife Biologist.
[b] Reporting programs who have a recognized TWS student chapter in 2008.
[c] Member of the National Association of University Fish and Wildlife Programs in 2008.
[d]U.S. Geological Survey Cooperative Fisheries or Wildlife Research Unit present in 2008.

Canadian Programs

For Canada, we examined 77 universities and 120 colleges listed by the AUCC and EcoCanada to determine their course and program offerings with respect to wildlife. College programs tend to be one or two years in length, with some offering transfer credit to the university level upon graduation, whereas university programs offer a four-year B.S. along with M.S. and/or Ph.D. degrees. Of these, we identified and verified 50 universities and 42 colleges that offer courses relating to wildlife in areas of interest to TWS (Tables 4 and 5).

Thus, for Canadian universities (Table 4), 65 percent (n = 50) provide course offerings relating to wildlife. However, only 21 percent (16 of 77) offer degrees or program specializations in the wildlife area. Of those universities teaching courses in wildlife, only 32 percent (n = 16) offer degree or program specializations in wildlife. These programs could be at the bachelor's master's or Ph.D. levels, or any combination thereof. Many Canadian universities have established the wildlife area in environment or environmental science programs, and these have seen increasing enrollments in recent years. Generally, all 16 of the Canadian university programs offering degrees or specializations in the wildlife area have curricula available that would enable their students to meet requirements for TWS certification, but

none requires certification to be met. Student chapters of TWS have been established at 4 of the 16 universities offering wildlife specializations. No Canadian university is a formal member of NAUFWP.

In terms of Canadian college programs (Table 5), 35 percent (n = 42) provide course offerings related to wildlife. However, only 20 of 120 (17 percent) offer certificate or diploma program specializations in this area. Since programs are relatively short and focused, none of the Canadian college programs was deemed to have sufficient content to meet TWS certification requirements. One student chapter of TWS has been established at a Canadian college.

Table 4. Summary of Canadian university wildlife, natural resources and environmental programs offering courses and degree or program specializations in wildlife during 2008[a].

Province	Courses[b]	Specializations[c]
Alberta	3	2
British Columbia	8	4
Manitoba	3	1
New Brunswick	5	2
Newfoundland and Labrador	1	1
Nova Scotia	6	2
Northwest Territories	0	0
Nunavat	0	0
Ontario	15	2
Prince Edward Island	1	1
Quebec	5	1
Saskatchewan	3	0
Yukon Territories	0	0
Total	50	16

[a]Derived from information provided by the Association of Universities and Colleges of Canada (AUCC) and the Environmental Careers Organization of Canada (EcoCanada).
[b]Number of Canadian university wildlife, natural resources and environmental programs offering courses relating to wildlife.
[c]Number of Canadian university programs offering degree or program specializations in wildlife.

Table 5. Summary of Canadian college wildlife, natural resources, and environmental programs offering courses and diploma, certificate or program specializations in wildlife during 2008[a].

Province	Courses[b]	Specializations[c]
Alberta	6	3
British Columbia	10	6
Manitoba	3	1
New Brunswick	0	0
Newfoundland and Labrador	1	1
Nova Scotia	1	0
Northwest Territories	1	1
Nunavat	1	1
Ontario	10	3
Prince Edward Island	0	0
Quebec	6	1
Saskatchewan	2	2
Yukon Territories	1	1
Total	42	20

[a]Derived from information provided by the Association of Universities and Colleges of Canada (AUCC) and the Environmental Careers Organization of Canada (EcoCanada).
[b]Number of Canadian college wildlife, natural resources and environmental programs offering courses relating to wildlife.
[c]Number of Canadian college programs offering diploma, certificate or program specializations in wildlife.

Discussion

Our results indicate that there are at least four times as many programs offering some kind of wildlife education than TWS had previously listed. There also appear to have been increases in AS and AAS degrees or college diplomas or certificates for training wildlife technicians or as preparation for four-year programs. Traditional U.S. programs (NAUFWP members) represent only 13.8 percent of the programs offering wildlife-related curricula. Wildlife programs in biology/zoology or agriculture and forestry/fisheries programs have been diversifying their curricula, offering courses in natural resources management, conservation biology, toxicology, geographic information systems (GIS) and other topics. But other programs, most notably biology and environmental sciences programs also have been diversifying by adding wildlife, conservation and natural resources courses to their curricula. This trend was particularly evident in Canadian universities, with an increase in environment or environmental science programs and enrollments. Interestingly, environment-related programs in Canadian universities have been identified as a growth area by EcoCanada, and particularly so in times of economic downturn when employees tend to return to universities for retraining or professional development.

Some U.S. regional trends include more environmental sciences programs in the populated centers of the Northeast, Southeast and West Coast. Canadian programs tend to be clustered according to population density. Few U.S. programs outside the traditional wildlife schools (NAUFWP and programs with Coop Units) focus on TWS certification requirements or support TWS student chapters. Our sample reporting on student enrollment and proportion of hands-on curricula may not accurately represent what is really offered. These data were all self-reported by contact individuals who provided only their best guess relating to the past 5 to 10 years. However, there was less hands-on training in the traditional programs. Enrollment numbers were not well correlated with how much experiential training schools provided. Trends in enrollment were highly variable within all groups and did not differ between traditional and other wildlife schools.

We do not have data but we can provide some useful conjecture about the reasons for the patterns detected here. The explosion of college and university programs offering wildlife-related coursework has resulted from even distantly related programs recognizing the popularity of the field in the last 10 to 20 years and trying to capture some of that student market. Universities competing for students are offering what they think will attract students to their programs. Declines in student enrollment in traditional U.S. wildlife programs may result simply from so many more choices of programs. However, perhaps because of a television rather than rural on-the-ground background, there is evidence that students today are less attracted to courses with titles such as wildlife science, forestry or watershed management (Nyland 2008). Nontraditional schools also may have done a better marketing job with course titles and content and perhaps less science-based or rigorous curricula that may be more attractive to students.

Many of the U.S. programs offering wildlife-related curricula are not the traditional wildlife schools and are not linked with TWS. They may not provide training that meets employment needs of the profession. We have not yet asked whether employers can tell the difference. Where have their recent hires come from? What degree did they really have? What program did they get it from?

Several concerns are interrelated when discussing the skills and abilities of wildlife graduates. Today's freshmen come to college less prepared and perhaps less motivated for wildlife careers than ever before. Students come from predominantly urban backgrounds with the majority of their experience from television and nature shows. The average high school senior spends only 3.8 hours per week studying but 35 hours watching television (Hansen 1998). Academic skills are lacking. Only 36 percent of 12th graders read at or above proficient level and 26 percent write at proficient level. In mathematics, the figure is 17 percent; in science, it is 18 percent (National Assessment of Educational Progress 2005). Only 22 percent of the 1.2 million U.S. high school graduates tested in 2004 met ACT's three college readiness benchmarks, which "represent the level of achievement required for students to have a high probability of success (a 75 percent chance of earning a course grade of C or better, a 50 percent chance of earning a B or better) in courses like English Composition, Algebra, and Biology" (ACT 2004). To encourage parents to pay for college education, many U.S. schools have instituted credit hour limits for degrees and simultaneously increasing the credit hours required for the general education core that all students must take. For example, in one traditional program, the program can include no more than 120 semester credits, of which 63 are general education. This leaves only 57 credits (19 lecture or 14 lab classes) left to cover all the skills our profession desires, from mammalogy, plant identification, and ecology to wildlife management, population modeling, statistics and GIS.

Declines in many field skills classes—those that require hands-on training, in which students learn by doing rather than listening, result from the economics and liabilities of higher education. It costs more to teach a field class, more in terms of money to pay for travel, more to ensure site availability for field opportunities, and even to insure safety and

reduce the risk for students traveling. It also costs time that could be generating more research dollars--the funding that really drives today's university corporations and faculty tenure decisions.

Summary

Rapid expansion and diversification of existing wildlife and biology programs and growth of environmental programs by schools competing for students has led many U.S. and Canadian academic institutions to add courses and, in some cases, entire curricula in wildlife-related areas. New wildlife specialization areas often are placed in nontraditional departments, where the link to TWS and its focus may not be readily apparent. These programs, and increasingly more of the traditional programs, see TWS certification as an unattainable laundry list of skills that a small proportion of potential employers see as an ideal but that few require for hiring a new employee. We recommend that TWS use these findings in a marketing strategy that would encourage the new breed of wildlife interests to find a way to get involved and prosper within our organization.

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Desired Competencies and Perceived Proficiencies of Entry-level Fisheries and Wildlife Professionals: A Survey of Employers and Educators

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The debate over whether universities are adequately preparing students to become wildlife professionals has been around since the profession came into existence, and it continues today. This special session addresses essentially the same question as a special session at the 2000 North American Wildlife and Natural Resources Conference ("Young wildlife professionals: Do they fulfill the needs of management in today's resource agency?"). Ten years earlier, Teer et al. (1990) addressed this conference and asserted that wildlife education in most universities did not adequately fill the needs of either young professionals or the agencies that hired them.

The continuing debate derives from a multiplicity of viewpoints about what the "product" of universities should be, ranging from well-read individuals (Regan 2000) to expert naturalists (Bleich and Oehler 2000). Although some wildlife professionals have suggested that universities are doing the right things to train future professionals (Porter and Baldasarre 2000), others have cautioned universities not to create "a false dichotomy: expecting students to either master more facts or to master synthesis and critical thinking skills. Clearly, students need to do both" (Matter and Steidl 2000). However, perhaps the primary reason the debate continues is that employers want graduates to know everything and there is too much to learn in four years (Brown and Nielsen 2000). Miller (2000: 536-537) said it best: "It is, in my opinion, virtually impossible for a department of wildlife and fishery sciences to turn out students with everything they need to be—technically and scientifically capable; well rounded in the comprehensive knowledge of how all the pieces of the puzzle fit together on the land; and with all the social, communication, and 'hands-on' management skills employers would like them to have—unless they have already obtained some on-the-ground experience and working skills and have returned for additional graduate work."

Matter and Steidl (2000) suggested that curriculum development should be based on an inventory of desired knowledge and competencies for students. In this paper, we present results of just such an inventory. As part of a larger effort by The Wildlife Society's (TWS) Ad Hoc Committee on College and University Wildlife Programs, we designed an electronic survey to assess the perceptions of TWS members of the importance of knowledge for success in entry-level positions in a range of areas of competency. The survey also asked TWS members in various sectors of the wildlife profession (state agencies, federal agencies, nongovernmental organizations [NGOs], the private sector and academia) for their perceptions of the proficiency of recent entry-level hires in their organizations relative to the same areas of competency.

Methods

We chose the membership of TWS for our sample population because TWS members encompass the entire spectrum of the wildlife profession and because they are readily accessible through the society's membership data base. Staff at TWS headquarters volunteered to contact all members with email addresses with invitations to participate in the survey (including imbedded links to the web-based survey), and follow-up with messages to nonrespondents.

The online survey's first question asked the respondent to classify his/her employer in one of seven pre-identified categories or an "other" category. Respondents who worked for government agencies, NGOs, Native American tribes or private sector firms answered a different set of questions than did respondents who worked for academic institutions. Elements of the TWS Certified Wildlife Biologist program provided the framework for the survey. Nonacademic respondents rated the importance to success in entry-level positions of 32 topics that could be addressed in individual or multiple courses across the five major areas of coursework required by TWS for certification. Twenty of the courses fit into the biological sciences category, four addressed physical and quantitative sciences, and eight addressed humanities and communication. Nonacademic respondents also rated the proficiency of recent entry-level hires in each of the 32 topics. Academic respondents first identified whether 30 topics (the same list presented to nonacademic respondents except that fisheries and interacting with stakeholders were deleted) were required for their undergraduate curriculum, whether the courses were taught in or outside of their department, or not taught. Academic respondents also were asked

several questions related to trends in field-oriented courses in their program. Academic respondents who worked at institutions that offered Master's (M.S.) degrees and/or doctoral (Ph.D.) degrees in wildlife science or a related field were then directed to a series of questions nearly identical to the importance and proficiency questions asked of nonacademic respondents. Academic respondents answered the importance and proficiency questions with respect to students entering their graduate programs at either the M.S. or Ph.D. level (or both levels if both degrees are offered at their institutions).

On January 5, 2009, staff members at TWS headquarters sent all TWS members with email addresses (N = 7,381) a personalized electronic invitation to participate in the survey. Each member's TWS membership number served as a password to access the survey. Nonrespondents received weekly reminders via email and one final notice of the impending closure of the survey, which occurred on January 27, 2009.

Results

A total of 1,750 TWS members responded to the survey, a response rate of at least 23.7 percent. The true response rate probably exceeded 23.7 percent because an unknown number of TWS members did not receive the invitations or reminders because they were diverted by spam filters. Respondents included 418 state agency personnel, 342 federal agency personnel, 111 NGO personnel, 235 members from the private sector and 218 university personnel. Local government (n = 27) and Native American (n = 8) respondents were not considered in analyses due to inadequate sample sizes. For this summary we also excluded 391 respondents who classified themselves as "other employment." We made no attempt to assess nonresponse bias because we had adequate sample sizes of individual groups and we were not attempting to characterize the TWS membership as a whole.

Agency, NGO and Private Sector Respondents

State and federal agency, NGO, and private sector respondents all identified knowledge in the same three areas of competency as most important to success in entry-level positions: oral communication, written communication and working in teams (Table 1). Knowledge in four other areas of competency fell into the top 10 for all four sectors of the profession: working with stakeholders, habitat ecology, ecology and field techniques. Respondents from three of the four sectors of the profession identified knowledge of geographic information systems (GIS) and ornithology as being among the 10 most important areas of competency. State agency respondents attached more importance to knowledge of wildlife management (including harvest management) than respondents from other sectors. Only NGO respondents included knowledge of human dimensions in their top 10 areas of competency and only private sector respondents included field botany in their top 10. Respondents from all four sectors rated knowledge of silviculture, physical sciences, dendrology, ichthyology, fisheries, physiology and forestry as being among the least important areas of competency.

Table 1. Top 10 mean ratings of areas of knowledge (out of 32 possible areas) for entry-level professionals as rated by employers in state and federal agencies, nongovernmental organizations (NGOs) and the private sector. Areas of knowledge were rated on a 1 to 10 scale, where 1 represented not at all important and 10 represented very important (ranks in parentheses).

Area of knowledge	*State agency*	*Federal agency*	*NGO*	*Private sector*
Oral communication	8.87 (1)	9.06 (1)	9.03 (2)	8.80 (3)
Written communication	8.79 (2)	9.06 (1)	8.81 (3)	8.90 (1)
Working in teams	8.70 (3)	9.01 (3)	9.09 (1)	8.87 (2)
Interacting with stakeholders	8.57 (4)	8.59 (4)	8.57 (4)	7.87 (6)
Wildlife management (including harvest management)	8.40 (5)		6.68 (9)	
Habitat ecology	8.24 (6)	8.24 (6)	7.77 (6)	7.80 (7)
Ecology	8.02 (7)	8.32 (5)	8.06 (5)	8.26 (4)
Field techniques	7.97 (8)	7.98 (7)	6.59 (10)	8.10 (5)
Mammalogy	7.49 (9)	7.36 (10)		
Geographic information systems (GIS)	7.45 (10)	7.72 (9)		7.47 (9)
Ornithology		7.88 (8)	7.47 (7)	7.25 (10)
Human dimensions			6.97 (8)	
Field botany				7.64 (8)

Wildlife scientists, wildlife managers, mid-level managers and administrators all identified knowledge in 8 areas of competency as being among their 10 most important (Table 2). Among those eight factors, however, administrators and mid-level managers attached greater importance to interacting with stakeholders than did wildlife managers or wildlife scientists.

Table 2. Top 10 mean ratings of areas of knowledge (out of 32 possible areas) for entry-level professionals as rated by wildlife scientists (n = 375), wildlife managers (n = 246), mid-level managers (n = 211), and administrators (n = 146) in nonacademic sectors of the wildlife profession. Areas of knowledge were rated on a 1 to 10 scale, where 1 = not at all important and 10 = very important (ranks in parentheses).

Area of knowledge	*Wildlife scientists*	*Wildlife managers*	*Mid-level managers*	*Administrators*
Oral communication	8.75 (1)	8.94 (1)	8.94 (2)	9.10 (1)
Written communication	8.75 (1)	8.89 (2)	8.89 (1)	9.03 (3)
Working in teams	8.71 (3)	8.75 (3)	8.75 (3)	9.00 (4)
Ecology	8.44 (4)	8.19 (7)	7.92 (6)	8.11 (6)
Field techniques	8.21 (5)	8.10 (8)	7.57 (7)	7.55 (8)
Interacting with stakeholders	8.19 (6)	8.53 (5)	8.68 (4)	9.08 (2)
Habitat ecology	8.08 (7)	8.54 (4)	7.97 (5)	8.21 (5)
Ornithology	7.91 (8)	7.69 (10)	7.50 (8)	7.34 (9)
Geographic information systems (GIS)	7.52 (9)	7.84 (9)	7.39 (9)	
Mammalogy	7.44 (10)			7.31 (10)
Wildlife management (including harvest management)		8.20 (6)		7.85 (7)
Policy and administration			7.21 (10)	

Ratings of the importance of knowledge and proficiency within areas of competency were positively correlated, i.e., the most important items also tended to be the items rated highest for proficiency. Among the 10 areas of competency rated highest for importance of knowledge, respondents in all four sectors rated only 1, interacting with stakeholders, below the top 10 for proficiency of recent entry-level hires. NGO respondents also rated knowledge of human dimensions among their top 10 in importance but rated proficiency of recent entry-level hires seventeenth out of the 32 areas of competency. Despite the positive correlation between ratings of the importance of knowledge and proficiency, respondents in all sectors of the profession perceived the largest gap between mean ratings of importance and proficiency in the areas of competency rated highest for importance of knowledge (Figure 1). For example, mean ratings of the importance of oral communication, written communication and interaction with stakeholders tended to exceed mean ratings of proficiency in those areas by two or more points on a 10-point scale. By way of comparison, ratings of importance and proficiency for many of the science-related topics (e.g., ecology, ornithology, mammalogy) differed by approximately one point or less.

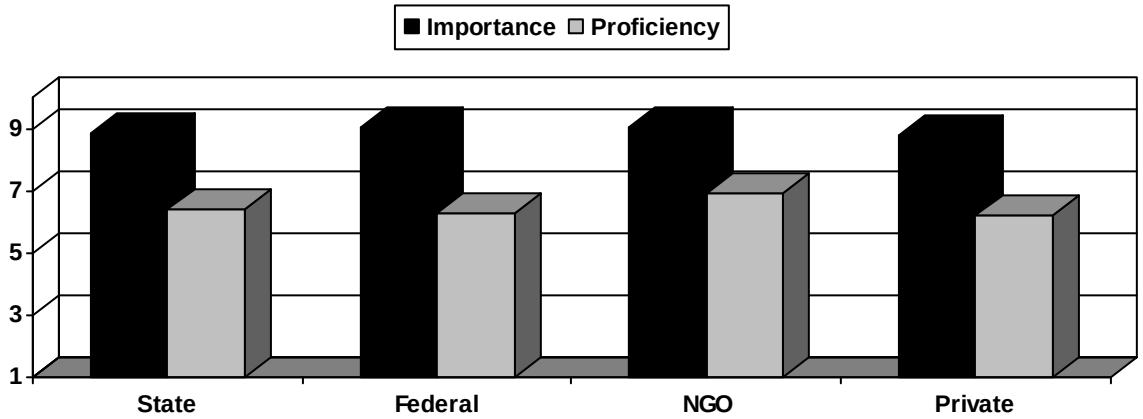

Figure 1. Mean ratings of importance of knowledge and proficiency in oral communication by respondents from state and federal agencies, nongovernmental organizations (NGOs) and the private sector. Both importance of knowledge and proficiency were rated on a scale of 1 to 10, where 1 = low importance of knowledge (proficiency) and 10 = high importance of knowledge (proficiency).

Plotting mean ratings of importance and proficiency in the 32 areas of competency provides a simple, visual method of identifying areas of competency that may be of greatest concern. The cross-hairs on Figure 2 represent the median values for mean ratings of importance of knowledge (X-axis) and proficiency (Y-axis). Thus, points in the lower right quadrant of the graph represent areas of competency rated among the top half in importance and the bottom half in proficiency. State agency respondents placed four areas of competency in the lower right quadrant: human dimensions, policy and administration, wetlands ecology, and field botany (Figure 2). The dashed diagonal line in Figure 2 represents when importance of knowledge is equal to perceived proficiency. It is clear that with few exceptions, perceived proficiency is less than importance for all subject areas considered. Federal agency and NGO respondents (not pictured) placed the same four areas of competency in the lower right quadrant and federal respondents also added experimental design. Private sector respondents placed only two areas of competency in the lower right quadrant: experimental design and statistics. However, wetlands ecology and policy and administration narrowly missed falling into the lower right quadrant for private sector respondents.

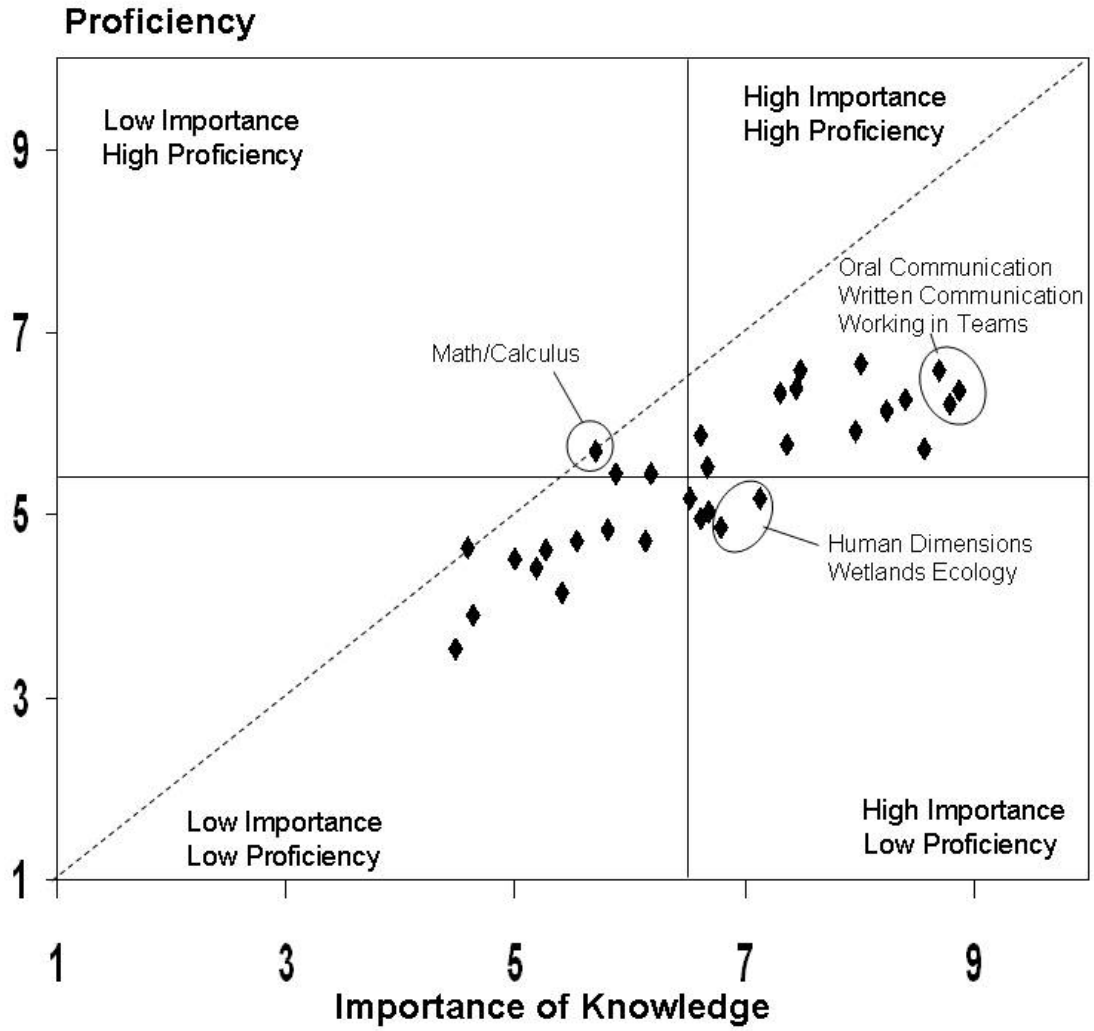

Figure 2. Plot of perceived proficiency (Y-axis) versus mean importance of knowledge (X-axis) for state agency respondents. Cross hairs on plot approximate median values for mean ratings of importance of knowledge and proficiency for all 32 areas of competency. The diagonal dashed line reflects where perceived proficiency and knowledge are the same.

In addition to the 32 areas of competency, nonacademic respondents also were asked to rate the importance of theory and principles, field techniques, and previous, nonacademic work experience for entry-level hires. Respondents in all four nonacademic sectors rated knowledge of field techniques and previous work experience as more important than knowledge of theory and principles.

Academic Respondents

Overall, academic respondents perceived no change in field exposure in their courses over the last 10 years. Of the 218 academic respondents, 59 indicated that field exposure had increased, 53 said it had declined and 102 identified no change over the period. However, 172 of the academic respondents desired more field-oriented courses. When asked about the major impediments to more field exposure, the dominant factors were adequate personnel (7.2 on the 1-10 scale), cost (7.1) and faculty commitment (6.5). Academic respondents indicated that TWS Certification requirements were not influential in determining their program's curriculum (mean score of 3.48).

Some differences were evident between expectations and importance of subject areas for incoming M.S. and Ph.D. students (Table 3). The three most important areas of knowledge for M.S. students were written communication, ecology and statistics, none of which were in the top 10 for Ph.D. students. Zoology, ornithology and mammalogy were the top three topic areas in importance for Ph.D. students, indicating that competency with various taxonomic groups is perceived as most important for doctoral students. GIS, behavior and population ecology were subject areas unique to the top 10 for Ph.D. students, and 6 topic areas were in the top 10 of importance for both M.S. and Ph.D. students (field techniques, zoology, habitat ecology, math/calculus, ornithology and field botany). Topic areas perceived as least important for M.S. students were silviculture, dendrology, wildlife damage control, forestry and ichthyology; for Ph.D. students the bottom five were silviculture, written communication, wildlife damage control, dendrology, and ecology. For M.S. students, the greatest gaps in perceived proficiency were for ecology, statistics and written communication (Figure 3). Additionally, proficiency in GIS, behavior and field botany fell into the category considered high importance and low proficiency.

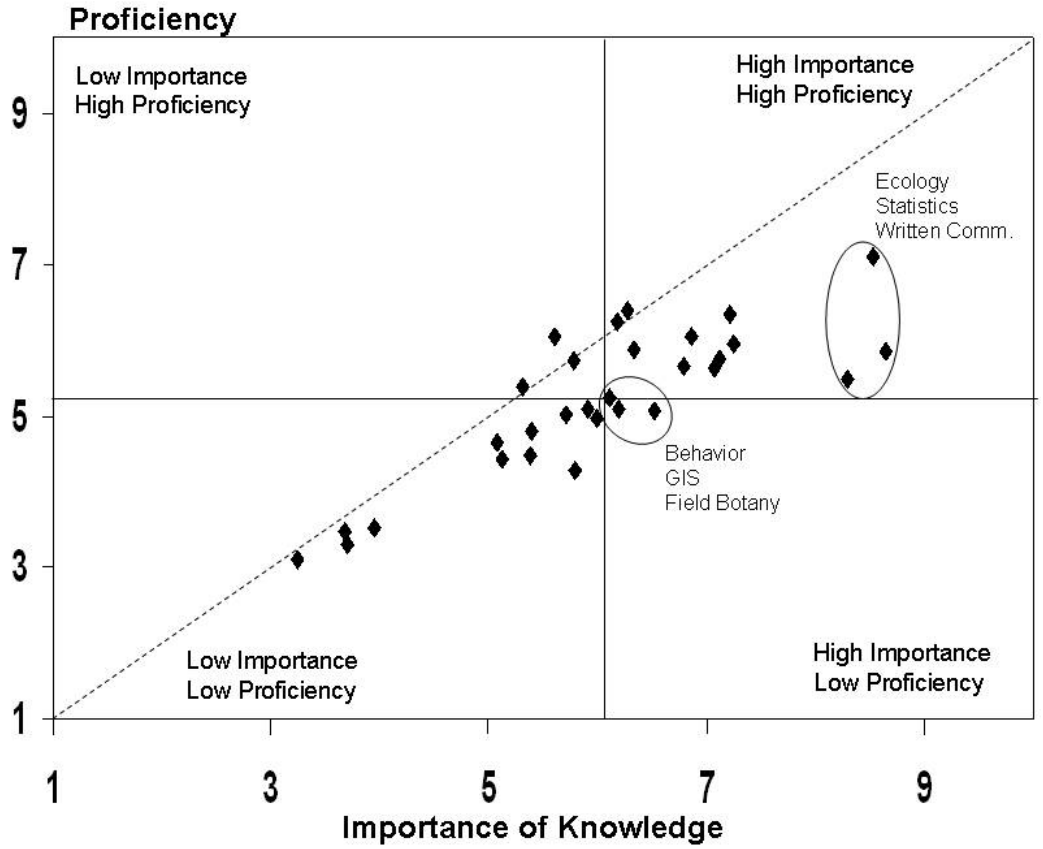

Figure 3. Plot of perceived proficiency (Y-axis) versus mean importance of knowledge (X-axis) for students entering an M.S. program. Cross hairs on plot approximate median values for mean ratings of importance of knowledge and proficiency for all 30 areas of competency. The diagonal dashed line reflects where perceived proficiency and knowledge are the same.

For the top 10 topics for M.S. students, the perceived proficiency of incoming students was consistently less than the importance (Table 3) and the gap was greater for those topics deemed most important (Figure 3). In contrast, for 8 of

the top 10 subject areas in importance, proficiency of Ph.D. students was perceived to be greater than the importance, which would indicate that academic faculty perceive incoming Ph.D. students to be well qualified.

Table 3.Top 10 mean ratings of areas of knowledge (out of 30 possible areas) for incoming master's (n = 146 respondents) and doctoral (n = 93) students, and perceived proficiency of students in these areas, as rated by faculty at institutions with M.S. and Ph.D. programs. Areas of knowledge were rated on a 1 to 10 scale, where 1 = not at all important and 10 = very important (ranks in parentheses).

Area of knowledge	*Master's*		*Doctoral*	
	Importance	Proficiency	Importance	Proficiency
Written communication	8.64 (1)	5.85		
Ecology	8.53 (2)	7.10		
Statistics	8.29 (3)	5.48		
Field techniques	7.25 (4)	5.95	5.98 (10)	6.87
Zoology	7.21 (5)	6.35	6.49 (1)	6.83
Habitat ecology	7.12 (6)	5.75	6.31 (4)	6.57
Math and calculus	7.08 (7)	5.63	6.13 (7)	6.55
Ornithology	6.87 (8)	6.06	6.27 (2)	6.79
Wildlife management	6.79 (9)	5.66		
Field botany	6.52 (10)	5.07	6.01 (9)	5.93
Mammalogy			6.34 (3)	6.72
GIS			6.26 (5)	6.31
Behavior			6.20 (6)	5.92
Population ecology			6.11 (8)	6.74

In addition to the specific topic areas that were ranked, respondents were asked to indicate any other areas of study they believed to be important. The highest rated (four or more responses) additional topics important to an academic program were critical thinking, ethics, computer skills, and adaptive management.

There was some overlap of the top 10 knowledge areas between agencies, NGOs and private sector groups, and M.S. and Ph.D. programs. The greatest overlap was between importance for M.S. students and the nonacademic groups. This may indicate that faculty expectations for incoming M.S. students is more similar to that of agencies for new hires than it is for Ph.D. students. Notably, oral communication and working in teams, 2 of the top 3 in importance for all nonacademic groups, did not occur in the top 10 for either M.S. or Ph.D. rankings by academic faculty.

Discussion

Agency, NGO and private sector respondents provided conflicting evidence regarding the anecdotal comments we frequently have heard that recent college graduates they hire are poorly prepared for some aspects of their jobs. Respondents in all nonacademic sectors of the profession identified nontechnical aspects of the job as the most important areas of competency, i.e., oral and written communication, working in teams, and interacting with stakeholders. Although nonacademic respondents tended to rate proficiency of recent entry-level hires highest in these areas of competency, their mean ratings of importance and proficiency differed more for nontechnical than technical areas of competency.

Nearly all universities emphasize the importance of writing and speaking skills in their curricula. However, the results of this survey suggest that, despite that emphasis, students may not be leaving school with the desired levels of competency in communication skills. It is notable that oral communication did not appear in the top 10 for importance for either M.S. (rank = 21st) or Ph.D. students (23rd), and it is not clear why academics did not rate this area higher. One potential strategy for improving writing skills is to incorporate more write/rewrite assignments in university courses, but this strategy is time consuming and costly for faculty. Furthermore, results from this survey suggest that write/rewrite assignments may have questionable efficacy. Writing a thesis or dissertation under the close direction of a faculty advisor should significantly improve a student's clarity of writing (Porter and Baldasarre 2000). Nevertheless, we found that perceived proficiency in written and oral communication did not differ significantly for respondents who identified bachelor's, master's or Ph.D. degrees as the level of education needed for entry-level hires. Given the amount of effort that faculty members put into reviewing theses and dissertations, this finding is particularly discouraging.

The perceived problem with written communication skills may be related more to the type of written communication that students learn versus what they need on the job. Most writing assignments in college, whether they are term papers or theses, focus on research. Many wildlife professionals, especially those who work for government agencies, spend more time writing environmental assessments or management plans than research publications or reports.

It is clear that there remains a breach between knowledge and skills employers deem most important and the importance assigned to these topic areas by faculty at academic institutions. For M.S. and Ph.D. students, faculty are likely to emphasize courses that develop and enhance competencies in organismal biology/ecology, statistics, and field techniques. These will help ensure successful research projects and publishable results. In contrast, communication, working in teams, and working with stakeholders clearly are skills valued highly by agencies, NGOs and the private sector. Efforts should continue to strive to bridge this gap, so that universities and colleges are developing individuals who are well qualified for careers in management as well as research.

Improving students' ability to interact with stakeholders or in team settings is more problematic for universities. Janik and Radloff (2000) noted that many entry-level employees in the U.S. Forest Service were not able to interact positively in planning team environments. Although many university courses incorporate team assignments and courses emphasizing human dimensions have been added to the certification requirements for both TWS and the American Fisheries Society, human dimensions remains an underdeveloped area in the curriculum of many universities. Even when human dimensions courses are present in curricula, opportunities for students to experience interaction with stakeholders almost always must be simulated or experienced secondhand. In our experience, students seem to understand readily the need for stakeholder involvement in making decisions about wildlife conservation. However, they have a more difficult time understanding the pros and cons of alternative approaches to public involvement in decision making. This suggests that, although students should be exposed to human dimensions in college courses, the most effective way of improving ability to interact with stakeholders may be through continuing education of wildlife professionals who have gained some real-world experience.

While potential nonacademic employers perceive gaps between proficiency and ability of new hires in knowledge areas they consider important, the gap does not seem as large for academics. Important topics for academics tended to be in areas that indicate strong field-oriented skills, and the ability to analyze and write reports related to the analysis. It seems odd that the top 3 areas of knowledge for M.S. students (written communication, ecology and statistics) did not appear in the top 10 for Ph.D. students. It may be that faculty assume that, because incoming Ph.D. students typically have completed an M.S. project, they already are proficient in these three areas.

It appears that nonacademic professionals may feel more strongly about the importance of knowledge of various topics than do academic faculty (Tables 1 and 3). For each of the four nonacademic groups, no fewer than five topic areas were ranked at a value of 8.0 or above. In contrast, for academics at the M.S. level, only three knowledge areas were above 8.0, and the highest importance rank for Ph.D. students was 6.49. Perhaps faculty consider so many different areas to be important, it was difficult for them to rank any particular area strongly ahead of the others.

The overall picture that develops from the survey is that gaps remain between academic faculty and potential employers of graduates from wildlife programs. In particular, proficiency in oral and written communication and in teamwork still is perceived to be less than desired. It seems reasonable and important for agencies and academic institutions to continue to work to bridge this gap, so that well-trained professionals are prepared to enter the workforce.

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Foraging Theory or Food Plots? Theory versus Practice in University Curricula

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It is widely recognized that student demographics in natural resource programs within universities have shifted. The days when most students were male and from rural backgrounds with strong interests and experience in utilitarian uses of natural resources (e.g., hunting and fishing) and other outdoor activities are seemingly coming to an end (Miller 2000, Porter and Baldassarre 2000, Scalet 2007, Responsive Management/National Shooting Sports Foundation 2008). In many cases, electronic devices, rather than time out-of-doors, now serve as entertainment (Porter and Baldassarre 2000). Additionally, many children and adults now rely on electronic media to learn about environmental issues, including natural resource management. Although increasing gender diversity is welcome, many have noted a "new class" of students, many of whom suffer from "nature deficit disorder" (Louv 2005). This may translate ominously into a disconnect with nature among students or a change in attitude toward human/wildlife relationships (Noss 1996, Miller 2000, Regan 2000), including declining interest in consumptive activities (Miller et al. 2000, Woolf 2000). This issue is confounded by the trend that many universities are changing their emphasis in natural resources from understanding and appreciating uses of utilitarian tools in wildlife management to nonconsumptive values and management techniques. Additionally, many university programs seem to be shifting from a strongly applied curriculum to a more basic, theory-based curriculum with considerably reduced field training. These trends have caused increasing concern among employers, particularly state and federal agencies, who still need wildlife managers and employees that are able to interact intelligently and respectfully with consumptive users (Peek 1989, Scalet 2007). To help address this concern, The Wildlife Society (TWS) convened an ad hoc committee (TWS Collegiate Wildlife Programs – Trends In, What's Given, and What's Needed) to explore university programs. One aspect of this effort was to examine the needed balance between theoretical and applied wildlife biology and management in university curricula. Our goal was to: (1) examine the context of theory versus practice in wildlife education; (2) summarize some of the existing literature relevant to this balance; (3) discuss constraints on student training within the university system; (4) examine perceptions of the proper balance of theory versus practice from the perspective of universities and potential employers; and (5) offer some suggestions on how to perhaps better train the next generation of wildlife professionals within the existing academic and employment structure.

Context of Theory versus Practice in University Curricula

The importance of properly training students is well recognized within the field, with several "special sessions" dedicated to this topic within the past decade (e.g., Session 6 in the 65th Transactions of the North American Wildlife and Natural Resources Conference 2000, Krausman 2000, Gould 2001). However, questions concerning adequacy of university programs to train future professionals are not new. For example, in 1914, decades prior to formalization of the field of wildlife management, William T. Horn lamented failures of the university system to train conservationists (http://www.archive.org/stream/wildlifeconserva00hornrich/wildlifeconserva00hornrich_djvu.txt; access 13 January 2009). Aldo Leopold (1966) suggested that university education did not impart to students knowledge of real world applications. In fact, Kessler and Booth (1998) contended that Aldo Leopold would be disturbed by today's university

education in that too much time is being spent in the classroom, rather than developing skills from personal experiences through outdoor laboratories and experiential activities (e.g., externships, cooperative work study). Peek (1989) indicated a concern that universities were not producing students with educations relevant to state agency needs, and Teer et al. (1990) suggested that the education obtained at most universities does not adequately train young professionals for management-oriented careers. More recently, concerns about university education have varied but include lack of natural history skills from recent graduates (Bleich and Oehler 2000), failure of universities to train conservation biologists for nonacademic work (Noss 1997), a shift away from management-oriented curricula (Scalet 2007), a need for more quantitative skills in university curricula (Gould 2001, Burger and Leopold 2001), and a need to train students to think critically before giving them something to think about (Kroll 2007, A. J. Kroll, personal communication: 2009).

Wildlife professionals have suggested that profound changes in the profession, society at large and student interests (which are a product of large-scale societal trends) require review and/or changes in university curricula (Teer et al. 1990, Kessler et al. 1998, Heezik and Seddon 2005). Increasing urbanization and diversification of stakeholder groups from hunter-dominated to an increasing component of nonconsumptive users (Brown and Nielson 2000, Porter and Baldassarre 2000, Heezik and Seddon 2005) have produced many students who come to universities with less background in natural resource management (Noss 1996). The greater diversity of values relative to wildlife management that these students possess (Miller 2000, Scalet 2007) includes more-frequent acceptance of radical animal rights agendas (Hafner 2007). Many of these students may view wildlife as apart from the human experience (Noss 1996, Kessler et al. 1998). However, most university programs are structured with the assumption that students enter the profession with substantial exposure to natural places and a connection to wildlife resources. This assumption may no longer be valid, and many students may lack exposure to life and death processes, basic animal husbandry and agricultural practices, and knowledge of and appreciation for the uses of hunting and trapping as a component of sustainable wildlife and habitat management. This change in student demographics needs to be addressed by university programs (see below).

Theory versus Practice in Wildlife Education

Within this backdrop of changing student demographics, the ever-changing field of wildlife ecology and management, decreased available credit hours at universities, shifting of university biology departments from being organismal to cellular, and the evolving needs of employers, what is the proper balance of theory versus practice in college curricula? First, we must define these terms. We defined "theory" as the theoretical underpinnings of wildlife management, including basic ecology, population ecology, principles of wildlife management, basics of science and scientific thought, etc. We define "practice" as skills to apply knowledge to solve problems. This may include such things as habitat-management techniques, verbal and written communication skills to a variety of audiences, applying science to research needs, providing input into land-use planning, placement of conservation easements, applying government incentive programs to improve wildlife habitat, and basic field skills (e.g., wildlife and plant identification, necropsy and specimen collection, equipment skills, etc.).

Second, we must strive to determine essential education components. Most would agree that students, regardless of career paths in natural resource management, must possess a base set of technical skills and biological knowledge (Brown and Nielson 2000, Matter and Steidl 2000, Porter and Baldassarre 2000, Heezik and Seddon 2005). Certification programs, such as The Wildlife Society's Certified Wildlife Biologist designation, may be a useful vehicle for conveying coursework required for such a set of basic skills (Kroll 2007). Third, we believe one step in achieving this balance is recognition that a bachelor's is not a terminal degree for most entry-level wildlife ecology or manager positions (Teer et al. 1990, Brown and Nielson 2000, Porter and Baldassarre 2000). This allows consideration of at least a Master's of Science (M.S.) degree as part of a student's education, which can provide students opportunities to concentrate on areas of interest after obtaining a strong basis in science and management as an undergraduate. This requisite has become even more important as universities are forced to reduce number of credit hours for graduation and, thus, the number of advanced courses in natural resource management. Further, as most universities in the United States require a thesis at the M.S. level (Heezik and Seddon 2005), advisors can use the thesis process to refine critical thinking and practical skills (Porter and Baldassarre 2000), especially if the thesis involves independent fieldwork and interactions with professional biologists at non-university organizations. However, a concern with this concept is that many universities apparently are adding non-thesis paths for graduate degrees, which may limit thesis-related experiences for graduate students in these programs.

Fourth, it must be recognized that there is no such thing as an "ideal program" (Matter and Steidl 2000) and, in fact, the profession benefits from having a diversity of programs that span the gamut of theory versus practice (Heezik and Seddon 2005). Lack of an ideal program is evident; some have suggested increasing theoretical/quantitative skills (Bleich

and Oehler 2000, Gould 2001) and others suggesting increasing practical skills (Teer et al. 1990, Kessler et al. 1998, Berkson 2002, Scalet 2007). Some universities pride themselves on producing quantitatively astute students well-versed in theoretical ecology, whereas others boast producing "dirt under the fingernails biologists" (Peek 1989, Bleich and Oehler 2000). We believe it is incumbent upon universities to convey clearly to prospective students the strengths of their particular programs regarding theoretical or practical educational components. Such honesty may help direct students to the proper program to meet their perceived needs. Of course, this means it becomes incumbent upon students (and likely their parents or guardians) to choose a university program that best fits their career goals, which may be difficult for incoming students, especially those lacking a natural resources background. Development of a meaningful accreditation system for university programs to ensure that curricula meet basic expectations of the students and the profession would help in this regard (i.e., students would know that a particular program is accredited). Therefore, we encourage further development of such accreditation programs, which have been recently discussed within TWS.

Finally, the end of the equation is potential employers. Employers must have realistic expectations about work-readiness of recent graduates (Teer et al. 1990, Miller 2000, Woolf 2000). As noted above, recent concerns have been centered on the ability of universities to train professionals properly, particularly management-oriented students. However, employers can take an active role to help ensure training is appropriate. Such avenues include partnerships with universities (Bleich and Oehler 2000, Woolf 2000), such as participation in advisory committees or provision of internship opportunities (Miller 2000), access to continuing education for employees (Peek 1989, Brown and Nielson 2000, Porter and Baldassarre 2000), and perhaps requiring TWS wildlife certification for employment.

Where is the Balance?

Where the "wildlifer meets the habitat," so to speak, is recognition of an increasingly complex world (Miller 2000, Porter and Baldassarre 2000), against a backdrop of reduced credit hours at most universities. This not only reduces program flexibility, but also means a greater proportion of hours are used for core curricula with fewer opportunities for students to take non-major courses (e.g., social sciences, budget management), participate in practical experience opportunities, or diversify professional electives and, thus, educational background (e.g., want to take upland wildlife management *and* waterfowl management, can only select one). These mandated reductions are problematic for many university faculty because the needed skill sets have expanded with growing technologies (e.g., Geographic Information Systems applications, advanced analytical tools, training in nongame and game management), which imply an increase in required credit hours for graduation rather than a reduction. Additionally, this required reduction forces curricula to be more rigid to maintain a basic level of knowledge (e.g., meeting TWS certification) and affords students less opportunity to take courses from other disciplines. An example of this greater rigidity is that university curricula often lack professional electives, as they must list specific courses to ensure compliance with university core and professional course expectations (e.g., TWS certification). This is problematic, as many critics of university programs have suggested the need to increase exposure of students to a broader world (Peek 1989, Teer et al. 1990, Kessler et al. 1998, Matter and Steidl 2000, Kroll 2007). There also is a dichotomy whereby students must have the fundamentals and be ready to work in the real world (Berkson 2002).

From a university perspective, the problem is how to be forward thinking–producing students for the next generation of wildlife managers–while maintaining a level of competency in the skills that currently are in demand? In the past, we have assumed that students already possessed some basic understanding of ecology (life and death processes), animal husbandry, agricultural practices, etc., and focused our attention more on quantitative, computer and communication skills. With the changing demographics, we are finding a need for a better balance between assumed knowledge and what students may need in the future. This situation is further complicated by the technician versus biologist track, and the continued pressure by universities to reduce the number of credit hours required for a student to graduate with a B.S. degree. So, how do we continue to produce students with the necessary skill set while training them to think and adapt under the changing paradigms that they certainly will encounter during their careers in wildlife management?

We contend that the proper balance is a moving target that is difficult to define. This target moves due to: (1) large-scale shifts in society and attitudes of stakeholders; (2) trends and competencies at individual universities due to faculty changes; (3) changing needs of employers and society; (4) the shifting paradigms of natural resource management from primarily applied management and consumptive use to theoretical principles and nonconsumptive use; (5) continued changes in credit hours; (6) availability of field-oriented courses; (7) biology departments less oriented toward organismal and more oriented toward cellular education and research, and other university pressures; and (8) unknown large-scale

issues that will drive the pendulum in the future (e.g., energy markets). Given this, we contend, as have others, that it is of utmost importance for students to have a strong grasp on the theoretical aspects of ecology, wildlife management and science, and that it also is critical that students can interact with the media and stakeholders and are able to apply critical thinking skills to problems grounded in ecological principles. We further suggest, similar to others (e.g., Kessler et al. 1998, Matter and Steidl 2000, Kroll 2007), that to meet these needs of students and employers, universities and employers will have to work together and independently to develop innovative, more comprehensive, integrated curricula that break down departmental barriers and expand a student's experience in school.

This is obviously no easy challenge. However, we offer some suggestions on how to continue to prepare students to meet the challenges of wildlife careers by combining theoretical content with practical experience. We base our recommendations on the belief that, again, it is critical for students to have a firm grasp on the theoretical basis of wildlife ecology and management, and that providing this core should be the first priority for university programs. Additionally, we believe that university programs should not rely on the assumption that incoming students have a base exposure to outdoor experiences, particularly land management (i.e., farming) or utilitarian activities. We also feel that embedded within these activities should be essential core skills required of any professional, including verbal and written communication, ability to work in teams, skills in conflict resolution, consensus building and decision making (recognizing that not all problems have just one solution). We also strongly feel that universities should strive to include exposure to these concepts/skills early in a student's career. University programs should also emphasize the importance of *sustained management* (manipulation of populations and habitats to meet human goals and needs), because some feel this now is viewed by students and some faculty as tangential to work in the profession, even though management activities are still the cornerstone of wildlife management.

With others (e.g., Kessler et al. 1998, Berkson 2002, Kroll 2007), we recommend that faculty members work to bring real-world applications into the classroom to allow students an opportunity to apply theoretical coursework to problem solving. Such experiential activities should improve critical thinking skills and help students understand the broad societal context within which they will need to operate as professionals. Another opportunity is to consider requiring student internships. Of course, this necessitates having the ability to place students with employers. Another option would be to have students spend a day to a few days with a professional during the semester, and having the student present results of their visit in a classroom setting. Required, extended field trips or summer practicums ("summer camps") that include exposure to a variety of employers and field sites with active management could also be used to help understand the practical side of wildlife management and how this is integrated into land use (e.g., forestry, agriculture).

Because every job is different, much practical experience must be gained through on-the-job training. However, agencies and other employers should initiate liaisons with universities to offer cooperative solutions for exposing students to the reality of working. Additionally, we feel many students have a "wildlife is always first" mentality, which does not reflect reality. That is, students may not have exposure to how wildlife conservation fits within an overall free-market economy and how the objectives and needs of stakeholders drive funding and opportunities for on-the-ground wildlife conservation. Therefore, opportunities to have students work on real-world case studies, perhaps supplied from agencies, will not only help employers, but should also help students understand how to use their knowledge and skills within a broader context. Finally, many entry-level professional jobs require at least a M.S. degree. We suggest that employers provide funding and guidance for M.S. students to use that program as an opportunity to gain skills that reflect agency needs. Perhaps, employers and universities can work together to create thesis work with an apprenticeship-type component (i.e., the student works directly with employees of the funding agency during their thesis work to develop real-world experience).

Another critical issue is the amount of time a professor is able to spend mentoring undergraduate students. University evaluations seem to place greater emphasis and reward on amount of research dollars garnered and number of publications. Thus, undergraduates may be given less consideration. Additionally, the emphasis of faculty hiring is on research capability, not teaching skills (i.e., universities hire researchers first, teachers second). Finally, many faculty members have a stronger interest in research than management, and the common perception is that "management-oriented" open faculty positions are being replaced by conservation biology-type positions that may not emphasize practical wildlife management. Therefore, at many institutions, students interested in applied management do not have mentors or are not instructed on the importance of applied wildlife management. Faculty members should also ensure that programs, where possible, are not geared toward producing just wildlife researchers. We recommend that natural resource departments work with university administration to re-evaluate time spent with undergraduate students as part of promotion and tenure packages.

Conclusions

The balance of theory versus practice is a moving target. It is obvious that a student cannot be taught everything he or she needs in a university curriculum. To best prepare students for working in an increasingly complex world, we recommend students have a strong foundation in basic science and ecological theory and that universities work to ensure that a background in applied skills also is included in curricula. This is particularly important, as many students now lack a background in land management, hunting, etc., coming into school, but often are required to deal with hunters and habitat management issues as employees. Providing students with opportunities to appreciate and understand the North American Model of Wildlife Conservation, the role of wildlife and habitat management as an important part of the profession, that there is more to conservation than wildlife research, and the political realities of managing wildlife populations seem to be critical needs. Students must be trained to be flexible enough to meet new challenges presented from changing and increasingly variable stakeholders, and to understand that, for many agencies, some stakeholders (i.e., hunters) are customers.

We feel it is the responsibility of students to choose a program that fits them. The responsibility of employers is to emphasize skills that an entry-level biologist needs and to work with universities to help meet these needs. The responsibility of universities should be to integrate broad-based topics innovatively within core curricula despite administrative demands for reduced credit hours. University curricula should include courses designed to broaden skills that entry-level wildlife professionals will need to succeed. Universities also should allow as much flexibility in coursework as possible while providing instruction in essential skills in both theory and practice (Peek 1989). Employers must be realistic about work-readiness of new graduates. We also need to recognize the need for "life-long" learning, and all entities should encourage use of continuing education to enhance professional skills (Porter and Baldassarre 2000). Continuing education could be expanded to include workshops and seminars geared toward students. These continuing education workshops could be developed cooperatively with employers and perhaps have a set number of hours of work outside the classroom required for graduation.

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The Coursework of Conservation: Are University Curricula on Target? A Synthesis

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Effectiveness of wildlife professionals in the 21st century will depend on their skill at integrating an array of information from biological and human dimensions of wildlife management into sustainable decisions (Decker et al. 2008, Riley et al. 2002). Wildlife agencies and professionals alike continue to seek ways to improve the adequacy of university programs in preparing young wildlife professionals to meet the demands of a dynamic profession (McDonald et al. 2009, Miller et al. 2009, Stauffer and McMullin 2009). This concern for linking university curricula and preparation for practice in the profession is evidenced by multiple special sessions at the North American Wildlife and Natural Resources Conference that have addressed the issue (e.g., see Miller 2000, Regan 2000, Teer et al. 1990,Woolf 2000), as well as discussion in other professional venues (Bleich and Oehler 2000, Brown and Nielsen 2000, Gore and Riley 2009, Matter and Steidl 2000, Noss 1996, 1997). Although the recurring emphasis on university curricula demonstrates the importance of the topic to the profession, we believe the focus currently is too narrow. Although universities play important roles in the development of young wildlife professionals, so, too, do employers and professional societies (e.g., The Wildlife Society, American Fisheries Society, Society of American Foresters). The question might be more productively phrased as, "Is the wildlife profession doing all it can to prepare wildlife professionals thoroughly for their jobs?"

Professional societies, universities and employers share responsibility for three aspects of developing wildlife professionals. First, we must clearly define what it means to be a wildlife professional. Professional societies should have the lead role in defining the standards of professionalism. Second, universities should design their wildlife curricula to ensure that graduates meet the standards defined by professional societies. Third, employers should commit to supporting continuing education of their employees (and wildlife professionals should commit to life-long learning). In this paper, we discuss each of these aspects of professional development in more detail.

Setting the Standards of Professionalism

Professional societies, such as The Wildlife Society (TWS), have as one of their primary responsibilities the definition of standards of professionalism, e.g., what it means to be a professional wildlife biologist. Professional societies do this primarily through certification programs that specify minimum education requirements for wildlife professionals, but also through accreditation of university wildlife programs and through codes of ethics that specify how wildlife professionals should conduct themselves.

Professional societies face a daunting task in defining the complex and moving target of professionalism. The expectations of competency for wildlife professionals in 2009 probably will not be adequate to meet the demands of wildlife professionals in 2019. Furthermore, the complexity of the profession demands a wide array of competencies. For

example, a natural resource agency needs field managers who are field savvy and know how to manage the land and its resources. The agency also needs research biologists who can design research projects that will produce credible science, program managers who can lead complex programs and work effectively with a variety of stakeholders to resolve controversies, and agency managers and leaders who can supervise employees effectively, think strategically and manage budgets. All of these various types of wildlife professionals need different sets of communication skills to succeed in their jobs.

A well-designed, integrative professional certification program should define the competencies expected of wildlife professionals. Furthermore, a comprehensive certification program should recognize that not all wildlife professionals will have (or need) the same set of skills (e.g., a specialist in the human dimensions of wildlife management may have less ecological training and more social science training than a research biologist). The collective competencies described in a certification program should drive curriculum design in university wildlife programs. Wallace and Baydack (2009), in their review of more than 500 North American universities offering courses in wildlife and related subjects, found that only 10 percent of the "programs" required students to meet TWS certification requirements. They estimated that another 25 percent of the "programs" offered courses that would allow students to meet TWS certification requirements. Thus, nearly two-thirds of the "programs" offering wildlife courses could not graduate students who could meet TWS certification requirements. These are not comprehensive wildlife programs.

How important is TWS certification in determining the curriculum of university programs? Stauffer and McMullin (2009) found that land grant universities, the traditional source of education for several generations of wildlife professionals, attached more importance to certification than did other state or private universities. That does not mean that only land grant universities produce students qualified to be wildlife professionals, as students graduating from other institutions may prove to be outstanding wildlife professionals. Nevertheless, comprehensive wildlife programs that expose students to a variety of courses that address the currently expected competencies for wildlife professionals, such as those found at most land grant universities, may be the best place for employers to begin looking for future wildlife professionals.

This special session was organized because many people in the wildlife profession believe that young professionals in entry-level jobs in the wildlife field are not adequately prepared for what they must do. Some wildlifers are concerned that today's young professionals are not as field savvy as previous generations of wildlifers were--a concern that extends to the broader societal context of fewer people being connected to nature (Louv 2006). Others are concerned that the current generation of wildlife professionals lack a variety of "people" skills, ranging from the ability to write and speak clearly to the ability to work effectively in interdisciplinary teams and interact effectively with stakeholders. The concern about lack of "people" skills suggests that despite a growing emphasis on the human dimensions of wildlife management over the last 35+ years, we are not adequately preparing young wildlife professionals for the people management part of the job. This latter concern is problematic given the complex, interdisciplinary and ecosystem-based approaches to wildlife conservation commonplace today, which require wildlife professionals to integrate biology and human dimensions of management more than ever before (Riley et al. 2002).

To be relevant, certification criteria must be updated regularly (Hutchins 2008). The current criteria for certification by TWS probably do not adequately reflect the need to integrate ecology and human dimensions. Despite increased emphasis placed on human dimensions during the last revision of TWS certification criteria, the current criteria do not clearly define the need for a wildlife professional to understand that today's stakeholders demand and are entitled to a meaningful role in making management decisions. Although it is not likely to be stated explicitly as a criterion for certification, one of the real challenges of integrating human dimensions into wildlife conservation is dispelling the commonly held misunderstanding that increasing public involvement in decision making must result in diminished importance of biology in decision making (Decker et al. 2008). Another competency that is rapidly becoming a necessity in wildlife is knowledge of and ability to use geographic information systems (GIS). Courses focusing on GIS are not currently required for TWS certification (and in fact, are specifically excluded from consideration among quantitative courses).

Design of Wildlife Curricula

Universities walk a fine line between meeting the demands of employers for young professionals knowledgeable in biological and human dimensions of wildlife management and maintaining a solid foundation of basic sciences and mathematics. All employers want the young professionals they hire to be field savvy and have excellent communication skills and the ability to work in teams and with stakeholders effectively. Nonetheless, few if any employers have a diminished expectation that their new hires will have a solid foundation in the sciences and math. If today's students have

less exposure to the outdoors as youth, universities may have to begin teaching field skills that once were assumed of entering students. Some universities have already begun to do this. Is it realistic, however, to expect young professionals with bachelor's degrees (and, probably, advanced degrees) to display great competency in ecological theory, field techniques, communication skills, working effectively in teams and with stakeholders based on their formal education alone? For example, students who lack real-world experience engaging stakeholders may gain a basic understanding of appropriate roles of stakeholders and professionals in the decision-making process, but they are less likely to appreciate the finer points of how and when to use specific techniques of public involvement.

We believe university faculty should collaborate with employers to define learning outcomes at the bachelor's, master's and doctoral degree levels that will lead to development of desired competencies of wildlife professionals. Many university programs already have advisory committees comprised of representatives of the various sectors of the wildlife profession that could collaborate in curriculum discussions. Others have collaborative programs with faculty or graduate students sponsored by agencies. These discussions also should identify the knowledge and skills that should be the focus of formal education and which skills would be better learned in continuing education once young professionals have matriculated to the workforce. At a minimum, we believe that graduates of a bachelor's program in wildlife management should have a solid grounding in basic biology, ecology, math, wildlife management and conservation biology. Furthermore, bachelor's graduates should be able to evaluate problems critically, collect data that are useful to scientific inquiry and have acceptable communication skills. We purposefully use the word "acceptable" to describe desired communication skills of bachelor's degree graduates because we believe that the excellent communication skills desired by employers normally will be gained through more-advanced education and training. Graduates of advanced programs in wildlife should be able to design scientifically credible research, analyze data appropriately and have more sophisticated communication skills (consistent with employer expectations). Expectations for communication skills revealed in a questionnaire of TWS members (Stauffer and McMullin 2009) indicated those skills should go beyond publishing in scientific journals and include an emphasis on the ability to explain technical information in language that nonprofessionals can understand.

The survey results reported by Stauffer and McMullin (2009) clearly point to a need to increase emphasis on writing, speaking and stakeholder engagement, which transcends disciplinary specialization in biological or social sciences. Stauffer and McMullin noted that employers responding to their survey did not differ in their perception of the proficiency of entry-level hires in written or oral communication regardless of whether the minimum education requirement for the position was a bachelor's, master's or doctoral degree. This suggests that either the substantial mentoring that occurs as graduate students write and defend their theses and dissertations has little effect or, more likely, that graduate students are not being mentored in the right set of communication skills (i.e., how to communicate more effectively with nonprofessionals).

Just as professional societies need to re-evaluate their certification programs regularly, universities need to re-evaluate their curricula regularly. This should be done in collaboration with their employer partners. Comprehensive wildlife programs must offer a variety of courses that teach students the value of traditional wildlife management and conservation biology. The complex, interdisciplinary nature of resource management today requires broad thinking, not the narrow thinking promoted by a profession divided into wildlife managers and conservation biologists.

Supporting Life-long Learning

The most important message that employers should take from this special session is that they should not expect entry-level hires to be finished products. Although students should have a life-long commitment to learning and professional development, employers must be committed to encouraging life-long learning and supporting professional development of their employees. Employer support for professional development may include supporting involvement in professional society meetings and committees and supporting continuing education workshops. Professional societies and universities should collaborate with employers to ensure that appropriate continuing education opportunities are provided for employees.

Employers might improve the chances that universities will attend to needs of agencies by heeding advice of Scalet (2007) to "follow the money," i.e., to provide funding for practical research of value to management agencies. Most university faculty members must support their research programs through external grants. If management agencies do not provide funding to support graduate students, faculty members will look elsewhere for financial support. The end result is that lack of funding from management agencies causes universities to conduct research that may be of less direct value to agencies. If the pattern persists, universities are less likely to hire new faculty members whose research focus depends on funding from management agencies. Those faculty members are less likely to produce students who look to management agencies as their first choice of careers.

Conclusion

This special session, as did many symposia in previous years, addressed the question, "Are university curricula on target?" We conclude that, while universities need to increase their focus on improving their graduates' communication skills, ability to work in teams and to work with stakeholders, a deeper issue exists. The entire wildlife profession must be involved in preparing future wildlife professionals for the complex, interdisciplinary, ecosystem-based jobs in wildlife conservation. Professional societies should re-evaluate and regularly update their certification programs to ensure that they define the competencies needed to be an effective wildlife professional. Universities that wish to provide comprehensive wildlife programs should ensure that their students can meet certification requirements. A comprehensive wildlife program should provide a solid foundation in science, math and wildlife conservation courses, and also ensure that students are field savvy and can communicate effectively. Employers must stay engaged in curriculum discussions with their partner universities and support research projects that provide the information they need while training students to be future employees. Finally, employers also must recognize that entry-level employees are not finished products and support their continuing professional development.

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Session Four.
Measuring State Wildlife Action Plan Implementation

Testing the Waters: How Private Investment is Facilitating State Wildlife Action Plan Implementation Nationally

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In February 2009, the Wildlife Conservation Society's North America Program announced the third round of grant making through its Wildlife Action Opportunities Fund-- a program to support nonprofit organizations and state wildlife agencies in their efforts to implement State Wildlife Action Plans.

Program Overview

With funding provided by the Doris Duke Charitable Foundation and managed by the Wildlife Conservation Society (WCS), the WCS Wildlife Action Opportunities Fund (Fund) provides competitive grants to conservation organizations, state fish and wildlife agencies, and tribal governments for projects focused on implementing priority conservation actions and strategies identified in State Wildlife Action Plans (SWAP). The Wildlife Action Opportunities Fund will provide a total of $3 million in grants over a two-year period, awarding $1.5 million in 2009 and $1.5 million in 2010. The Request for Proposals (RFP), detailed below, is for 2009 grants only.

For the first time, this program will be able to provide grants not only to nonprofit conservation organizations with approved Internal Revenue Service 501(c)3 status, but to state wildlife agencies, tribal governments and regional associations of state fish and wildlife agencies. Grants can be awarded only for projects within the 50 United States and six U.S. territories with an approved SWAP. The Fund is unable to make grants to for-profit corporations or individuals. It cannot be used to support: capital costs for land acquisition or conservation easements, building construction, political lobbying, organizational capacity building, captive breeding, zoo exhibits, or the gathering of additional data for a SWAP through biological inventory, monitoring or research (unless the proposed data gathering is a minor component of a project addressing one of the funding priorities outlined in the next section).

Over the previous two years, the Fund has awarded 42 grants totaling more than $3.5 million to nonprofit conservation organizations working to implement the priority conservation activities of the SWAPs in 38 states. Grant award recipients brought another $6.5 million in matching dollars to create more than $10 million for wildlife conservation. These grants were selected from a highly competitive pool of 738 applicants requesting almost $63 million in funding and offering another $100 million in match for projects to implement SWAPs.

2009 Wildlife Action Opportunity Fund Program Priorities

1. **Promoting Wildlife Resilience to Climate Change**--Projects that demonstrate on-the-ground management responses for wildlife adaptation. Projects designed to work collaboratively with state fish and wildlife agencies to develop strategies and actions for responding to climate change (e.g., use of ecosystem services incentives for habitat protection). Projects that work to incorporate wildlife adaptation into SWAPs and/or with other local, state and federal planning efforts (e.g., plans for alternative energy development, new protected areas or county growth). Projects that integrate existing wildlife data with other climate change planning efforts. Projects that conduct wildlife vulnerability assessments for terrestrial and aquatic species in priority regions identified by SWAPs or downscale existing models.

2. **Communicating about SWAPs--**Projects that publicize and raise the profile of SWAPs with nongovernmental organizations, elected officials, decision makers and policymakers, and private landowners. For example, a project that works to build new partnerships between state wildlife agencies and nongovernmental conservation organizations.

3. **SWAP Accessibility--**Projects that work collaboratively to improve existing SWAPs or that integrate a SWAP's conservation priorities with other public planning efforts. This funding priority is restricted to four types of projects:

(a) projects that work collaboratively to integrate SWAP priorities with other land-use or natural resource planning efforts of public agencies at the local, state or federal level, such as a county growth or comprehensive plan; (b) development of or improvements to maps of focal conservation areas (including freshwater and marine); (c) development of prioritized strategies and actions that help facilitate conservation action; and (d) development of specific actions or guidelines in response to climate change (see priority 1 above).

4. **Policy Research**--Projects aimed toward changes in natural resource policy at the local, state or federal government level that facilitate implementation of SWAPs. We are particularly interested in projects that identify and secure new or existing sources of public and private funding for implementation of SWAPs. For example, a project that utilizes impact payments from energy development to fund offsetting conservation actions identified in State Wildlife Action Plans.

5. **Species and Habitat Management**--Projects aimed toward reintroducing or supplementing populations of species of greatest conservation need (SGCN), as identified by a SWAP, to historical range from which the species has been lost or greatly reduced. Projects proposing to develop and implement specific management guidelines for such species (e.g., a project proposing to reduce or eliminate disturbances to a SGCN). Large-scale stewardship projects that both implement the priorities of SWAPs and can serve as models that may be replicated in other places, including projects in terrestrial, freshwater and coastal marine realms. Projects that propose to re-establish or mimic natural fire regimes or natural flow regimes in streams and rivers.

6. **Wildlife, Energy, Infrastructure and Connectivity**--Projects that seek to integrate connectivity needs of wildlife with SWAPs. Projects that seek to integrate SWAP priorities for the needs of wildlife with plans for energy development, transportation infrastructure and community development activities. Projects to protect wildlife connectivity areas as prioritized by SWAPs.

Important: highest preference will be given to projects that: (a) apply sources of matching funds from private, local, state and federal programs, or seek to create new sources of funding for the implementation of SWAP priorities; (b) demonstrate strong working partnerships between state wildlife agencies or tribal governments and nongovernmental conservation organizations; and (c) complement or enhance larger-scale regional or multi-state conservation objectives, as defined by SWAPs.

Using State Wildlife Action Plans to Guide Landscape-level Conservation in the Northeastern United States

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To be eligible for State Wildlife Grant (SWG) funds, states have developed comprehensive State Wildlife Action Plans (SWAPs) that identify species and habitats of greatest conservation need. Many of the species, habitats and conservation actions cited by the SWAPs are common across the Northeast or common to a group of states within the region. These issues can be addressed most effectively by actions across state lines. To address conservation problems that transcend state boundaries, the Northeast Association of Fish and Wildlife Agencies (NEAFWA) developed the Northeast Wildlife Teamwork Strategy (NEWTS) to develop, coordinate and implement conservation actions that are regional/subregional in scope and build upon the many regional initiatives that already exist.

The Birth of Landscape-scale Conservation

The National Fish and Wildlife Foundation (NFWF), with support from the Doris Duke Charitable Foundation, first recognized the need for landscape-level conservation by funding a two-step process to recognize and address multistate priorities. The first step was a regional workshop involving states, federal agencies and nongovernmental organizations (NGOs) to develop blueprints of priority regional conservation projects. The workshop was held in Albany, New York, and was attended by 43 people from 12 of the 13 states in the NEAFWA and the District of Columbia. The outcome was a prioritized list of 72 regional projects. Six projects were subsequently identified for follow-up blueprint development resulting in three formal proposals for the second phase of the NFWF process. Two of these proposals ultimately were funded--a regional habitat classification and an assessment of performance measures.

Many of the projects identified in the Albany meeting highlighted the need to eliminate duplication of effort within the region and to create tools that would allow a consistent approach to conservation across the region. Workshop attendees recognized that working across state lines would be difficult both logistically and administratively without a formal, sanctioned process to organize, fund and pursue regional projects. Concepts for a multistate partnership continued to be discussed after the Albany meeting by an ad hoc group representing technical and policy sectors within NEAFWA. The groups work eventually coalesced into a proposal for the NEWTS strategy. NEAFWA directors formally endorsed NEWTS in spring 2006.

History of Multistate Collaborations in the Northeast

Multistate collaborations along the model of NEWTS are not new to NEAFWA. Beginning decades ago, NEAFWA state agencies that were members of the Atlantic Flyway Council (AFC) banded together to pool state funds with federal funds to support waterfowl-banding efforts in Canada. Cooperation between states was essential to enable a program of work that would provide equitable benefits to members from work done on a research and management challenge that was greater than one state could tackle alone. Two problems were solved with AFC-wide cooperation: funds were administered by an entity capable of pooling state funds and sending pooled funds outside of the United States, and pooled funds provided the financial strength to conduct projects that were needed to support state agency waterfowl management but were well beyond the capability of

a single state to conduct. Pooled resources allowed common benefits to all contributors, resulting in credible management of a migratory resource important for all states with waterfowl seasons.

More recently, NEAFWA state agencies pooled funds to support a Wildlife Damage Management, Research and Outreach Cooperative (WDM Coop) to coordinate state, federal and university approaches to wildlife damage management research and outreach, including wildlife population levels and distributions, improved methods of direct intervention for avoidance and mitigation of damage, and increased human dimensions inquiries. The benefits of coordination--including better cost-effective public and private solutions to damage conflicts through regional planning, sharing of expertise, facilities and fiscal resources, and rapid completion of work--were recognized.

Regional Conservation Needs

The need for a process to facilitate NEWTS was recognized and resulted in creation of the Northeast Regional Conservation Needs (RCN) grant program. States recognized that many of the conservation needs identified in SWAPs were best addressed at a landscape-scale--a scale that did not conform to state boundaries. In addition, states understood that many conservation actions were most efficient with the reduction or elimination of redundancies that minimized independent state actions toward problems common throughout the region. By combining financial and technical resources, NEAFWA created an efficient and effective mechanism to address landscape-scale wildlife conservation issues by combining resources, leveraging funds and prioritizing conservation actions identified in SWAPs.

NEAFWA members agree to devote 4 percent of their annual federal appropriation of SWG federal funds to a common pool dedicated to regional issues. The use of federal funds for this initiative mandated an administrative connection between the U.S. Fish and Wildlife Service, each state and the Wildlife Management Institute (WMI) which administers the program for NEAFWA. Funds are made available to conservation partners through competitive grants, with grant recipients responsible for providing nonfederal match. Projects funded through the RCN program are required to address priorities highlighted in each SWAP. Technical experts are made responsible for the nomination of topics to address highest priority regional actions. Topics eventually are formally approved through a vote by the NEAFWA directors. A Request for Proposals (RFP) is then issued to solicit proposals for funding within RCN topic areas. Technical experts are responsible for proposal review and ranking. NEAFWA directors then vote to provide grant funds to the highest priority projects. Progress reports are evaluated by technical review teams to monitor progress toward SWAP goals.

Roles and Responsibilities

The structure developed by NEAFWA to address technical and policy issues facilitates the implementation of NEWTS. This structure involves the existence of a number of technical committees made up of members from each state, who are given charges (assignments to complete) on issues of significance within the region. Without such a structure, the necessary vertical decision making needed for review and approval of RCN grants would be difficult. The NEAFWA structure has three tiers: technical committees; administrators who provide oversight and charges to the committees; and the directors, who make policy and procedural decisions based on recommendations of the administrators.

Northeast Fish and Wildlife Diversity Technical Committee and Northeast Habitat Technical Committee

These two technical committees are charged with annually developing a prioritized list of RCN topic areas that advance the conservation of species of greatest need at the regional scale. Committee membership includes both terrestrial and aquatic specialists from member states and the District of Columbia. Federal and NGO technical experts also are frequently in attendance at committee meetings. Areas of expertise range from species specialists to habitat specialists. In the formal approval process, each jurisdiction has equal vote. Once RCN grants are approved within the topic areas, committee members serve as RCN technical coordinators to assist in the review and prioritization of project proposals and for oversight of grant recipients.

Northeast Fisheries Administrators Association and Northeast Wildlife Administrators Association

Administrators of either the wildlife or fisheries sections/divisions within the NEAFWA agencies form the second tier of authority within NEAFWA. Administrators make formal recommendations on technical committee actions, including ranking of RCN topics, RCN preproposals and RCN proposals. Administrators ensure that both aquatic and terrestrial priorities are addressed, and they have the authority to recommend topics not addressed by the technical committees.

NEAFWA Directors

NEAFWA directors meet twice per year to approve RCN topics and award RCN grants formally. Directors respond to the rankings, comments and recommendations of technical committees and administrators, but also are guided by national perspectives on the purpose and place of SWAPs and SWG funds as components of conservation policy and action.

U. S. Fish and Wildlife Service Division of Wildlife and Sport Fish Restoration

The Region 5 office of the U. S. Fish and Wildlife Service, Division of Wildlife and Sport Fish Restoration provides oversight on SWG funds used in the RCN program. Division of Wildlife and Sport Fish Restoration staff developed a single application for federal assistance to be used by each state. Each grant has two projects: project 1 for the annual administration of the program, and project 2 for conducting regional programs. Each state annually submits a grant agreement to obligate a fixed amount of its SWG funds to administration of the regional program. Performance reports are prepared by the RCN program administrator to cover reporting requirements of all states. Each year, amendments are submitted to create jobs under the regional programs project to implement specific regional projects.

The Nongovernmental Partner

Lessons learned during the history of NEAFWA multistate partnerships guided the developers of NEWTS toward the use of a NGO to administer the regional program. WMI has provided administrative services to NEAFWA members for the AFC funds and for WDM Coop. Given the accounting and administrative frameworks in place with those two projects, WMI accepted NEAFWA's invitation to administer the additional duties of the RCN grant program. WMI's administrative duties include:

- partnership development;
- regional grant amendment and report writing;
- contracting for services with grant recipients;
- financial administrative services;
- reporting of accomplishments;
- facilitation of decision making for technical committees, administrators and directors; and
- oversight of technical coordinators.

WMI facilitates the process to develop an annual list of projects, coordinates the solicitation of cooperators and matching funds, prepares grant amendments for approved regional projects and writes annual and final performance reports.

Accomplishments to Date

The RCN grant program issued the first RFP in early 2007. RFPs have followed in 2008 and 2009. The list of RCN topics generally provides an organizational structure for the 72 priorities identified at the initial Albany meeting. New topics, however, embrace new problems or issues that have emerged after the Albany meeting (e.g., White Nose Syndrome in Northeast bats). RCN topics include:

- creation of regional habitat cover maps;
- identification of invasive species that impact species of greatest conservation need in the Northeast;
- development of instream flow standards, guidelines and policies;
- development of model guidelines for assisting local planning boards with conservation of species of greatest conservation need and their key habitats through local land-use planning;
- identification of regional focal areas and corridors for the conservation of species of great conservation need in the Northeast;
- development of regional indicators and measures;
- development of habitat conservation initiatives at a landscape scale;
- potential impact of climate change on Northeast species of greatest conservation need;
- regional standards and guidelines for location and operation of wind turbine sites;
- geospatial condition analysis based on Northeast species of greatest conservation need habitat maps;
- enhance conservation of invertebrate species of greatest conservation need by developing an online database that facilitates the submission of data by the scientific community; and
- identification of factors contributing to the regional decline of populations of species of greatest conservation need and the development of methodologies that will assist in the identification of such factors.

For the two grant cycles that have been completed, 34 preproposals have resulted in 14 funded grants. The total amount of federal funds provided to grant recipients was $833,000. Grant applicants provided $870,000 in nonfederal match funds.

Conclusions

NEAFWA has identified regional coordination of conservation as a critical component of meeting the priorities established in respective state SWAPs. Through an inclusive state/federal/private partnership, NEAFWA's RCN grant program provides maximum leverage to federal SWG funds, focuses conservation attention on the highest priority actions identified by SWAPs and delivers conservation on the ground efficiently and economically.

Acknowledgments

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The Table is Set, but are We Missing Opportunities?

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State fish and wildlife agencies have a successful track record spanning nearly a century for recovering declining game fish and wildlife. Early in the last century, white-tailed deer, elk, pronghorn, striped bass and many other species were imperiled due to overharvest and habitat loss. Today, many game species are thriving once again due in part to the Wildlife and Sport Fish Restoration program, a state/federal partnership funded in part by a federal excise tax on hunting products and fishing equipment. However, more than 90n percent of species under the authority of state fish and wildlife agencies are nongame and are not hunted or fished. Although many nongame species have benefitted from land protection and management directed at game species, states have had limited capacity to manage the full array of species because of a lack of funding.

In 1980, Congress passed the Fish and Wildlife Conservation Act, which authorized funding for state and federal fish and wildlife agencies for planning and management of nongame species. Funding for the Act was never appropriated, so, in the 1990s, the Teaming With Wildlife coalition (www.teaming.com) was started to advocate for dedicated federal funding for management of nongame species similar to that provided under the Wildlife and Sport Fish Restoration programs. The coalition, which now stands at nearly 6,000 organizations, was successful in bringing attention to the funding need and resulted in two new federal programs to conserve declining nongame fish and wildlife. In 2001, Congress created the Wildlife Conservation and Restoration Program and State Wildlife Grants programs to provide funding to state fish and wildlife agencies to conserve species in greatest need of conservation. Since 2001, states have received nearly $500 million through these programs for planning, land protection, management, research and inventory.

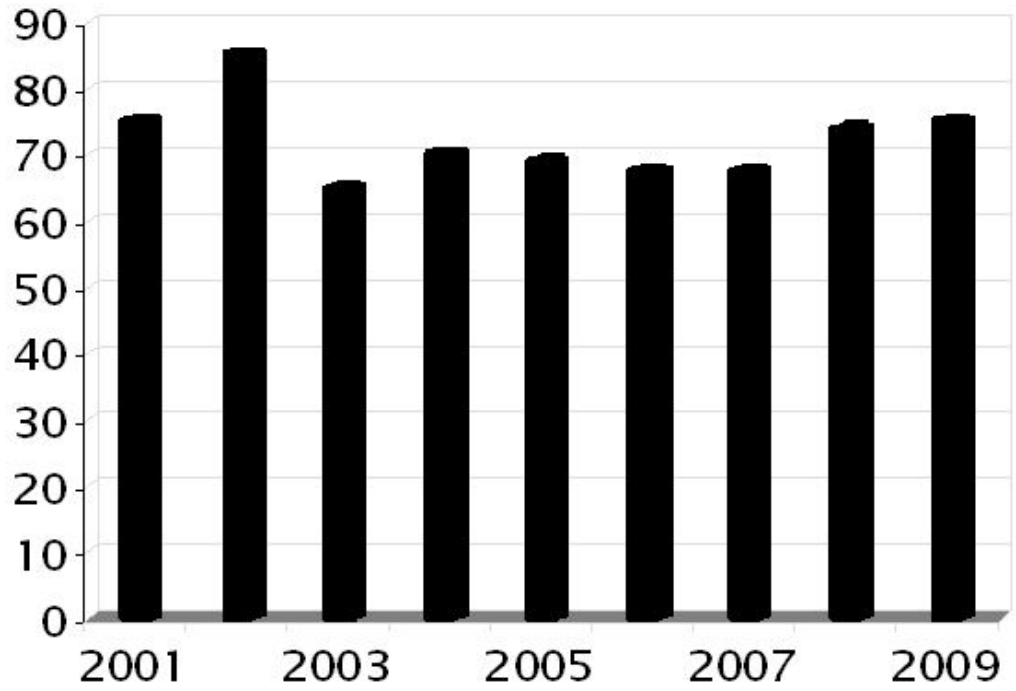

Figure 1. Annual funding made available to state fish and wildlife agencies through the State Wildlife Grants program from 2001 to 2009 (in millions of dollars).

As a condition for receiving new federal funding, each state, territory and the District of Colombia agreed to develop a Comprehensive Wildlife Conservation Strategy (State Wildlife Action Plan). These plans identified the species in greatest need of conservation, threats to those species and actions needed for the species' recovery. The planning effort was led by state fish and wildlife agencies in collaboration with federal, state, private and local conservation partners. When the plans were approved in 2007, it marked the first time in history that comprehensive plans had been developed for each state, territory and the District of Columbia. The plans are being implemented. However, with an average of just

$1 million per state/territory in federal funding, the pace and scale of conservation work are inadequate for addressing the needs of the majority of species in greatest need of conservation.

In 1991, the Association of Fish and Wildlife Agencies (AFWA) produced the "Bridge to the Future" report, which conservatively estimated the annual funding need for state-based wildlife conservation at more than $100 million annually. This was the first estimate of state fish and wildlife funding needs for comprehensive fish and wildlife management. In the mid- to late 1990s AFWA began advocating to Congress for $350 million annually in dedicated funding for state fish and wildlife agencies. This estimate was based, in part, on projected revenues from a proposed new excise tax on binoculars, field guides, camping equipment and other outdoor items. The revenues were projected to be comparable to the amount distributed to states through the Wildlife and Sport Fish Restoration program in the early 1990s.

In 2000, the Conservation and Reinvestment Act (CARA) was debated in Congress. Title III of CARA would have provided states with $350 million annually in dedicated formula-based funding for conservation of species in greatest need of conservation. Although the bill passed the House of Representatives by a 3 to 1 margin, it never reached the floor of the U.S. Senate, despite a majority of support. In 2008, the Teaming With Wildlife Act was introduced in the U.S. Senate by Senator Tim Johnson of South Dakota. The Teaming With Wildlife Act would have provided states with $350 million annually from 2011 to 2016 for the conservation of species in greatest need of conservation through implementation of State Wildlife Action Plans. The bill did not advance but was reintroduced by Senator Johnson in March 2009. Although both bills would have provided states with much needed resources to manage declining nongame species, funding levels in the bills were not based on an identified need.

In fall 2008, AFWA conducted a pilot survey of state fish and wildlife agencies to estimate funding needs for state wildlife action plan implementation. Data were obtained from 10 states, and estimates for plan implementation ranged from $1.6 to $50 million per year. The percentage increase over current funding was calculated for sampled states and an average percentage increase over current funding was calculated to attain a national funding needs estimate. The estimate of funding needed to implement State Wildlife Action Plans more fully in all states and territories was $700 to $800 million annually, double the amount currently advocated in federal legislation.

AFWA conducted a second survey in December 2008 to identify funding needs for restoration and management projects that could be completed in a short timeframe (less than 18 months). This estimate did not include funding needed for land protection, increased staff, research, inventory, education, outreach and other activities. Thirty-five states provided data, and estimates ranged from $236,500 in Georgia to $149.7 million in California. The total estimated need for the surveyed states was $388 million (Table 1).

Table 1. 2008 estimate of State Wildlife Action Plan restoration and management costs for projects that could be completed within 18 months.

State	Project examples	Cost
Alaska	Rat prevention and control to protect seabirds and other wildlife	$850,000
Arizona	Grassland and wetland restoration; water development	$2,880,000
Arkansas	Restore streamside buffers; prescribed fire; forest thinning; exotic species control; native plant reestablishment.	$5,850,000
California	Restore lands damaged by wildfire; wetland management and restoration; juniper removal; wildlife fencing; remove and prevent invasive species; stream restoration	$149,765,100
Connecticut	Invasive species removal, stream restoration, dam repair, grassland management	$2,069,100
Delaware	Oyster-bed seeding; shoreline stabilization; invasive species control; stream restoration; install wildlife-friendly crossings	$6,587,000
Florida	Manage invasive species; employ fire strike teams; reforestation, erosion control and invasive species control on public lands	$58,760,000
Georgia	Forest and grassland restoration on public lands; prescribed burning; invasive species control	$236,500
Hawaii	Install ungulate-proof fencing to conserve endangered species; remove introduced sheep and goats	$1,500,000

Idaho	Stream restoration of steelhead habitat; remove fish passage barriers; reestablish spawning habitat and improve riparian habitat	$1,442,000
Illinois	Wetland restoration and creation; reforestation; stream restoration; restoration of Lake Michigan ecosystem; install bat cave gates; invasive plant control; prairie restoration; natural area restoration	$48,900,000
Iowa	Conduct forest management on public and private lands; do seedings and control woody invasive species on native prairies on public and private lands; wetland restoration	$600,000
Kansas	Control invasive aquatic species; assist private landowners with patch-burn grazing in the Flint Hills	$2,200,000
Kentucky	Remove fish/mussel passage barriers; remove debris from sinkholes; create ephemeral ridgetop wetlands; wetland creation	$970,000
Louisiana	Control and prevention of invasive species such as feral hogs and nutria	$450,000
Massachusetts	Invasive species removal and forest management on public and private lands	$11,000,000
Michigan	Control invasive species and forest management on public and private lands	$5,250,000
Minnesota	Tallgrass prairie restoration; prescribed burning; invasive species control; reforestation; shallow water habitat restoration	$2,100,000
Missouri	Restore early successional habitat; wetland creation; forest management on private and public lands	$9,500,000
Nebraska	Conduct prescribed burning; invasive species management; tree removal on native prairies; timber stand management; install fencing to benefit wildlife	$7,140,305
Nevada	Restoration of sagebrush, priority wetlands, riparian areas and watersheds to benefit wildlife	$2,000,000
New Hampshire	Early successional habitat restoration; aquatic habitat restoration; seabird island management	$1,150,000
New Jersey	Construct artificial reef; restore wetland, grassland and shrubland habitat; remove invasive species; dam removal; install wildlife passages	$16,489,200
New York	Control invasive species; grassland and forest management; stream and wetland restoration	$920,980
North Carolina	Wetland maintenance and enhancement	$3,000,000
Ohio	Restore native mussels; control invasive species; prairie, stream and wetland restoration	$1,550,000
Oklahoma	Control invasive species such as salt cedar, eastern red cedar and invasive aquatics	$12,000,000
Oregon	Use community-based conservation to protect riparian habitat and control invasive species; juniper control in sage brush/steppe; feral swine removal	$4,585,000
Pennsylvania	Protection of bat caves; wildlife nest boxes; restoration of early successional habitat	$704,000
South Dakota	Control invasive species; implement grazing management; fence riparian areas; habitat management	$914,000
Texas	Remove woody vegetation and other invasive species; rehabilitate fire and hurricane damaged habitat; management of at-risk bats; construct protective fencing	$9,061,820

Utah	Habitat restoration through the Watershed Restoration Initiative	$10,000,000
Vermont	Forest management planning; invasive species management; early successional species management	$5,040,250
Wisconsin	Control invasive species and restore natural communities on state natural areas	$1,000,000
Wyoming	Wetland and riparian development and enhancement	$1,500,000
Total		$387,965,255

The surveys conducted by AFWA revealed the need for a more rigorous survey and confirmed that most states lack a detailed estimate of their funding needs for State Wildlife Action Plan implementation. For states that could provide data, there was a wide range in funding estimates. States with ambitious goals to accelerate land protection had the highest funding needs, whereas those states with modest land-protection goals and a management focus had the lowest estimated funding needs. The pilot survey helped identify major categories for implementation costs. The categories identified as part of the survey include land protection, public lands management, private lands management, research, monitoring, inventory, education and outreach. There likely are other categories that still need to be identified.

In 2008, AFWA produced a report, "State Wildlife Action Plans: From Vision to On-the-Ground Action." It includes examples of State Wildlife Action Plan implementation projects in every state and territory. The report shows that state fish and wildlife agencies are working with a diverse array of partners and using innovative projects to implement their plans. However, current funding levels are preventing states from addressing the needs of the majority of species in greatest need of conservation.

Development of State Wildlife Action Plans in every state and territory was an historic accomplishment. The plans used the best available science to identify species and habitats in greatest need of conservation, key threats and the actions necessary to overcome threats. The plans also included broad collaboration with each state's conservation community. Federal agencies, such as the U.S. Fish and Wildlife Service, U.S. Forest Service, Natural Resources Conservation Service, Department of Defense, Department of Transportation, and many private conservation organizations are using State Wildlife Action Plans to improve the effectiveness of their conservation programs.

As part of the planning process, many states produced maps that identified key habitats and/or landscapes that should be conserved. The maps are helping states communicate the importance of landscape-level conservation and are spawning new public/private sector conservation partnerships. Private sector entities, such as land trusts and state and federal agencies, are using the maps as a new planning tool to direct conservation funding better.

The State Wildlife Grants program has provided state fish and wildlife agencies with an important source of funding to build infrastructure needed to conserve fish and wildlife. Improved collaboration with the private conservation community has led to new partnerships and a greater sense of shared responsibility. Although the State Wildlife Grants program remains a key source of funding for State Wildlife Action Plan implementation, state funds, federal programs (such as the conservation title of the Farm Bill) and private foundations (such as the Doris Duke Charitable Foundation) also have become increasingly important as funding sources. However, the need for sustained, dedicated funding for State Wildlife Action Plan implementation remains the largest obstacle.

For the first time in history, state fish and wildlife agencies have a clear picture of the species that are in greatest need of conservation, their threats and the actions necessary for their conservation. State fish and wildlife agencies have entered a new era of collaboration with the public and private sectors. With many existing partnerships in place and potential new collaborations possible, the principal missing ingredient is sufficient funding to do the work identified in State Wildlife Action Plans. Without a significant investment in these plans, opportunities to stem the decline of many species may be lost forever.

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Paying the Piper Now: Will Delayed Implementation of the State Wildlife Action Plans Result in Higher Costs?

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Reliable estimates of investment costs and associated benefits are crucial for developing and implementing public policies to establish a comprehensive national habitat conservation system. In order for conservation managers and policymakers to make the case for increased habitat conservation investments, information will be required on cost and benefit levels and how these vary across land protection strategies. In this paper, we provide estimates of the economic costs and benefits of establishing a national habitat conservation system.

Methodology

A complete explanation of the cost methodology reported here is available in Casey et al. (2008). In general, using a representative sample of State Wildlife Action Plans (SWAP), the costs for a comprehensive *national* habitat conservation system are estimated for four land-protection strategies: fee-simple purchase; rental/lease; permanent easements; and payments to landowners to manage for biodiversity values. We compare cost estimates for 10-, 20- and 30-year time periods for the conservation of about 12 percent (218 million acres) of the continental United States. Cost estimates are for habitats that are classified as endangered or at-risk and currently are in private ownership. We assume that the total national acreage would be protected in equal annual increments for each time period. With the exception of the base year, we assume a 3-percent annual increase in real land costs and that all protection strategies are equally viable in all parts of the United States. The cost estimates do not reflect present values. For easements, we assume that there are no public management costs because landowners selling development rights would be responsible for habitat management.

The methodology for estimating the cost of a national habitat conservation system consists of five discrete steps: (1) estimate the size of the *total* focal opportunity area to be protected, as identified in the sample SWAPs; (2) determine which portions of state opportunity areas currently are unprotected; (3) define land-use/cover types in unprotected opportunity areas; (4) based on steps 1 through 3, conduct an overall spatial analysis of total unprotected area by land-use category for each state; and (5) provide cost estimates for four land-protection strategies.

Estimation of Land Area

To identify unprotected focal areas and to quantify their size and land cover composition, we analyzed geographic information systems (GIS) files or other data sets for focal conservation areas, land ownership and land cover using ArcGIS 9.1. Focal area and land cover data were provided by the state wildlife agencies, the Gap Analysis Project (GAP) and the U.S. Geological Survey or were located on state GIS data clearinghouse websites.

This first step estimates the total national conservation acreage based on a sample of states that identified geographically specific "focal conservation opportunity areas" within the SWAPs. For these opportunity areas, we then identified the percentage land area already protected through some form of public ownership or conservation status to derive an estimate of the size of the focal area that currently was *unprotected*. For unprotected focal areas, the third step consisted of identifying major land cover types (agricultural, pasture/grassland, forest, etc.) and estimating the acreages for each. The fourth step aggregated steps one to three into an overall spatial analysis. The sample size for this analysis consisted of 18 states for which sufficient spatial information was available.

There were three criteria for determining which states could be included in estimating costs: those that had maps of focal conservation opportunity areas; protected versus unprotected areas that could be spatially differentiated; and those for which land-use/cover could be determined. The states that met these criteria were Delaware, Florida, Georgia, Illinois, Iowa, Kentucky, Massachusetts, Maryland, Missouri, Montana, North Dakota, Nebraska, New Hampshire, New Jersey, Oregon, Tennessee, Virginia and Wyoming. The spatial analysis is restricted to *terrestrial* opportunity areas in these states.

For distinguishing between protected and unprotected focal areas, we included a wide range of landownership types in the "protected" category. Public lands, including federal (but excluding Indian trust lands), state and locally owned lands were all considered protected. Land parcels in private conservation (owned or managed by a land trust) and conservation easement lands were considered protected. In states where we used GAP stewardship data, we considered any land parcel with a management status of 1 to 3 as protected.

The overall spatial analysis entailed overlaying datasets for the total and protected focal opportunity conservation areas using ArcGIS 9.1. Using this overlay, polygon areas were estimated to derive protected and unprotected focal area acreages. Using the focal conservation and protected areas layers, we created a new layer of unprotected areas. Table 1 shows the total and percentage acreages identified as protected and unprotected focal areas for 18 states. With the exception of Delaware, total estimated state focal areas exclude excavated lands, open water and areas classified as developed. Across our sample, the total unprotected focal was estimated at about 69 million acres, or an average of 12 percent of the total land area of the 18 states (Table 1). Applying this percentage to the total area of the continental United States yields a national conservation opportunity area of about 218 million acres.

Table 1. Unprotected focal areas in sample states (acres).

State	Unprotected acreage within conservation focal areas	Total state acreage	Unprotected area as percentage of the state
Delaware	113,195	1,251,200	9
Florida	3,065,409	34,558,080	9
Georgia	3,302,888	37,068,160	9
Illinois	164,181	35,579,520	0.46
Iowa	650,000	35,760,000	2
Kentucky	3,076,078	25,428,480	12
Massachusetts	1,195,190	5,016,320	24
Maryland	1,670,108	6,256,000	27
Missouri	5,096,597	44,094,720	12
Montana	3,954,524	93,155,840	4
Nebraska	14,305,198	49,201,920	29
New Hampshire	343,615	5,740,160	6
New Jersey	700,000	4,748,160	15
North Dakota	3,400,000	44,156,160	8
Oregon	4,949,529	61,441,920	8
Tennessee	5,786,573	26,380,800	22
Virginia	2,299,290	25,342,720	9
Wyoming	14,717,889	62,147,200	24
Total	68,790,264	597,326,360	
Average			12

Estimation of National Protection, Transactions and Management Costs

National costs were derived from state-level data for fee-simple purchase, easements, management only and rentals. Cost data are adjusted to reflect 2007 price levels and, with the exception of land rentals, are weighted by land-use/cover category. A more detailed description of cost-estimation methods is found in Casey et al. (2008).

In addition to per-acre total cost estimates, we provide estimates for stewardship/management costs associated with fee-simple purchases and for transaction costs incurred in processing easements. Limited information is available on the type and level of easement transaction costs, either in absolute terms or as a percentage of the cost of purchasing development rights. We rely mostly on information gathered from the land trust community, land managers and other key sources.

Estimated costs represent *national* averages that were aggregated from state-level data for various land-protection strategies. Thus, they reflect an array of ecological and economic conditions. These estimated costs aggregate various purchase, easement and rental programs (private, state, federal) across several land types (grasslands, wetlands, productive agricultural and ranchland, forest land, etc). Therefore, for any particular geographical area (local or state), national averages could either be over- or underestimates. For decision makers at the local and state levels, a more precise analysis is recommended. The eventual allocation of public funds to protect lands identified in the SWAPs should be based on actual cost at the local/state level. The results presented in this report are useful for informing policy makers about how much funding will be required for establishing a *national* habitat conservation system.

Fee-simple acquisition costs. Fee simple acquisition cost estimates are based on average private sector purchase costs of cropland and pasture lands, and public purchases of forest land, grassland and rangeland. Per-acre costs for cropland and pasture land reflect commercial transactions between private parties for continued production purposes. For forest and grazing lands, public fee-simple purchases represent conservation acquisitions.

For private commercial transactions, we utilized state sales data compiled by the U.S. National Agricultural Statistics Service (2006). For fee-simple public purchases of forest land, we utilized sales statistics from the 2006 federal Forest Legacy Program (FLP). We also utilized multi-agency transactions compiled by the Trust for Public Land (TPL). Federal acquisition data include cost information from the National Park Service, the U.S. Fish and Wildlife Service, and the Coastal and Estuarine Land Conservation Program.

For fee-simple purchases, we derived a *weighted* average cost by accounting for the relative proportion of different land cover types. We calculated a weighted estimate by employing information from 17 states for which we had detailed land cover data within unprotected conservation focal opportunity areas, and applying the proportion of land-use types from the sample to the lower 48 states. Details of the weighting procedure can be found in Casey et al. (2008). The *national average* per acre weighted fee-simple cost is estimated at $2,355 per acre.

Management costs for fee-simple purchases. To estimate the habitat-management costs of lands protected via fee-simple purchase, we used 2006 budget figures for the National Wildlife Refuge System (NWRS). We selected the NWRS data for two primary reasons. First, the data are consistent with respect to how management costs are defined across geographic space. Cost estimates at the state and local levels, whether incurred by public or private (e.g., land trusts) entities, are highly variable due to different definitions of what constitutes a management activity. Second, the NWRS sample frame is representative of the entire United States. The data reflect budgeted costs for 529 sites across several ecological zones. Budgeted amounts do not necessarily represent the financial resources *required* to manage the refuges effectively for wildlife values. Therefore, we increased the total budgeted per-acre level by about 91 percent, as recommended in a report by the Cooperative Alliance for Refuge Enhancement (2007). With this adjustment, management costs are estimated at about $23 per acre per year in 2007 dollars. For the case in which existing private landowners would be engaged in managing for biodiversity values, this estimate is likely too high, as certain capital equipment and building expenditures would not have to be incurred.

Conservation easement costs. In estimating easement costs, we utilized information from public programs across an array of land-use types. For federal and state conservation easement programs, there are both mid-term (30-year) and permanent easement options. Cost data for permanent and 30-year easements were combined because they could not be separated within the data sets we were given. Still, it should be recognized that for any nonpermanent easement, landowners will revisit the decision when an easement period is about to expire and any decision to renew the easement will be based on the economic circumstances at that time. Easement costs are based on data from four federal easement programs and state-level easement information assembled by TPL. These programs include the Farm and Ranchland Protection Program, Wetland Reserve Program, Grassland Reserve Program (GRP) and FLP. We estimated the national average weighted easement cost at about $897 per acre.

Easement transaction costs. Transaction costs generally are defined as those costs incurred in the process of selling and buying goods and services. In the case of habitat conservation easements, buyer transaction costs include expenses for surveys, appraisal, environmental assessments, title search and insurance, legal costs for creating easements, staff time, transfer taxes, and recording and monitoring. In some cases, especially those acquisitions that involve public entities, transaction delays also may represent significant opportunity costs. The challenge with estimating buyer transaction costs is that they rarely are documented as separate expenditures. There are no centralized databases that systematically record these costs. To address this issue, we queried key informants who have experience in negotiating and completing easements. Across our sample, the average transaction cost is estimated at about $144 per acre. Thus, the total national average cost for easements plus transactions costs is estimated at about $1,041 per acre.

Land rentals/leases. For land rental/lease costs, we assumed that a landowner receiving the rental/lease payment is responsible for maintaining the habitat values of the land. We obtained land-rental data from two main sources: the USDA National Agricultural Statistics Service (2006) and the U.S. Natural Resources Conservation Service for the Conservation Reserve Program and the GRP. Data from the former reflect the price of leasing private crop and pastureland for production purposes. Depending on the state, commercial rents for cropland could be higher or lower than where land is rented for conservation purposes. As with the national fee-simple purchase and easement cost estimates, national private and public costs associated with land rentals represent 2006 payment levels that are aggregated over all states and land-use categories. The *national* average land-rental cost is estimated at $37 per acre per year in 2007 dollars.

Cost Estimate Results

Table 2 shows our national cost estimates for conserving an estimated 218 million acres using various strategies over the 10-, 20- and 30-year periods. These estimates indicate that the least costly alternative over all time periods is to compensate landowners for managing for biodiversity conservation. This is followed by land rentals, easements, and fee-simple purchase and management. Over a 10-year conservation period, the undiscounted, least-cost option for protecting 12 percent of the continental United States is to pay landowners to manage for biodiversity values at an estimated cumulative cost of about $32.5 billion (Table 1). Since management costs are recurrent, however, cumulative costs for a 20-year period are about $76 billion and, for 30-years, about $138.5 billion.

Table 2. Cost of protecting land over different time periods.[a]

	10 years	20 years	30 years
Fee-simple costs	$588.2	$689.3	$813.6
Management costs	$32.5	$76.2	$138.5
Fee-simple costs plus management costs	$620.7	$765.5	$952.1
Conservation easement costs	$224.1	$262.6	$310.0
Transaction costs	$35.9	$42.1	$49.7
Conservation easement costs plus transaction costs	$260.0	$304.7	$359.6
Rental agreement costs	$52.7	$123.4	$224.4

[a]In billions of 2007 dollars.

Fee-simple purchases with management costs within the 10-year conservation period would be about $621 billion. They would increase to nearly $952 billion over 30 years. Of course, annual management costs would continue to be incurred indefinitely beyond any given acquisition period.

The cost of conservation easements, including initial one-time transaction costs, would amount to about $260 billion over 10 years, but would increase to about $305 billion for the 20-year time frame and nearly $360 billion over 30 years.

If all identified conservation lands were rented/leased within a 10-year time frame, the cost would be about $53 billion. For the 20- and 30-year time frames, rental costs would increase to about $123 billion and $224 billion, respectively. Like management costs, however, rental payments would continue to be incurred indefinitely.

There are two conditions relative to fee-simple purchase and easements which make rentals less financially attractive. First, rental payments would continue to increase indefinitely. Casey et al. (2008) showed that easements become more cost-effective than land rental/leases at year 40. Cumulative land rental/lease costs increase to about $435 billion in year 40, compared with the 30-year cumulative easement costs of about $360 billion. Over the longer term, conservation easements become relatively more cost-effective.

For fee-simple purchases, habitat management costs would constitute an on-going expenditure beyond each of the selected time periods. For example, assuming a 20-year acquisition period, ongoing management costs between years 20 and 30 increase the cumulative fee-simple cost to about $904 billion.

The relative effectiveness and efficiency of various protection strategies will depend on biological and economic conditions at the local level. In reality, a mixture of strategies, including paying landowners to manage for wildlife habitat, will be employed to implement the SWAPs. Despite the long-term drawbacks of land rental, renting may be a viable short-term option if the goal is to achieve species adaptation to climate change. Alternatively, those areas seen as crucial for habitat connectivity over the long term may warrant permanent protection through easements or fee-simple purchases.

In the future, the cost of a national habitat conservation system may have to be adjusted upwards for two reasons. First, large investments in conservation lands identified by SWAPs may initiate unintended dynamic market feedbacks by causing land prices to increase. Land prices could be driven up as a result of an expected decrease in the available area for development and/or through speculative purchases. The second factor may be the impact of increased worldwide demand for biofuel and food, both of which can drive up rural land prices.

Eventually, the competiveness of land rental over the fee-simple purchase protection strategy will be minimized. This essentially is due to the difference between annual rental rate increases and expected increases in management costs over time. The average projected land-rental rate is about $37 per acre per year. In comparison, annual management costs for fee-simple purchases are relatively less at about $23 per acre. Because management costs would increase less in absolute terms than would rental rates over time (assuming the same rate of price increase of 3 percent applies in both markets), at some time beyond year 50, it will be cheaper to own and manage habitats rather than to rent them continually (Casey et al. 2008).

There are a few principal factors that determine the cost levels presented in Table 1. First, the longer the time frame for completing the necessary levels of land protection, the more expensive it gets. Recall that we use an annual real (i.e., net of inflation) rate-of-increase in land prices of 3 percent. In addition, annual rates for habitat management also will increase. There is a possibility that future land prices in areas identified by SWAPs could be bid up significantly either because of large decreases in the supply of developable land, land speculation prior to public acquisition or higher-value competing uses.

Second, it is likely that the real level land conservation costs will reflect the use of a combination of protection strategies. Some lands may need to be purchased, others leased or rented, and some will be protected best through permanent conservation easements. In addition, some lands within a national habitat conservation system may only require the payment of management costs to landowners who agree to maintain quality habitat on their property.

Third, to maintain conservation effectiveness and flexibility in the face of a dynamic environment (e.g., climate change), it may be more *biologically and economically* efficient to engage in flexible short-to medium-term land lease agreements, even though these types of agreements might be more costly over the long term.

Fourth, even though public purchase of land may be the most "secure" means of achieving habitat-conservation objectives, it is important to remember that fee-simple purchases entail ongoing habitat-management costs--an expenditure that typically has not been well funded by state and federal governments in the past.

Last, the cost of a national habitat-conservation system is comparable with other large-scale infrastructure investments. If we assume a 30-year acquisition period, the most expensive strategy of fee-simple purchase plus management cost, is estimated to be about $952 billion. Paying landowners to manage for biodiversity values or for protection through easements costs about $139 billion and $360 billion, respectively. In contrast, it is estimated that urban building construction costs will reach about $1 trillion per year over the next 30 years. Annual federal expenditures on transportation infrastructure are about $47.8 billion. According to a recent report by the American Society of Civil Engineers (2009**)**, the expected total costs over the next 20 years for replacing or repairing our road, levee, bridge, water treatment and utility grid facilities could be as high as $10.4 trillion. Purchasing and managing a national habitat-conservation system over the same 20-year period would be less than one-tenth of this amount.

Estimated Economic Value of Benefits Provided by Unprotected SWAP Focal Lands

Land conservation generates a wide range of benefits that carry economic values. A portion of these values is reflected in market transactions, e.g., spending by participants for outdoor recreation activities, and timber or water sales. Other values may not be captured in market transactions, but generate real benefits through their contribution to the biophysical, emotional and spiritual well-being of individuals and communities. Examples of the latter benefits are the conservation of species or ecosystems valued by humans and the maintenance of ecosystem services not (yet) sold in markets, such as the water purification or storm water buffering functions provided by wetlands.

Although valuation methods applied by natural resource economics have seen dramatic advances recently, generating reasonably accurate value estimates for unstudied areas still is a challenging task because most ecosystem service values vary across space and time (Boyd and Banzhaf 2007, Brown et al. 2007, Salzman and Ruhl 2000, Troy and Wilson 2006). Valuation of ecosystem service benefits in many cases is hampered by a lack of data on the flow of biophysical functions.

Results from existing valuation studies can be used as a basis for developing benefit estimates for unstudied sites. However, the validity of such benefit transfer-based estimates depends on the degree to which differences between the

sites in terms of resource and user characteristics can be adjusted. For some ecosystem services, large numbers of observations allow the estimation of meta-analysis-based valuation functions that can be tailored to match the characteristics of particular unstudied sites (Kroeger et al. 2008). For others, too few previous estimates exist, and benefit transfer is restricted to application of an average value from one or a few studied sites that match the target site. For other sites, there may not be a good match with existing studies, and new research will be needed.

Importantly, the site specificity of many ecosystem services means that value estimates should be generated for individual sites. Thus, any attempt to develop an estimate of the total economic value of the goods and services provided by large aggregates of conservation lands, such as the entirety of the lands identified in the SWAPs, can only be expected to yield findings that are of the right order of magnitude. Nevertheless, we provide a first-order approximation of the expected benefits generated from conserving the estimated 218 million acres of unprotected focal opportunity areas, by extrapolating the benefits estimated for five diverse focal opportunity areas (Oregon, New Mexico, Nebraska, Florida and Maine).

Kroeger (2008) conducted an in-depth analysis of the economic values generated by a sample of these five opportunity areas. These areas ranged from 29 to 4,900 square miles and were characterized by differences in ecosystem type, land-ownership composition, and variety and intensity of human uses. The study estimated that these areas collectively generated total benefits of $280 million to $570 million per year in 2004 dollars (Table 3). It should be noted that these values represent underestimates of the full economic benefits associated with the sites due to a lack or incompleteness of data for many services.

Table 3. Estimated annual economic benefits provided by selected conservation opportunity areas (Kroeger 2008).

		Estimated annual value in study area and ecosystem[a]				
Use	Type: Benefit	Florida wetlands/lowlands (825 mi^2)	Nebraska riparian (658 mi^2)	New Mexico forest (4,900 mi^2)	Oregon coastal/estuary (29 mi^2)	Maine upland/wetland (60 mi^2)
Direct	Timber Extraction	(✓)	-	3.2	✓	0.07 [b]
	Nontimber Products	?	-	3.7	?	✓
	Grazing	(✓)	-	2.2	0.28	?
	Commercial Fishing	-	-	-	0.9	-
	Recreation	2.6 [b]	23-37	70	1.0-2.3 [b]	0.25 [b]
	Camping	(✓)	(✓)	✓	?	?
	Backpacking	(✓)	?	✓	?	?
	Picnics/general relaxation	(✓)	(✓)	✓	(✓)	✓
	Fishing	1.2	8.1-13.1	✓	1.0-2.3	(✓)
	Hunting	0.03	(✓)	✓	?	(✓)
	Wildlife watching	0.13	(✓)	✓	(✓)	(✓)
	Skiing	1.2	15.0-23.4	✓	(✓)	(✓)
	OHV use	-	-	✓	-	(✓)
	Mountain biking	?	-	✓	?	(✓)
	Research and Education	-	-	(✓)	?	(✓)
	Property Value Premiums	(✓)	(✓)	5.3	(✓)	(✓)
		6.5	0.5		0.42	2.0 [b]
Indirect	Ecosystem Services					
	Water supply	135-306	0.6-3.6	22-120	0.2-0.6	2.9-4.0
	Water quality	130-285	?	(✓)	?	2.7
	Species habitat provision	(✓)	(✓)	(✓)	(✓)	(✓)
	Biodiversity maintenance	(✓)	(✓)	(✓)	(✓)	(✓)
	Temperature modulation	(✓)	(✓)	(✓)	(✓)	(✓)
	Crop pollination	(✓)	(✓)	(✓)	?	?
	Carbon sequestration	(✓)	?	?	?	?
	Air quality	5.1-21.2	0.6-3.6	22-120	0.2-0.6	0.2-1.3
		(✓)	?	(✓)	?	?
Passive	Provision of Habitat for Threatened, Endangered, Rare or "Charismatic" Species	(✓)	(✓)	(✓)	(✓)	(✓)
Total annual value of quantified uses[a]		$145 - $315	-	$106 - $205	$3 - $5	$5 - $6

[a]In millions of 2004 dollars.

[b] Incomplete estimate; ? not documented; - not applicable; ✓ included in analysis; (✓) relevant but not quantified due to lack of data.

The five case study sites comprise a total of about 4.1 million acres, of which nearly 3.7 million acres are undeveloped (not in cultivation, residential or extractive use). The number of ecosystem goods and services varies across the five areas (Table 3). As a result of the wide range of goods and services, and in per-unit values, average per-acre benefits between sites vary considerably among the five conservation opportunity areas.

By employing average per-acre values reported in Kroeger (2008), we use three approaches to develop a range of benefit values generated by the estimated 218 million acres of unprotected focal opportunity areas. In the first approach, the average per-acre values from the five areas are multiplied by the ratio of the total acreage of all unprotected focal areas (218 million acres) to the total undeveloped acreage in the five case studies (3.7 million acres). This is equivalent to applying the area-weighted average per-acre value. In the second approach, we multiply the *unweighted* average per-acre values by the same land base ratio used in the first approach. This yields higher average per-acre values because the largest case-study area had the lowest estimated per-acre values. In the third approach, we multiply the lowest and highest of the average per-acre values of the five areas by the same land ratio used in the other approaches. This yields the largest difference between low and high focal area benefit values.

The three approaches generate different benefit values (Table 4). Using the lowest and highest estimates (third approach, Table 3) yields what might be considered *first approximation* outer envelope estimates of the potential annual benefits generated by the 218 million acres of unprotected focal opportunity area. Annual benefits are estimated to be between $8 billion and $186 billion per year in 2007 dollars. The lower-bound and upper-bound estimates may be biased downward because they are based on per-acre values that account for only a portion of the total goods and services provided by the five sites.

Table 4. Estimated value of benefits provided by all unprotected SWAP focal lands.

	Annual benefits of five case study unprotected areas[a]		Annual benefits provided by 218 million acres of unprotected focal areas[b]	
	Low estimate	High estimate	Low estimate	High estimate
Approach 1	84	170	18.3	37.0
Approach 2	194	352	42.4	76.6
Approach 3	37	855	8.2	186.4
Mean			22.9	100.0

[a]In 2007 dollars per acre.
[b]In billions of 2007 dollars.

It is not clear *a priori* which of the three approaches is most appropriate, as this would require knowledge about how valuable economically the unprotected focal areas in the United States are on average compared with the five areas examined by Kroeger (2008). Therefore, Table 4 also provides the means of the annual benefit estimates generated by the three approaches for the 218 million acres, which are $23 billion and $100 billion for the low and high estimates, respectively.

To make the annual benefit estimates in Table 4 comparable to the cost estimates, Table 5 shows the aggregate 20-year benefits generated by the 218 million acres. The first two rows of Table 5 show undiscounted 20-year values for the third approach (outer envelope) and the mean value of all three approaches, respectively. For the outer envelope approach, the low estimate is about $163 billion and the high-end estimate is more than $3.7 trillion. Using the mean value of all three approaches, benefits range from $459 billion to about $2 trillion over the 20-year period. Rows 3 and 4 of Table 5 provide benefit estimates for the same categories, but in terms of present value, use a 3-percent annual discount rate.

Table 5. Twenty-year aggregate benefit, lowest and highest and present value, estimates provided by unprotected focal areas (source: Table 4).

	Benefits provided by 218 million acres over 20 years[a]	
	Low estimate	High estimate
Outer envelope (Approach 3)/Present value[b]	$163/$121	$3,727/$2,773
Mean of Approaches 1 through 3/Present value[b]	$459/$341	$2,000/$1,488

[a]In billions of 2007 dollars.
[b]Discount rate used in present value calculations is 3 percent per year.

Table 6 provides a first approximation of a (undiscounted) cost-benefit ratio for conserving 218 million acres as part of a national habitat conservation system by the various conservation strategies over a 20-year period. We use the benefit estimates generated by average values of the three approaches previously described. Because of their lower costs, the management and rental/lease options have the largest cost-benefit ratios, followed by permanent conservation easements and fee-simple purchases. It is significant to note that, with the exception of the low cost-benefit estimate (0.6) for the fee-simple plus management option, all strategies have a positive and significant cost-benefit ratio. In public policy analysis, a cost-benefit ratio above 1 is considered to be a sufficient public investment. If we consider that the 0.6 cost-benefit estimate for fee-simple purchase and management costs over 20 years does not account for several direct and indirect use benefits (Table 3), then it is possible that all the conservation scenarios will have cost-benefit ratios well above 1. Thus, the establishment of a national habitat conservation system would result in net public economic benefits and would be competitive with other types of public investments. Future research should be aimed at fine-tuning the results presented in this paper at both the regional and national scales. However, as a first approximation, we find that the market and nonmarket economic benefits of establishing such a conservation system would far outweigh estimated costs and would contribute to the dual objective of facilitating habitat and species adaption to climate change over the medium term to long term.

Table 6. Estimated cost-benefit ratio of conserving 219 million acres over 20 years (based on undiscounted means of average benefits in row 2, Table 5).

Conservation strategy	Low estimate	High estimate
Management costs	6.0	26
Fee-simple costs plus management costs	0.6	2.6
Conservation easement costs plus transaction costs	1.5	6.6
Rental agreement costs	3.7	16.1

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WORKSHOP: Climate Change and Managing Fish and Wildlife

Coordinators: John Cooper, *Bipartisan Policy Center*
Douglas Inkley, *National Wildlife Federation*

[Editors' note: The following paper was an exemplary contribution to the all-day workshop on Tuesday, March 17. It and some of the other workshop presentations will be featured in the Projects window at www.wildlifemanagementinstitute.org.]

Managing Fish and Wildlife Habitat in the Face of Climate Change: USDA Forest Service Perspective

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Introduction

The spatial and temporal scope of environmental change anticipated during the next century as a result of climate change presents unprecedented challenges for fish and wildlife management. The Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC 2007) suggested impacts from climate change on natural systems will be more grave than earlier projections. Recent reports on emissions, glacial melting, and sea level rise (Kintisch 2009) intimate that even the 2007 IPCC report is conservative in its assessment. The challenges posed by climate change cut across all aspects of land and resource management – difficult decisions will need to be made in the areas of agency policy, scientific research, and prioritization of resource management actions.

Crafting land management in the face of long-term climate change adds new complexities to an already difficult task of managing habitat to support sustainable populations of fish and wildlife. For instance, uncertainties in the trajectories of climate and ecosystem response alter the way the managers must deal with uncertainty and employ science to meet management goals and objectives (Millar et al. 2007, Safford et al. 2008). Furthermore, biologists must manage species in a world where stationarity cannot be assumed— the management environment will change in a directional way rather than varying around some mean condition (Milly et al. 2008). Finally, planning must focus on spatial and temporal scales that are broader and longer than typically considered.

Over a century of managing National Forests and Grasslands provides the Forest Service unparalleled experience in the social, political, and ecological complexities of broad-scale land and resource management. The complexity posed by climate change is, for the most part, not new. As noted in the U.S. Climate Change Science Program's Synthesis and Assessment Product 4.4 (Julius et al. 2008:1-2) "[m]any existing best management practices for 'traditional' stressors… have the added benefit of reducing climate change exacerbations." Forest Service resource managers have always worked in an environment of uncertainty and the agency has access to a wide array of management tools to meet even the most novel resource needs, including a research branch to constantly modernize the tool box. Although climate change represents a major challenge for fish and wildlife management, the Forest Service is uniquely well-positioned to meet the challenge.

The U.S. Forest Service recently mobilized to meet the challenges posed by climate change. Building on a century of climate-related studies, for the last two decades Forest Service Research and Development has directly investigated

climate change and its implications for the nation's ecosystems. In 2008, agency leadership developed a set of strategic focus areas to guide coordinated research/management action to confront the challenges of climate change on National Forest and Grasslands. This focus on climate change harnessed significant energy and interest within agency personnel and motivated a myriad of local and national activities to manage fish and wildlife in the face of climate change.

This invited review explores progress that the research and management branches of the Forest Service have made addressing fish and wildlife management in the face of climate change. In this paper, we begin by providing an overview of the agency's research and management context. Key to this overview is the Forest Service Strategic Framework (U.S. Forest Service 2008a) for responding to climate change, which defines three broad categories of agency goals that guide the incorporation of climate change into natural resource management. Through a series of case studies we demonstrate progress the agency has made in each of those broad goal categories. We conclude by reviewing those features of the Forest Service that position it as an important partner in addressing climate change, and by highlighting some of the management, research, and policy opportunities that must be seized if fish and wildlife are to be successfully managed in the face of climate change.

Forest Service Management Context

Organizational, Ecological, and Geographic Context

The outcome of resource management depends critically on the social, ecologic, and geographic context of management (Groves et al. 2002, Stokstad 2005, Lindenmayer et al. 2008). Therefore, understanding the dominant factors establishing the management context for the agency helps define the limitations and opportunities for management of fish and wildlife habitat by the agency.

Organizational context. Throughout a century of land management, the Forest Service has responded to uncertainty and gaps in knowledge through research/ management partnerships The organizational structure of the Forest Service provides a strong science-management link that facilitates rapid development and testing of management approaches. In particular, close research/ management relationships afforded by a shared administration for both the management and research arms in a single agency provide the opportunity for clinical trials and formal adaptive resource management (Walters 1986). A broad system of 80 experimental forests and ranges along with 193 million acres of National Forest System lands provide unparalleled opportunities to observe and manipulate ecosystems, organisms, and ecological processes in the field. Pertinent examples include ground-breaking studies of watershed processes (Likens and Bormann 1995), long-term response of forest to disturbance (Troendle and King 1985), and approaches to actively managing forest to support old forest associated wildlife (Carey 1995, 2000). The support provided by Forest Service research extends directly to evaluating fish and wildlife management in the face of climate change (Koopman et al. 2009).

Ecological and geographic context. Among land owners and stewards in North America, the Forest Service is in a unique position to influence fish and wildlife resources owing to the size of its geographic footprint. The Forest Service is directly responsible for stewardship of over 193 million acres (78.1 million ha) of wildlands from Alaska to Puerto Rico and influences management of nearly 430 million acres (174 million ha) of state, private, and tribal forests through partnerships with states, tribes, and private landowners. The vast geographic range of Forest Service jurisdiction extends from approximately 18° to over 61° north latitude, representing ecosystems from tropical rainforests to deserts, coastal ecosystems to high alpine sites, grasslands and shrublands to hardwood and conifer forest. This results in considerable variation, not only in the environments themselves, but in the climate change trends these environments are likely to experience.

Layered upon the foundation of ecological and environmental variation is an extremely complex geographic pattern of land ownership. Interactions between these ecological and jurisdictional patterns influence the array of management options and scope of influence the Forest Service has on fish and wildlife habitat management.

- East of the Missouri and Mississippi Rivers, the Forest Service manages a minor portion of the landscape that consists primarily of former private lands that were abandoned at the beginning of the last century after failed attempts at agriculture. Forest Service ownership in the midwestern and eastern United States is comprised mostly of relatively small parcels dispersed across many states and jurisdictions. The complex pattern of land ownership presents a major challenge to coordinating management in response to climate change across this broad and diverse area.
- In contrast to the ownership pattern in the eastern United States, the Forest Service is responsible for management of vast areas of contiguous landscapes in 11 western states and Alaska. This ownership pattern presents opportunities for broad coordinated planning and implementation not possible in the East. Despite broad similarities in land ownership patterns across the western states — for example the Forest Service generally manages most middle- to high-elevation lands — patterns of climate change are expected to differ in the direction

and magnitude of change in precipitation, temperature, and seasonal patterns. Hence, in the West, impediments to Forest Service efforts to manage fish and wildlife habitats under changing climates will probably be due to strong ecological and climate gradients and the scale of the problem rather than jurisdictional complications.

- Checkerboard ownership on many National Grassland units in the Great Plains presents a particularly challenging context for executing consistent management across broad areas. Given limited topographic relief in the Great Plains, the consequences of climate change may result in especially dramatic shifts in species distributions and unique challenges for managers (Peterson 2003, Johnson et al. 2005). In this region, the patchy nature of remaining Great Plains habitat, a diverse and changing economy, and varied land ownership patterns may interact with climate to create a "wicked" problem in fish and wildlife conservation (*sensu* Rittel and Webber 1973).

The effectiveness of actions taken by the Forest Service to manage fish and wildlife habitat in the face of climate change will depend critically on the particular ecosystems being managed and geographic variation in patterns of neighboring land ownership. History, geography, ecological conditions, and patterns of climate change have influenced, and will continue to influence, agency management of fish and wildlife habitat. Careful, deliberate consideration of context will improve the development of policy, crafting of adaptation and mitigation plans, and implementation of active management. Before reviewing several case studies, we first provide an overview of the agency's strategic framework and use it to organize our case study examples.

Strategic Framework

In 2008, the Forest Service drafted and adopted a "Strategic Framework for Responding to Climate Change" (hereafter referred to as "Framework") to provide broad guidance as the agency plans and implements land management activities in a climate change context (U.S. Forest Service 2008a). The document includes seven "strategic elements" that, for the purposes of this paper, are grouped into three goal categories: Foundational, Structural, and Action goals. These categories and the accompanying strategic elements, outlined in Table 1, are discussed in further detail below.

Foundational Goals: Science and Education strategic elements. The two strategic elements in the "Foundational Goals" group, science and education, address core information and awareness needs of the agency. The "Science" strategic element identifies the need to enhance the environmental, social, and economic knowledge and information base that informs actions on the ground, particularly mitigation and adaptation activities. This includes, but is not limited to, application of downscaled models, vulnerability analyses, and evaluating trade-offs in management considerations.

The "Education" strategic element highlights the essential importance of common understanding and awareness of climate change among agency employees and the public. As the climate changes, acclimating managers to this new language, its application, and the changing demands on management is a high priority.

Structural Goals: Policy and Alliances strategic elements. As a governmental entity and public lands manager, the Forest Service must have certain "infrastructure" in place in order to make decisions and carry out management. This must be done legally, appropriately, and in keeping with scientific information, management needs, and the public's vision. The two key pieces of this "infrastructure" include climate change relevant and responsive policy ("Policy" strategic element) and collaborators within and beyond National Forest System boundaries to broaden and deepen the Forest Service's own expertise, perspective, and effectiveness ("Alliances" strategic element).

Action Goals: Adaptation, Mitigation, and Sustainable Operations strategic elements. Climate change literature relevant to management actions has converged on the "adaptation" and "mitigation" breakdown (language adopted by the Forest Service in the Framework). Specifically, adaptation addresses those actions that enable or enhance the capacity of natural systems to adapt to climate change stressors and maintain ecosystem functions and services, while mitigation accounts for those activities that address ecosystem capacity to store carbon.

Successful mitigation is contingent on well-adapted systems, and this relationship is an important consideration in future management. In order to emphasize the key importance of adaptation in management success, agency leadership has emphasized that the Forest Service should be an "international model of excellence in sustaining forest health, diversity, and productivity in the face of climate change" (U.S. Forest Service 2008b). Given management's uncertainty associated with climate change, collaboration between research and management that is focused on experimentation and monitoring, with an eye toward modifying approaches, will be invaluable as climate change adaptation becomes a focus of fish and wildlife habitat management.

The Forest Service also acknowledges its responsibility and contribution to greenhouse gas (GHG) emissions. As such, the Framework includes a "Sustainable Operations" strategic element. Under this element, the agency observes and modifies business practices and other operations for potential GHG emissions reductions opportunities (Table 1).

Case Studies

Forest Service efforts to manage fish and wildlife habitat under changing climates vary from recent actions motivated entirely by climate change concerns, to existing projects or plans that have been modified to accommodate anticipated climate shifts. In this section, we highlight a small subset of actions being taken by the Forest Service at national, regional, and local scales to illustrate the scope and breadth of climate change response in Forest Service management. Our case studies are organized by the three Framework goal categories described above (Table 1). We stress programs and projects focused on adaptation strategies rather than mitigation, since these more directly relate to fish and wildlife habitat conservation and management.

Table 1. Overview of U.S. Forest Service "Strategic Framework for Responding to Climate Change." (U.S. Forest Service 2008a).

Goal Category	Strategic Elements
Foundational	**Science:** Advance our understanding of the environmental, economic, and social implications of climate change and related adaptation and mitigation activities on forests and grasslands.
	Education: Advance agency and public awareness and understanding regarding principles and methods for sustaining forests and grasslands, and sustainable resource consumption, in a changing climate.
Structural	**Policy:** Integrate climate change, as appropriate, into Forest Service policies, program guidance, and communications and put in place effective mechanisms to coordinate activities across the management, research, and extension branches of the agency.
	Alliances: Establish, enhance, and retain strong alliances and partnerships with federal agencies, state and local governments, tribes, private landowners, non-governmental organizations, and international partners to provide sustainable forests and grasslands for present and future generations.
	Adaptation: Enhance the capacity of forests and grasslands to adapt to the environmental stresses of climate change and maintain ecosystem services.
Action	**Mitigation:** Promote the management of forests and grasslands to reduce the buildup of greenhouse gases, while sustaining the multiple benefits and services of these ecosystems.
	Sustainable Operations: Establish the Forest Service as a leading example of example of a green organization by reducing our operations environmental footprint.

Foundational Goals

Forest Service resource managers are poised to take action to adapt to climate change. However, uncertainty regarding the actual trajectories of change may encourage the status quo and a reluctance to modify traditional management practices. A period of delay in applying climate change motivated action unavoidably occurs. Specifically, science must develop an informational basis for action, management must consider uncertain outcomes of given actions, and agency leadership needs to build new policy and strategies. Furthermore, outreach and education programs must be developed to inform agency personnel and the public of the rationale for management response to climate change. During the next few years, considerable energy and attention will be given to activities related to the foundational elements of the climate change strategic plan, Science and Education. Three projects representing collaboration between research and management illustrate the diverse approaches the Forest Service is taking in the areas of Science and Education.

Applying historical ecology to land management. In February 2008, Science included the headline "Stationarity is Dead…" (Milly et al. 2008). The directionality of climate change has undermined our (already tenuous) ability to rely on static models of past climates and ecosystem response as reference conditions. The likelihood that future climates will be novel in some respects (Williams and Jackson 2007) adds to the uncertainty that assessment of past reference conditions (e.g., assessments of the "historical range of variability" [HRV]) will have much value in setting desired conditions. In April 2008, the National Forest System, in collaboration with The Nature Conservancy, held a workshop entitled "Incorporating Historical Ecology and Climate Change into Land Management." The workshop, involving managers and scientists from multiple federal agencies, three conservation organizations, and several universities, wrestled with how to effectively use history to inform management in a changing world (Safford et al. 2008). The workshop concluded that it is no longer appropriate to automatically use historical information to establish static targets for restoration, conservation, or land management. Approaches that assume "stationarity"—the theory that environments vary about some constant, long-term average—are no longer defensible. That said, historical ecology continues to represent critical context for land

management planning. Past ecological responses to global change are essential to understanding changes currently occurring in the earth's natural systems, and paleoecology will always be a primary source of information for the development of mechanistic models of global change and ecosystem response. Results of the historical ecology workshop are being incorporated into agency policy and multiple teams are working to synthesize results of the workshop for publication in a variety of outlets.

Climate-conscious planning in the Greater Yellowstone region. Developing sound adaptation strategies that meet management goals requires an understanding of potential future climate at a scale relevant to the management unit, and an assessment of likely consequences for local ecological systems. Scientists from Forest Service Research are partnering with the Shoshone National Forest and neighbouring land managers to assess and manage the effects of climate change on critical public lands within the Greater Yellowstone region. This effort has resulted in down-scaled climate models to project future climate for the Greater Yellowstone region. Based on these projections, significant changes in vegetation communities are predicted (Wertz and Smith 2009).

Armed with this new information, research/management collaborators are working together to identify analysis, planning, and implementation tools that can help managers build from projections for a range of possible future conditions toward management direction to achieve multiple resource objectives. Examples of difficult issues managers face include: energy needs, the decline of white-bark pine, and beaver activity.

- Energy needs are driving massive increases in hydrocarbon extraction in the southern part of the Greater Yellowstone region. How will the Forest Service and other management agencies balance the development of oil and gas fields with fish and wildlife needs in conditions made continuously more stressful by climate change?
- Declines in white-bark pine as a result of blister rust and bark beetles will significantly reduce a major food source for grizzly bears, nutcrackers, and other species. Climate change may be increasing the rate of white-bark pine mortality. How should managers respond?
- American beaver currently occupy only a portion of suitable drainages in the Greater Yellowstone region. Through beaver "management" of water resources and riparian vegetation, beaver interact with system elements that are likely to change in response to climate. How, where, and why should managers encourage or discourage beaver activity?

This research/management collaboration will provide processes and approaches to answer these and similar questions for managers across the nation.

Managed Relocation/Assisted Migration. The current combination of habitat and climate change pose a daunting challenge for many species. Rates of global change, from human habitat alteration to modifications of the atmosphere, are so high that many species lack the capacity to "track" these changes through natural dispersal (Malcolm et al. 2002). Increasingly fragmented landscapes can sever corridors, disrupting dispersal. "Managed relocation" (MR); also known as "assisted migration" is the human-aided movement of species adversely affected by global change. Goals of MR include conservation of biodiversity, reduction of extinction risk, enhancement of evolutionary potential, and maintenance or augmentation of ecosystem services.

MR has promise as a conservation strategy, but unintended consequences could have serious costs. For example, MR may assist in rescuing a species from extinction, but may introduce a species into habitat where it becomes invasive. The Forest Service is a partner in a national effort to develop a framework for understanding the degree to which MR could achieve its objectives, the risks that it might incur, and strategies that could be used for implementation (Safford et al. 2009). Participants in the Managed Relocation working group represent federal land management agencies, academic institutions, and non-governmental organizations involved in conservation. Focus areas include: (a) basic goals of MR, (b) identifying trigger conditions for the implementation of MR, (c) genetic considerations, (d) legal, policy and ethical questions, (e) reconciling MR with existing conservation strategies, and (f) evaluating community- and ecosystem-level interactions. The working group has developed four criteria for comparing strategies for conservation of a target species: the risk of negative impact of climate change (or other anthropogenic disturbance) for the target species, the risk of collateral effects, and both the feasibility and acceptability of the strategy in question. Subgroups are currently carrying out studies that use well-known groups of plant and animal taxa to pilot test the process. Concurrently, Forest Service policy analysis specialists are examining the business mission of the agency in this important activity.

Structural Goals

Although consensus about the nature and extent of climate change impacts on ecological systems is emerging, there remains considerable equivocation as to how climate trajectories will play out (Schröter et al. 2005). Complex

feedbacks between climate, the biota, land use, and land cover can foil even generalized predictions of how ecosystems may respond to some future realized climate (Hansen et al. 2001, Parmesan and Yohe 2003).

These dynamic and uncertain times suggest to some that a new conservation paradigm is needed (Winter 2009), but what form this new paradigm may take is unknown. Resource management policies that shape future wildlife and fish management under climate change will need to promote the development of decision-support tools that accommodate uncertainty and are open to the management of wildlife and fish over broad spatial and temporal scales. Interdisciplinary and multi-jurisdictional partnerships will also be required to successfully implement management actions.

Here we outline three efforts that illustrate the development of decision-support tools that inform fish and wildlife habitat management over broad scales, represent collaborative projects that developed a framework for adaptation planning, and demonstrate nation-wide assessment of wildlife management in the face of climate change.

Adaptation Planning Process. Climate change literature includes a growing number of general recommendations to conserve species and ecological systems across large geographic scales (e.g., Hannah and Hansen 2005, Scott and Lemieux 2005, Millar et al. 2007). While helpful, these recommendations have thus far failed to motivate much on-the-ground management (Cross et al. in review). Working in collaboration with the Wildlife Conservation Society, National Centre for Ecological Analysis and Synthesis, and scientists from throughout North America, the Forest Service is participating in the design of a planning framework to facilitate development of specific management actions to conserve fish and wildlife at local scales (Cross et al. in review). This effort develops a practical, participatory climate change adaptation framework to translate general recommendations into adaptation strategies for particular landscapes, species, or ecosystems. The framework addresses the uncertainty and complexity of understanding climate change impacts. It also considers the specific climate, ecological, and sociopolitical contexts that motivate management decisions. Late in 2008, a large group of state biologists in Montana used this framework to evaluate adaptation approaches for vertebrate species of conservation concern. In February 2009, this framework was introduced to nearly 40 Forest Service biologists in a workshop format. In both cases, post-workshop questioning demonstrated that biologists felt empowered to consider adaptation actions to meet a wide range of management objectives.

Assessing climate stress to terrestrial wildlife for conservation planning. State agencies that have management responsibility for wildlife incorporate vast cumulative experience in wildlife conservation. However, the dispersed nature of 50 state fish and game agencies poses problems for collaboration and integration for issues, like climate change, that transcend political boundaries. In the fall of 2006 the Forest Service initiated a study to develop a terrestrial wildlife habitat climate stress index that will seek to define areas of the country that will most likely be affected by significant changes in the climate regime, vegetation, and productivity. The study was jointly funded by the Forest Service as part of their national resource assessment responsibilities[1] and the National Council for Science and the Environment through the recently established Wildlife Habitat Policy Research Program. The Program's mission is to develop and disseminate new information and tools to accelerate the conservation of wildlife habitats by: (a) synthesizing literature on climate change impacts on terrestrial habitats; (b) quantifying the stress on terrestrial wildlife habitats from predicted changes in climate, vegetation, and productivity; and (c) reviewing management recommendations proposed in the State Wildlife Action Plans (SWAPs), which represent each state's approach to maintaining viable populations of wildlife over the long term. The SWAPs review revealed that less than half of the state plans addressed climate change as a threat to wildlife. A Forest Service-led team published a summary of the SWAPs review and recommended measures to improve treatment of climate change in state conservation planning (Joyce et al. 2008).

Development of nation-wide guidance to incorporate climate change into Forest Service resource planning. In January 2009, the Forest Service released guidance to provide the necessary level of consistency across the agency to treat climate change in land management planning (U.S. Forest Service 2009a). The guidance instructs National Forests and Grasslands to consider climate change in all relevant plan components. Moreover, the best available science should be used, including models at the finest level of resolution available, to evaluate climate change impacts on natural resources as a basis for recommending resource management strategies that address both adaptation and mitigation. The guidelines stress flexibility in crafting management that is relevant to local issues and circumstances. Agency direction specifically acknowledges the continued relevance of historical ecology in providing context within which to consider climate change. When planning projects, the agency may propose activities to increase the adaptive capacity of ecosystems, address the impacts of climate change on managed landscapes, or simply promote the sequestration of carbon. It is currently not feasible to quantify global climate effects from individual projects, but decisions can be informed by quantifying differences in carbon storage or greenhouse gas emissions among alternatives. The climate change guidelines, which direct the agency's approach to individual projects as well as Forest-wide plans, help motivate managers to carefully consider the influence of climate change on critical wildlife species, and influence management decisions on mitigation efforts. In project and forest

[1]The Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378, 88 Stat. 476, as amended; 16 U.S.C 1600[note], 1600-1614) requires the Forest Service to conduct national assessments of resource status and trends every 10 years.

planning, Regional Offices and Forest Service Research will have a substantial role in assisting in the assimilation and evaluation of scientific information relevant to the different National Forest and Grassland units.

Draft land management plans (LMPs) for the Cimarron-Comanche National Grassland, the National Forests in Mississippi and Uwharrie National Forests are the first LMPs developed under the 2008 National Forest Management Act, Planning Rule. Each draft plan includes discussion of the impact of climate change. To varying degrees, these documents address application of adaptation and mitigation. Models of future climates and ecosystem responses suggest that the Gulf Coastal Plain will be hotter and drier, will burn more frequently, and will experience increased hurricane and tornado activity in the coming years (U.S. Forest Service 2009b). In response, the National Forests in Mississippi have adopted an aggressive longleaf pine restoration program for most of their management units, because longleaf pine, which has been largely replaced by other species due to fire suppression and plantations, is significantly more resilient to fire, drought stress, and high winds than other native pines. Attention to climate change goes beyond plans developed under the 2008 Rule. For example the recent revision to the Tongass National Forest plan includes a monitoring plan that incorporates climate change considerations, and climate change on the forest is discussed at length in the Environmental Impact Statement.

Action Goals

As a land management agency, the Forest Service has the capacity to influence fish and wildlife through changes in habitat across vast portions of the United States through active programs focused on adaptation and mitigation. The agency's institutional focus is currently on foundational and structural goals, as outlined above. Developing a strong science and policy foundation is critical prior to implementing broad adaptation and mitigation programs. With some exceptions, most project planning and implementation occurs on landscapes much less than 100,000 ha in area, an area that may represent only a few grid cells in the climate, ecosystem, and biogeographical models currently used to make future predictions. Managers have limited local information on projected climate trajectories or impacts upon which they might base site-specific management decisions. As a consequence, some resource managers are taking more general action, preparing the landscapes they manage for rising temperatures and increased probabilities of extreme events, such as flooding, drought, fire, and insect outbreaks. Some of their guiding principles are "uncertainty," "resilience," "adaptation" and "mitigation" (Millar et al. 2007). The three case studies below are emblematic of the efforts being made by land and resource managers in the Forest Service to both adapt to and mitigate the tremendous— yet incompletely understood— changes in ecosystems that will likely occur over the coming century.

Aquatic species management: restoration, triage, and adaptation. The strong relationships between water temperature, oxygen, and aquatic species performance make aquatic habitats especially vulnerable to climate change. Cold-water fisheries have experienced substantial reductions in distribution over the past century and climate projections predict further declines (Rahel et al. 2008). Adaptation strategies to conserve aquatic vertebrates represent a particularly clear example of the importance of integrating science and practice to make difficult decisions to prioritize management actions. Examples from eastern and western cold-water fisheries illustrate progress the Forest Service has made in this arena.

In the east, brook trout managers are using new models of stream temperature patterns to guide restoration efforts for trout in northeastern streams (Hudy et al. 2008). Based on new understanding of fine-scale stream temperature patterns and associated models, biologists identify reaches with high potential for restoration. For instance, recovery of riparian vegetation along a 500-m reach in Virginia dropped the maximum water temperatures by 2 degrees C and created miles of additional cold water habitat (Fink 2008). Equally important, biologists can identify locales where restoration may not be helpful, resulting in significant savings through triage. On the Bighorn National Forest in Wyoming, a collaborative team of scientists and managers demonstrated the value of a more complex system of stream classification to identify restoration priorities for cutthroat trout (Wohl et al. 2007). Coupled with information on projected stream temperatures, the classification, which considers stream gradient, flow regime, and bedrock geology, can identify restoration and climate adaptation priorities for entire drainage basins.

A simple, direct application of adaptation management is motivated by the understanding that extreme precipitation events are likely to be more common and severe in the future. The active aquatic passage program in the Forest Service is asking whether road culverts are likely to fail, resulting in significant stream damage if flood events occur. As a result, new and replacement culverts are being oversized to accommodate extreme events expected in the future. In a more general sense, the aquatic passage program, which seeks to design culverts to improve connectivity, improves mobility within stream networks allowing for adaptation of aquatic organisms to changes in local conditions. On many Forests, decisions are also being made to close road segments as part of the national travel management mandate. Some of these decisions are being made with climate change impacts in mind.

Restoration of frequent-fire ecosystems: habitat, forest resilience, and carbon benefits. Many pine-dominated forest types in the United States were historically characterized by frequent, low severity fires, and relatively open stand structure dominated by mature trees. Examples include longleaf pine (*Pinus palustris*) in the Southeast, and ponderosa pine (*P. ponderosa*) and Jeffrey pine (*P. jeffreyi*) in the Southwest and California. In these forest types, a long history of timber harvest, historical grazing, land conversion, and more than 70 years of fire suppression have led to significant losses in habitat and changes in forest structure and composition (Lander et al. 1995, Allen et al. 2002). Vegetation change in these forest types has led to dramatic impacts on the biota, especially in the Southeast, where more than 30 animal and plant species associated with longleaf pine are now listed as threatened or endangered. In ponderosa and Jeffrey pine forests, highly competitive and shade tolerant conifers (often fir species [*Abies spp.*]) threaten the remaining large trees through competition for water and nutrients and increased susceptibility to high severity crown fire (Allen et al. 2002). In recent years, extensive areas of these pines have been lost to drought and insect attack, and increasingly severe wildfires (Allen and Breashears 1998, Miller et al. 2009). In longleaf forests, loblolly (*P. taeda*) and slash pine (*P. elliottii*), have largely taken the place of longleaf, and are now planted in dry, fire susceptible sites that were dominated by longleaf under the frequent-fire regime. Hurricane and fire damage to these stands is much higher than in open stands still dominated by longleaf pine (U.S. Forest Service 2009b).

In forests characterized by frequent fire, restoration efforts can serve multiple purposes. In the Southeast, replanting of longleaf pine in forest stands and reintroduction of frequent fire is commonly used to create and maintain habitat for the red-cockaded woodpecker (*Picoides borealis*). However, with greater understanding of climate change, these forest practices are recognized as producing multiple benefits. Longleaf pine is more resistant to pathogens and insect attack, it is less damaged by high winds than other pines with which it grows, and it is more tolerant of warmer, drier conditions (Burns and Honkala 1990, U.S. Forest Service 2009b). In addition, mature longleaf pine grows more rapidly than other local pine species, it has a relatively high wood specific gravity, and it may capture more carbon belowground. Taken in combination, restoration of longleaf pine-dominated forest appears to be the best bet for both wildlife habitat maintenance and carbon sequestration on these landscapes (U.S. Forest Service 2009b). Revised Forest Plans on the Uwharrie and Mississippi National Forests are noteworthy examples of restoration built on these principles.

Work in western ponderosa and Jeffrey pine forest has shown similar results. These species are highly fire and drought tolerant, and under optimal conditions they live long and attain massive size (Burns and Honkala 1990). Numerous studies have shown that ponderosa and Jeffrey pine stands that have been restored to open structure are much more likely to survive fire. Recent modeling suggests that long-term carbon sequestration is maximized where open habitats have been restored and frequent fire reintroduced (Hurteau et al. 2008). In summary, restoration efforts in forests historically characterized by frequent, low severity fires may serve multiple purposes, including the achievement of desired ecosystem and species diversity conditions, the enhancement of resilience to climate change, and maximization of the long-term potential for carbon storage.

Genetic and species strategies for reforestation. Current and projected future rates of climate change are thought to exceed the capacity of long-lived organisms like trees to evolve or disperse. Maximum documented post-glacial migration rates for trees were on the order of 100 meters per year, averaged over millennia, whereas recent modeling suggests that many species will have to average much more than 1 kilometer per year to track current rates of temperature change in the northern hemisphere (Malcolm et al. 2002). To meet evolutionary challenges, Rehfeldt et al. (2001, 2002) estimated that up to 12 generations and 1,200-1,500 years would be necessary for populations of two pine species to evolve to new optima for likely future climates. Other studies have found that in a century, regenerating conifer populations will require characteristics currently 500-1,000 meters lower in elevation or as far south in latitude as 2 to 5 degrees (St. Clair and Howe 2007). These alarming scenarios have led researchers, managers, and the public to openly advocate the managed relocation (or assisted migration) of tree species to areas that are climatically more appropriate for their long-term survival. Most active management of distributions would occur as part of reforestation efforts after stand-replacing disturbances.

The Forest Service is currently developing a policy analysis concerning managed relocation of tree taxa, but on-the-ground action is already occurring in both the science and management arms. For instance, the Pacific Northwest and Pacific Southwest Research Stations are collaborating on the development of a variety of tools for identifying the best-adapted tree populations for given climate change scenarios. Examples of these tools include guidelines for considering genetic and silvicultural options for responding to climate change (TAFCC 2008), and an internet-based tool that will allow users to characterize the current climate for a given seed zone (a “seed zone” is an area within which soil and climate are sufficiently uniform that it is expected that seed can be freely moved without problems of maladaptation). Predicted geographic locations of that seed zone’s climate are then mapped under a number of future scenarios. On the National Forests, scientific recommendations to “hedge bets” in reforestation practices were being heeded locally in the 1990s (Ledig and Kitzmiller 1992), but the increasing rapidity of climatic changes is leading to more broad application of this advice. As a business practice, many foresters now routinely (though mostly informally) mix seed sources to increase genotypic diversity, and move populations from lower to higher elevations and sometimes from south to north slopes.

Incense cedar (*Calocedrus decurrens*) represents an interesting example. In California incense cedar density is already increasing in many mixed conifer stands as a result of fire suppression, but further increases are expected under warmer climates and higher pollutant loads (Miller and Urban 2000, Arbaugh et al. 2003). Evidence suggests that this species will thrive under future climates and be a good choice for increased inclusion in planting mixes. However, certain guilds of birds consistently avoid incense cedar (e.g., Airola and Barrett 1985) and more widespread planting of the species will likely have important effects on avifaunal composition and possibly diversity. These sorts of secondary effects are likely to surprise us at every turn.

Conclusions and Recommendations

The U.S. Forest Service has embraced the management challenges posed by climate change. The agency's "Strategic Framework for Responding to Climate Change" (U.S. Forest Service 2008a) provides broad direction to guide future management and research to address climate change in all aspects of agency work. With this Framework, the agency has attempted to integrate climate change throughout its organizational structure. As a result, significant momentum is building from the individual Ranger District level up through the Washington Office to actively manage fish and wildlife habitat in a way that is mindful of climate change.

The case studies reviewed above serve two purposes. First, they provide substantive examples where the building momentum throughout the agency has manifested as successful fish and wildlife habitat management designed to address the stewardship challenges of climate change. Second, they serve to highlight features of the Forest Service that position it to be an effective partner in managing fish and wildlife resources in the 21st century. These features include: the agency's vast geographic footprint and highly diverse landbase, its strong internal ties between management and research, its considerable experience dealing with broad-scale land management, and its acquired expertise dealing with risk and uncertainty in resource management.

The Forest Service's Geographic Footprint

The vast geographic area managed by the U.S. Forest Service makes it one of only a few land stewards that can have a significant impact on how fish and wildlife respond to climate change. The ranges of many animal species are found entirely or primarily on Forest Service-managed lands, and in many cases the agency manages remnant habitats that have disappeared on adjacent private lands. The agency will play a substantial role in the development and implementation of adaptation strategies for managing fish and wildlife habitat. Nevertheless the geographic extent of the agency's reach results in numerous neighbors and the need to cultivate partners in carrying out sustainable fish and wildlife management. Strong and continuous collaboration with state and federal agencies, private landowners, and nongovernmental organizations will be necessary to successfully implement management across landscapes at scales necessary to make real impacts on populations and habitats of fish and wildlife.

The Management-Research Linkage

The strong, historical relationship between Forest Service Research and Development and its management arms (National Forest System, State and Private Forestry, and International Programs) has supported and motivated management response to the challenge of climate change. In the face of uncertainty and significant risk of unintended consequences, the agency must make an even more conscious effort to forge substantive ties between research and management. Informal approaches to field experiments or casual implementation of adaptive management (sensu Walters 1986) are unlikely to provide useful answers. New approaches, or more sophisticated implementation of existing approaches, that are based on close collaboration between scientists and managers developing well-monitored 'clinical trials' will be necessary. Furthermore, more effective communication between managers and scientists is necessary. This may demand new organizational structures, shifts in culture, and a conscious effort to bring scientists and managers together to work on important problems.

Broad-Scale Assessments

As climate change impacts manifest across broad areas, the appropriate decision-making level for various activities may shift to cover larger, more regional scales. This scope of consideration is not new to the agency. For example, the Forest Service has considerable experience developing broad-scale land management plans and associated broad-scale assessments (e.g., Sierra Nevada Framework, Northwest Forest Plan), and it has developed or contributed to

dozens of species-specific conservation assessments and recovery plans that span multiple states (e.g., grizzly bears, sage grouse, Canada lynx). As demonstrated in our case study on Yellowstone (see page 9), the Forest Service is currently working to provide science assessments that include down-scaled climate scenarios and ecological threat assessments that stem from those scenarios. These examples, among others, suggest the agency is well positioned to develop the broad-scale management plans that will be a critical element of climate-change response.

Accounting for Risk and Uncertainty

Land management decisions to meet multiple resource objectives involve trade-offs (Loomis 1993: 197), where benefiting one resource or service may compromise another. As the Forest Service considers management actions that address climate change, trade-offs will continue to emerge. The Forest Service's recent experience with developing assisted migration strategies for tree species, setting priorities for cold water fishery restoration, and restoring frequent-fire ecosystems (see case studies pages 8, 9) provide some insight into the wicked problems associated with difficult risk analyses. In each case, the complex decision space that defines the climate change problem includes multiple, and often opposing, desirable outcomes supported by various stakeholder groups. For this reason, technical analyses alone will not provide an adequate decision-support framework (USDA 2004). Effective decision-making will require a functional science-management link, and a robust, two-way relationship between the public and the Forest Service. Fortunately, the Forest Service has decades of experience collaboratively developing management plans to resolve complex resource issues and we have learned that complex challenges often manifest as opportunities for the agency. The uncertainty associated with climate change and the potential risk associated with novel and untested management practices will require altogether new levels of institutional flexibility. New tools or approaches to managing for uncertainty will become essential, and their development and implementation will offer new possibilities for integration across environmental, social, and economic realms. Tools such as scenario planning, sensitivity analysis, or risk analysis will need to be commonplace and incorporated into the agency's resource planning culture if adaptive management and monitoring needs are to be retooled to address climate change.

Although the Forest Service has built considerable momentum and demonstrated a broad commitment toward addressing climate change threats to fish and wildlife, the challenge is considerable and the future uncertain. The case studies described in this paper illustrate the agency's capacity to develop knowledge and implement adaptation management to conserve fish and wildlife habitats. However, for the Forest Service to be successful, the examples we review here must, five years from now, represent the tip of an iceberg. Long-term, passionate, and focused management such as that displayed in the agency's 100-year history will be necessary if the collective stewards of fish and wildlife resources are to meet the challenge posed by one of the most significant environmental threats faced by humankind.

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Patrick Noonan Receives 2009 Grinnell Award

Renowned conservationist Patrick F. Noonan was honored with the 2009 George Bird Grinnell Memorial Award for Distinguished Service to Natural Resource Conservation. The Wildlife Management Institute (WMI) conferred the award during the 74th North American Wildlife and Natural Resources Conference, held last month in Arlington, Virginia.

The Grinnell Award was established in honor of George Bird Grinnell, a prominent and powerful voice for the nation's earliest conservation movement. Its honorees have demonstrated leadership, tenacity, and integrity in shaping fish and wildlife policy throughout the North American continent. "Pat Noonan has been a giant among conservationists across the nation for more than 35 years," observed Steve Williams, WMI President, when presenting the award.

Noonan served as the President of The Nature Conservancy and was cofounder and chairman of the board of the American Farmland Trust. In 1985, he established The Conservation Fund (TCF). As TCF chairman, and chairman emeritus, he has guided efforts to conserve more than 3.5 million acres of America's most precious landscape. The organization he founded has enlisted the financial support of more than 250 corporations and 300 foundations to create one of the most powerful land conservation organizations in the world.

Noonan's contributions to conservation include co-authorship (with Henry Diamond) of the influential book, *Land Use in America*. He has served on three Presidential commissions, is a trustee of the National Geographic Society, and sits on numerous corporate and academic boards.

Pat's lifetime contributions also include pioneering work to create conservation partnerships among federal and state agencies, non-profits, and business and industry. He pioneered the use of tax incentives, real estate deals, zoning regulations and smart growth to conserve the nation's natural resources. He took the leveraging of private-public funding from a concept to an extremely successful technique to achieve fish and wildlife conservation.

"All of us have been the beneficiaries of Pat Noonan's remarkable legacy of protecting national wildlife refuges, national parks and other of America's special places," said Williams.

Registered Attendance

Alaska
Doug Alcorn, U.S. Fish and Wildlife Service, Anchorage; Tim Bowman, USFWS, Anchorage; Ann Claerbout, HDR Alaska, Inc., Anchorage; Tina Cunning, Alaska Dept. Fish and Game, Anchorage; Anthony DeGange, U.S. Geological Survey, Anchorage; Gary Edwards, U.S. Fish and Wildlife Service, Anchorage; Glenn Elison, The Conservation Fund, Anchorage; Christopher Estes, AFWA/ADF&G, Anchorage; Lisa Evans, Alaska Department of Fish and Game, Anchorage; Herman Griese, Air Force 3 CES/CEVP, Elmendorf AFB; John Haddix, U.S. Army Alaska, Delta Junction; Geoff Haskett, U.S. Fish and Wildlife Service, Anchorage; Kelly Hepler, National Fish Habitat Board, Anchorage; Judy Jacobs, U.S. Fish and Wildlife Service, Anchorage; Cindi Jacobson, Alaska Department of Fish and Game, Anchorage; Steve Kessler, U.S. Forest Service, Alaska Region, Anchorage; Wini Kessler, Forest Service, Region 10, Juneau; Doug Larsen, Alaska Fish and Game, Juneau; Andrew Levi, Alaska Dept of Fish and Game, Anchorage; Thomas Liebscher, National Park Service, Fairbanks; Thomas Lonnie, Bureau of Land Management, Anchorage; Brad Meyen, Alaska Dept of Law, Anchorage; Jerome Montague, Alaskan Command, Elmendorf AFB; Russ Oates, USFWS, Anchorage; John Payne, North Slope Science Initiative, Anchorage; Bill Romberg, Alaska Dept. of Fish and Game, Anchorage; John Sandor, Retired U.S. Forest Service, Juneau; Mark Sledge, Air Force, Elmendorf AFB; Patrick Valkenburg, Alaska Department of Fish and Game, Juneau; Matthew Varner, Bureau of Land Management, Anchorage

Alabama
Dean Gjerstad, The Longleaf Alliance, Auburn; Chester McConnell, Wildlife Management Instititue- Retired, Daphne; Lisa Samuelson, Center for Longleaf Pine Ecosystems, Auburn University

Arkansas
Suresh Basnet, Tribhuvan University, Lalitpur; Drew Brighton, Wildlife Data Solutions, Little Rock; Carl Carlson; Arkansas State Military Dept., Ft. Chaffee; Daniel Farrer; Arkansas State Military Department, Fort Chaffee; David Goad; Arkansas Game and Fish Commission, Little Rock; Jeff Johnston, Wildlife Data Solutions, Little Rock; Lucy Moreland; Arkansas Game and Fish, Little Rock; Dustin Opine; Arkansas ARNG, Fort Chaffee; Beth Phillips; Arkansas ARNG, Fort Chaffee

Arizona
Aaron Alvidrez, Range Management Office, Luke AFB; Josh Avey, Arizona Game and Fish Department, Phoenix; Robert Broscheid, Arizona Game and Fish Department, Phoenix; John Eichinger, Safari Club International, Tucson; Randy English, U.S. Army Yuma Proving Ground, Yuma; Steve Filipek, Arkansas Game and Fish, Little Rock; Eric Gardner, Arizona Game and Fish Department, Phoenix; Rhett Johnson, The Longleaf Alliance, Inc., Andalusia; Abraham Miller-Rushing, The Wildlife Society and USA National Phenology Network, Tucson; Chantal O'Brien, Arizona Game and Fish Department, Phoenix; Sal Palazzolo, Arizona Game and Fish Department, Phoenix; Brian Powell, Pima County, Arizona, Tucson; Larry Riley, Arizona Game and Fish, Phoenix; James Douglas Ripley, Engineering-Environmental Management, Inc., Saint David; Mike Senn, Arizona Game and Fish, Phoenix; Thomas Skinner, USDA Forest Service Region 3, Tucson; San Stiver, Western Assoc. Fish and Wildlife Agencies, Prescott; William Van Pelt, Arizona Game and Fish Dept., Phoenix; Larry Voyles, Arizona Game and Fish Department, Phoenix; Kirk Young, Arizona Game and Fish Department, Phoenix;

California
James Asmus, AC/S Environmental Security, Camp Pendleton; Sandra Baldwin, NAVFAC SW, San Diego; Cheryl Carrothers, USDA Forest Service, Vallejo; Tammy Conkle, Naval Facilities Engineering Command Southwest, San Diego; Tom Esgate, Cooperative Sagebrush Initiative, Penn Valley; Mary Sue Fisher, USDA Forest Service - Region 5, Oakland; Bob Frost, Boone and Crocket, Lincoln; Bruce Hamilton, Sierra Club, San Francisco; Lisa Heffernan, NAVFAC SW, San Diego; Manny Joia, MCLB Barstow; , Barstow; Eric Kershner, USMC-Camp Pendleton, Camp Pendleton; Matthew Klope, NFESC, Port Hueneme; Mary Lamb, AF Western Regional Environmental Office, San Francisco; Dawn Lawson, NAVFAC Southwest, San Diego; Robert Lovich, U.S. Navy, San Diego; Lisa Markovchick-Nicholls, NAUFAC Southwest, San Diego; Tom McCabe, DOI USFWS Pacific Southwest Region, Sacramento; Sherri Miller, U.S. Forest Service, PSW, Arcata; Toni Mizerek, NAVFAC Southwest, San Diego; Amber Pairis, California Dept. Fish and Game, Sacramento; David Pease, CECOS, Port Hueneme; C.J. Ralph, U.S. Forest Service, Arcata; Jacqueline Rice, NAVFAC Southwest, San Diego; Rudy Rosen, Ducks Unlimited, Rancho Cordova; Martin Ruane, U.S. Navy (Naval Base Ventura County), Point Muav; Robert Schallmann, NAVFAC Southwest, San Diego; Roland Sosa, MCB Camp Pendleton, Camp

Pendleton; Marie Strassburger, U.S. Fish and Wildlife Service, Sacramento; John Wiens, PRBO Conservation Science, Petaluma; Christy Wolf, NAVFAC Southwest, San Diego

Colorado
Mary Anderson, HQ AFSPC, Peterson AFB; Carol Beidleman, National Park Service, Fort Collins; Del Benson, Colorado State University and McGraw Wildlife Foundation, Fort Collins; Richard Bunn, DPW Environmental Division, Fort Carson; Lew Carpenter, National Wildlife Federation, Boulder; Larry Clark, USDA/APHIS/WS/NWRC, Fort Collins; Coralie Cobb, Naval Facilities Engineering Command, Southwest, Lafayette; John Cornely, The Trumpeter Swan Society, Littleton; Thomas DeLiberto, USDA/APHIS/WS, Fort Collins; Antoine Dixon, U.S. Forest Service, Golden; Peter Dratch, National Park Service, Fort Collins; James Dubovsky, U.S. Fish and Wildlife Service, Denver; Matt Dunfee, Wildlife Management Institute, Durango; Michael Fall, USDA/APHIS/WS/NWRC, Fort Collins; Jeffrey Green, APHIS Wildlife Services, Ft. Collins; Steve Guertin, U.S. Fish and Wildlife Service, Denver; Jay Hestbeck, U.S. Geological Survey, Denver; Diana Hoff, Questar, Denver; Kimberly Kaal, Colorado Division of Wildlife, Grand Junction; Emily Kelley, Questar, Denver; Mitch King, Archery Trade Association, Golden; Robin Knox, Western Native Trout Initiative, Lakewood; Mark Konishi, Colorado Division of Wildlife, Denver; Elaine Leslie, National Park Service, Fort Collins; Brian Mihlbachler, U.S. Fish and Wildlife Service, USAF Academy; Jerry Mitchell, National Park Service, Fort Collins; Amanda Peyton, e2M, Englewood; Tom Remington, Colorado Division of Wildlife, Denver; Stan Rogers, HQ Air Force Space Command, Peterson AFB; Dave Sharp, U.S. Fish and Wildlife Service, Denver; Mike Simon, PCMS Transformation Team, Fort Carson; Casey Stemler, U.S. Fish and Wildlife Service, Denver; Jodi Stemler, Jodi Stemler Consulting, Littleton; Scott Stewart, Shell Unconventional Oil, Denver; Seth Swafford, USDA/APHIS Wildlife Services, Ft Collins; Stephen Torbit, National Wildlife Federation, Boulder; Jeffrey Ver Steeg, Colorado Division of Wildlife, Denver; Noreen Walsh, U.S. Fish and Wildlife Service, Denver; Tom Warren, Dept of the Army, Fort Carson; Greg, Watson, U.S. Fish and Wildlife Service, Denver; Gary C., White, Colorado State University, Laporte; Emily Jo, Williams, U.S. Fish and Wildlife Service, Denver; Janet Wise, National Park Service, Lakewood; Melanie Woolever, U.S. Forest Service, Golden; Chris Zimmerman, Dept of the Army, Fort Carson

Connecticut
Bill Brassard, National Shooting Sports Foundation, Newtown; Robert Delfay, Hunting Heritage Trust, Watertown; Lawrence Keane, NSSF, Newtown; Rick Patterson, SAAMI, Newtown

District of Columbia
Tyler Abbott, Bureau of Land Management; Maria Arnold, National 4-H Headquarters, CSREES, USDA; Bryan Arroyo, U.S. Fish and Wildlife Service; Dan Ashe, U.S. Fish and Wildlife Service; Carol Bambery, Association of Fish and Wildlife Agencies; Scott Bates, National Park Service; Michael Bean, Environmental Defense Fund; Andrea Bedell-Loucks, U.S. Forest Service; James Bedwell, USDA - Forest Service; Todd Bogenschutz, Iowa DNR; Brian Bohnsack, AFWA/USFWS; Marc Bosch, Forest Service; Wilhelmina Bratton, USDA Forest Service; Dr. Jean Brennan, Defenders of Wildlife; Chris Brown, USDA - Forest Service; Gordon Brown, Department of the Interior; Doug Burdin, Safari Club International; Kraig Butrum, American Wind Wildlife Institute; Mary Byrne, Bureau of Land Management; Gabriela Chavarria, Natural Resources Defense Council; Arpita Choudhury, AFWA; Jamie Rappaport Clark, Defenders of Wildlife; Bill Clay, USDA-APHIS-Wildlife Services; David Cleaves, USDA Forest Service; Antoinette Condo, U.S. Dept of State; George Cooper, Theodore Roosevelt Conservation Partnership; Jeff Crane, Congressional Sportsmen's Foundation; Drue DeBerry, American Forest Foundation; Ken Deslarzes, NFESC, Marine Ecological Dive Support; Jere Dick, USDA APHIS VS; Jim Dryden, BLM; Ronald Dunlap, USDA Forest Service; Lori Duplantier, NAVFAC Washington; Naomi Edelson, National Wildlife Federation; Peter Egan, Armed Forces Pest Management Board; Tom Egeland, Office of the Assistant Secretary of the Navy ; Jan Engert, U.S. Forest Service; Terrell Erickson, USDA; Olivia Ferriter, U.S. Department of the Interior; Dwight Fielder, Bureau of Land Management; Danielle Flynn, Bureau of Land Management; Thomas Franklin, Theodore Roosevelt Conservation Partnership; Gary Frazer, U. S. Fish and Wildlife Service; Melinda Gable, Congressional Sportsmen's Fdn.; Ralph Giffen, Forest Service; Rowan Gould, U.S. Fish and Wildlife Service; Estelle Green, Association of Fish and Wildlife Agencies; Deb Hahn, AFWA; Mary Hassell, HQ U.S. Marine Corps; Evan Hirsche, National Wildlife Refuge Association; Steve Hodapp, Bureau of Land Management; Matt Hogan, Association of Fish and Wildlife Agencies; Joel Holtrop, U.S. Forest Service; Mark Humpert, Association of Fish and Wildlife Agencies; Bengt Hyberg, USDA/FSA/AO/EPAS; Mike Ielmini, U.S. Forest Service; Bob Irvin, Defenders of Wildlife; Barton James, Ducks Unlimited; Peter Jenkins, Defenders of Wildlife; Jonathan Jourdane, Dept. of the Interior; Gary Kania, Congressional Sportsmen's Foundation; Hank Kashdan, U.S. Forest Service; Bill Knapp, U.S. Fish and Wildlife Service; Terry Knupp, USDA Forest Service; John Kostyack, National Wildlife Federation; Amy Krause, Bureau of Land Management; Olivia Kwong, Bureau of Land Management; Don Larsen, Washington Dept of Fish and Wildlife;

John Lewis, APHIS, USDA, Wildlife Services; Carol Lively, Forest Service-International Programs; Donald MacLauchlan, AFWA; Laura MacLean, Association of Fish And Wildlife Agencies; Andrew Manale, U.S.EPA; Jina Mariani, USDA Forest Service; Noah Matson, Defenders of Wildlife; Dr. Jonathan Mawdsley, The H. John Heinz III Center for Science, Economics and the Environment; Bill McGrath, Safari Club International; Malcolm McLeod, NQ USACE; Tom Mendenhall, Bureau of Land Management; Martin Mendoza, USDA-APHIS-Wildlife Services; Alan Mitchnick, Federal Energy Regulatory Commission; Raul Morales, Bureau of Land Management; Ralph Morgenweck, U.S. Fish and Wildlife Service; Laura Muhs, NAVFAC Washington ; James Murkin, Dept. of Interior-BLM; Priya Nanjappa, AFWA; Angela Nelson, Association of Fish and Wildlife Agencies; Peter Nelson, Defenders of Wildlife; Maribeth Oakes, The Wilderness Society; Kevin O'Donovan, Shell Oil Company; Peggy Olwell, Bureau of Land Management; Ryan Orndorff, U.S. Marine Corps; Benito Perez, U.S. Fish and Wildlife Service/Office of Law Enforcement; David Pivorunas, Forest Service; Karla Raettig, National Wildlife Federation; Bob Ratcliffe, Bureau of Land Management; Joe Reddan, U.S. Forest Service; Ronald Regan, AFWA; Teiko Saito, U.S. Fish and Wildlife Service; Jen Mock Schaeffer, Association of Fish and Wildlife Agencies; Paul Schmidt, Fish and Wildlife Service; Jamie Schwartz, USDA Forest Service; Lorri Schwartz, Naval Facilities Engineering Command HQ; Steve Segovia, USDA Forest Service; Anna Seidman, Safari Club International; Gregory Siekaniec, NWRS; Melissa Simpson, Pac/West; Gregory Smith, USDA Forest Service; Jane Smith, Smith and Jensen, LLP; William Spicer, Commander Navy Installations Command; Tim Spisak, BLM; Carol Spurrier, Bureau of Land Management; Bruce Stein, National Wildlife Federation; Elizabeth Stevens, Fish And Wildlife Service; Scott Sutherland, Ducks Unlimited; Richard Swanson, USDA Forest Service; Gary Taylor, Association of Fish and Wildlife Agencies; Katie Theoharides, Defenders of Wildlife; Anne Truslow, National Wildlife Refuge Association; Maria Vargas, NAVFAC WASH-PWD WASH; Geoff Walsh, Bureau of Land Management; Leslie Weldon, U.S. Forest Service; Bryant White, Association of Fish and Wildlife Agencies; Kristin Whitman, Shell Oil Company; Melinda Wilkinson, National Invasive Species Council; Lori Williams, National Invasive Species Council; Craig Woods, NAVFACHQ; Dan Wrinn, Ducks Unlimited; Christina Zarrella, Association of Fish and Wildlife Agencies; Tim Zink, Theodore Roosevelt Conservation Partnership

Delaware
Jeffrey Buler, University of Delaware, Newark; Jason Collins, Delaware State University Wildlife Society, Woodside; Rachel Emory, Delaware State University Wildlife Society, Dover; Rebecca Lynch, Delaware State University Wildlife Society, Dover

Florida
Carrie Backlund, Naval Air Station Key West, Key West; Jesse Borthwick, AFMC 46TW, Eglin AFB, Eglin AFB; Thomas H. Eason, Florida Fish and Wildlife Conservation Commission, Tallahassee; Mark Fredlake, Avon Park Air Force Range, Avon Park; John Galvez, U.S. Fish and Wildlife Service, Vero Beach; Don George, U. S. Air Force, Patrick AFB; Chris Horton, BASS/ESPN Outdoors, Lake Buena Vista; Brian Hostetter, NOAA, St. Petersburg; Barbara Howe, NAVFAC-SE, Jacksonville; Jason Kirkpatrick, 6 CES/CEVN, MacDill AFB; Ronald Labisky, University of Florida, Gainesville; Elizabeth Martin, U.S. Geological Survey, Gainesville; Douglas Nemeth, NAVFAC SE, Jacksonville; Mabel O'Quinn, 45 CES/CEVP, Patrick AFB; Patrick O'Rouke, University of Florida, Gainesville; Robert Southwick, Southwick Associates, Inc., Fernandina Beach; Crissy Sutter, Pandion Systems, Inc., Gainesville

Georgia
Liz Agpaoa, USDA Forest Service, Atlanta; Tim Beaty, U.S. Army, Fort Stewart; John Biagi, Georgia Wildlife Resources Division, Social Circle; Cynthia Bohn, U.S. Fish and Wildlife Service, Atlanta; Amadou Diop, National Wildlife Federation, Atlanta; Cynthia Dohner, U.S.FWS, Atlanta; Robert Drumm, U.S. Army, Fort Gordon; Jim Fenwood, USDA Forest Service, Atlanta; John Fischer, SCWDS, Athens; Jeffrey Fleming, USFWS-EA, Atlanta; Dan Forster, Wildlife Resources Division, Social Circle; Sam Hamilton, U.S. Fish and Wildlife Service, Atlanta; Deborah Harris, U.S. Fish and Wildlife Service, Athens; Todd Holbrook, Wildlife Resources Division, Social Circle; Noel Holcomb, Georgia Dept. of Natural Resources, Atlanta; Dennis Krusac, USDA Forest Service, Atlanta; Gregory Lee, Moody Air Force Base; Tim Marston, U.S. Army, Fort Benning; Clinton Moore, USGS Patuxent Wildlife Research Center, Athens; Jonathan Neufeldt, U.S. Army, Fort Benning; Ronald Smith, Installation Management Command - Southeast, Fort McPherson; Mark Whitney, Department of Natural Resources, Wildlife Resources Division, Social Circle; Marshall Williams, U.S. Army, Atlanta

Hawaii
Patrice Ashfield, U.S. Fish and Wildlife Service, Honolulu; Alvin Char, Directorate of Public Works, Schofield Barracks; Paul J. Conry, Hawaii Division of Forestry and Wildlife, Honolulu; JT Hesse, NAVFAC PACIFIC, Pearl City; Stephen

Jameson, U.S. Navy-NAVFAC PAC, Pearl Harbor; Patrick Leonard, U.S. Fish and Wildlife Service, Honolulu; Michelle Mansker, Directorate of Public Works, Scholfield; Vanessa Pepi, NAVFAC Pacific, Pearl Harbor; Jennifer Sakai, NAVFAC, Pearl Harbor

Iowa
Kim Bogenschutz, Iowa Department of Natural Resources, Boone; Mike McGhee, Iowa Department of Natural Resources, Des Moines; David Otis, U.S. Geological Survey, Ames

Idaho
Clen Atchley, Intermountain West Joint Ventures, Ashton; Edward Garton, University of Idaho, Moscow; Jon Horne, University of Idaho, Moscow; J. Peter Jenny, The Peregrine Fund, Boise; Virgil Moore, Idaho Department of Fish and Game, Boise; James Peek, University of Idaho, Moscow; Kerry Reese, University of Idaho, Moscow; Terrell Rich, U.S. Fish and Wildlife Service, Boise; Mike Schlegel, Pope and Young Club, Grangeville; J. Michael Scott, USGS, Moscow; Katherine Strickler, University of Idaho, Moscow; Jenny Taylor, U.S. Forest Service, Coeur D'Alene; James Weaver, Idaho Army National Guard, Boise

Illinois
Raymond Ballard, Illinois Institute of Technology, Chicago; Tim Hayden, USACE/ERDC, Champaign; Matthew Hohmann, U.S. Army ERDC-CERL, Champaign

Indiana
David Case, D.J. Case & Associates, Mishawaka; David Howell, Quail Unlimited, Stendal; Zachary Lowe, Conservation Leaders for Tomorrow, Lafayette; Jon Marshall, D.J. Case & Associates, Mishawaka; Glen Salmon; Indiana DNR; Indianapolis; Phil Seng, D.J. Case & Associates, Mishawaka; John Tomke, Ducks Unlimited, NFWF Board, SCC, Boone and Crockett, Carmel

Kansas
Barth Crouch, Playa Lakes Joint Venture, Salina; Joe Kramer, Kansas Department of Wildlife and Parks, Pratt; Murray Laubhan, KS Dept of Wildlife and Parks, Pratt; Rob Manes, The Nature Conservancy, Sedan; Mike Mitchener, KS Dept of Wildlife and Parks, Pratt; Doug Nygren, KS Dept of Wildlife and Parks, Pratt

Kentucky
Karen Alexy, KY Dept. of Fish and Wildlife Resources, Frankfort; Tom Bennett, National Archery in the School Program, Shelbyville; Margaret Everson, KY Dept of Fish and Wildlife, Frankfort; Jonathan Gassett, KY Dept of Fish and Wildlife Resources, Frankfort; Tim Guilfoile, Sierra Club, Edgewood; Benjy Kinman, KY Dept of Fish and Wildlife, Frankfort; James Watkins, Fort Knox Natural Resources Branch, Fort Knox

Louisiana
Wylie Barrow, Jr., USGS, Lafayette; Mark Gates, U.S. Air Force, Barksdale AFB; David Hoge, USDA, New Orleans; John Jackson III, Conservation Force, Metairie; Scott Knans, GEC, Inc., Baton Rouge; Howard Nass, Gulf South Research Corporation, Baton Rouge; Maria Reid, Gulf South Research Corporation, Baton Rouge; Greg Smith, USGS National Wetlands Research Center, Lafayette; Samuel Smith, National Trappers Assoc., DeQuincy

Massachusetts
Rick Bennett, U.S. Fish and Wildlife Service, Hadley; Jack Buckley, Massachusetts Div of Fisheries and Wildlife, Boston; Ernie Garcia, U.S. Fish and Wildlife Service, Hadley; Phil Herzig, U.S. Fish and Wildlife Service, Hadley; Olivia LeDee, Manomet Center for Conservation Sciences, Manomet; Wayne MacCallum, Massachusetts Division of Fisheries and Wildlife, Westboro; John McDonald, U.S. Fish and Wildlife Service, Hadley; Andrew Milroy, USAF: Westover Air Reserve Base, Chicopee; Sherry Morgan, U.S. Fish and Wildlife Service, Hadley; Marvin Moriarty, U.S. Fish and Wildlife Service, Hadley; John Organ, U.S. Fish and Wildlife Service, Hadley; Katharine Parsons, Manomet Center for Conservation Sciences, Manomet; Thomas Poole, FT Devens USAG, Devens

Maryland
Lowell Adams, University of Maryland, College Park; Lowell Baier, Boone and Crockett Club, Bethesda; Jim Bailey, U.S. Army, APG; John Barczak, U.S. Army Environmental Command, APG-EA; Gary Belew, Army Environmental

Command, Aberdeen Proving Ground; Scott Belfit, Army, Apgea; Seth Berry, NAVFAC WASH-PWD South Potomac, Indian Head; Laura Bies, The Wildlife Society, Bethesda; Janet Bucknall, USDA/APHIS/WS, Riverdale; Andrew Bullen, North American Falconers Association, Centreville; Amy Burgess, Aberdeen Proving Ground, Aberdeen Proving Ground; Therese Conant, NOAA Fisheries, Silver Spring; Tom Cooper, U.S. Fish and Wildlife Service, Laurel; Jorge Coppen, U.S. Fish and Wildlife Service, Laurel; David Dolton, U.S. Fish and Wildlife Service, Laurel; Brad Gentner, Gentner Consulting Group, Silver Spring; Bess Gillelan, NOAA/NMFS Habitat Conservation, Silver Spring; Dean Goeldner, USDA-APHIS-Veterinary Services, Riverdale; David Guldenzopf, U.S. Army Environmental Command, APG-EA; Paul Hansen, Izaak Walton League of America, Gaithersburg; Ronald Helinski, Consultant, Arnold; Vance Hobbs, OREGA-N -U.S. Army, Aberdeen Proving Ground; Harry Hodgdon, Retired, Frederick; David Hoskins, Izaak Walton League of America, Gaithersburg; Ladd Johnson, North American Gamebird Association and Foundation, Cambridge; Patrice Klein, USDA APHIS, Riverdale; Mark Koneff, U.S. Fish and Wildlife Service, Laurel; Jim Lecky, NOAA Fisheries, Silver Spring; Andrew Loftus, Loftus Consulting, Annapolis; Tony Maranto, Booz Allen Hamilton, Belcamp; Richard McCabe, Wildlife Management Institute, Annapolis; Bette McKown, Wildlife Management Institute (retired), Hyattsville; Helene Merkel, Arcadis-US, Inc., Millersville; Steve Meyers, NOAA Fisheries Service, Silver Spring; Richard Minnis, USDA/APHIS/WS, Riverdale; Timothy Moser, U.S. Fish and Wildlife Service, Laurel; Jim Mosher, Conservation Results, LLC, Williamsport; Paul Padding, U.S. Fish and Wildlife Service/Migratory Bird Management, Laurel; Keith Pardieck, U.S. Geological Survey, Laurel; Paul Peditto, MD Dept. of Natural Resources, Annapolis; Bruce Peterjohn, USGS Patuxent Wildlife Research Center, Laurel; Kyle Rambo, U.S. Navy, Hollywood; Gus Rassam, American Fisheries Society, Bethesda; Charlie Rewa, USDA NRCS, Beltsville; Tim Richardson, American Land Conservancy, Rockville; Kenneth Richkus, USFWS- Div. of Migratory Bird Mgmt., Laurel; Leslie Ries, University of Maryland, College Park; Ryan Roberts, NFHAP, Silver Spring; Jill Rolland, USDA, APHIS, VS, Riverdale; Jay Rubinoff, Army Environmental Command, Aberdeen Proving Ground; Ali Schwaab, Student, Baltimore; Jerry Serie, USFWS retired, Easton; Graham Smith, USGS Patuxent Wildlife Research Center, Camel; Jacqueline Smith, NAVFACWASH-PWD PAX RIVER, Patuxent River; Angela Somma, National Marine Fisheries Service, Silver Spring; Susan-Marie Stedman, NOAA Fisheries Service, Silver Spring; Elena Takaki, Maryland DNR, Annapolis; Bill Woodson, Contractor, Bel Air

Maine
David Santillo, Tetra Tech, Inc, Yarmouth

Michigan
David Brakhage, Ducks Unlimited, Ann Arbor; Dale Burkett, Great Lakes Fishery Commission, Ann Arbor; Shari Dann, 4-H Great Lakes and Natural Resources Camp, East Lansing; Bill Demmer, Boone and Crockett Club, Lansing; Marc Gaden, Great Lakes Fishery Commission, Ann Arbor; Robert Hoffman, Ducks Unlimited, Ann Arbor; Becky Humphries, Michigan Department of Natural Resources, Lansing; Ann LeClaire-Mitchell, Michigan Dept. of Natural Resources, Lansing; Alex Lott, 4-H Great Lakes and Natural Resources Camp, East Lansing; David Luukkonen, Michigan DNR, East Lansing; Russ Mason, Michigan Dept. of Natural Resources, Lansing; Robert Patterson, Michigan 4H, Big Rapids; Judy Ratkos, 4-H Great Lakes and Natural Resources Camp, East Lansing; Shawn Riley, Michigan State University, East Lansing; Brandon Schroeder, 4-H Great Lakes and Natural Resources Camp, Tawas City; Bill Taylor, Michigan State University, East Lansing; Gildo Tori, Ducks Unlimited, Ann Arbor; Lydia Vanderbilt, 4-H Great Lakes and Natural Resources Camp, East Lansing; Gary Whelan, Michigan DNR Fisheries Division, Lansing; Tina Yerkes, Ducks Unlimited, Ann Arbor

Minnesota
David E. Andersen, Minnesota Cooperative Fish and Wildlife Research Unit, St. Paul; Ryan Bronson, ATK/Federal Premium Ammunition, Anoka; John Christian, U.S. Fish and Wildlife Service, Fort Snelling; Steve Delehanty, U.S. Fish and Wildlife Service, Morris; Doug Grann, Wildlife Forever, Brooklyn Center; Jim Hodgson, U.S. Fish and Wildlife Service, Fort Snelling; James Kelley, Fish and Wildlife Service, Fort Snelling; Jim Leach, U.S. Fish and Wildlife Service, Minneapolis; Thomas Melius, U.S. Fish and Wildlife Service, Ft. Snelling; Bill Miller, North American Media Group, Inc., Minnetonka; Harvey Nelson, Trumpeter Swan Society, Bloomington; Dave Nomsen, Pheasants Forever, Garfield; Barb Pardo, U.S. Fish and Wildlife Service - Joint Venture, Fort Snelling; Dave Schad, Minnesota DNR Division of Fish and Wildlife, Saint Paul; Dennis Simon, Minnesota DNR Division of Fish and Wildlife, Saint Paul; Bob St. Pierre, Pheasants Forever, Inc. and Quail Forever, Saint Paul; W. Daniel Svedarsky, University of Minnesota, Crookston; Paul Webster, Boone and Crockett, Wayzata; Charlie Wooley, U.S. Fish and Wildlife Service, Ft. Snelling

Missouri
DeeCee Darrow, Missouri Department of Conservation, Jefferson City; Ronald Dent, Missouri Department of Conservation, Jefferson City; Lorna Domke, Missouri Dept. of Conservation, Jefferson City; Dave Erickson, Missouri Department of Conservation, Jefferson City; Ray Evans, ECO Associates, Holts Summit; Dennis Figg, Missouri Department of Conservation, Jefferson City; Thomas F. Glueck, U.S. Army, Fort Leonard Wood, Fort Leonard Wood; John Hoskins, Missouri Department of Conservation, Jefferson City; Brad Jacobs, Missouri Dept of Conservation, Jefferson City; Bill McGuire, Missouri Dept of Conservation, Jefferson City; Becky Plattner, Missouri Department of Conservation, Jefferson City; John Schulz, Missouri Dept. Conservation, Columbia; Michael Smith, Missouri Dept of Conservation, Jefferson City; Kelly Srigley Werner, MoBCI; Linda Tossing, MoBCI; Bill Turner, Missouri Department of Conservation, Jefferson City; Virginia Wallace, D.J. Case & Associates, Jefferson City; Bill White, Missouri Department of Conservation, Jefferson City; Daniel Zekor, Missouri Department of Conservation, Jefferson City

Mississippi
Pam Bailey, U.S. Army Corps of Engineers, Vicksburg; Sandra Brasfield, U.S. Army ERDC Environmental Laboratory, Vicksburg; Eric Britzke, U.S. Army Corps of Engineers, Vicksburg; Kelly Burks-Copes, U.S. Army Engineer Research and Development Center, Vicksburg; Steve Demarais, Mississippi State University, Mississippi State; Richard Fischer, USACE, Environmental Laboratory, Vicksburg; Curtis Hopkins, Ducks Unlimited, Inc., Ridgeland; Rick Lance, U.S. Army ERDC, Vicksburg; Bruce Leopold, Miss State University, Miss State; Frank Lockhart, Columbus Air Force Base, Columbus AFB; Ross Melinchuk, Ducks Unlimited, Inc., Ridgeland; Darren Miller, Weyerhaeuser Company, Columbus; Jim Miller, Mississippi State University Dept Wildlife and Fisheries, Mississippi State; Michael Passmore, U.S. Army ERDC, Vicksburg; Ed Penny, Mississippi Dept. of Wildlife, Fisheries, and Parks, Jackson; Ben West, Mississippi State University, Mississippi State; Jane West, U.S. Fish and Wildlife Service, Fort Snelling

Montana
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Managing Predator-Prey Systems: An Update

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For the 72nd North American Wildlife and Natural Resources Conference in Portland, Oregon, in March 2007, we organized a symposium on managing predator-prey systems, cosponsored by Safari Club International Foundation and the Wildlife Management Institute (Boyce and Byrne 2007). Our motivation for the symposium was concern about how to manage predators and prey in the face of expanding populations of large carnivores, especially wolves (*Canis lupus*) and cougars (*Puma concolor*) in North America, and the changing human perceptions of both predators and their prey. Much has happened since 2007, and this report is intended to record the dynamics of large carnivores and their prey, as well as the dynamic policy changes that have occurred during the past two years.

Ecologists continue to find evidence of the importance of top predators in structuring communities (Bump et al. 2009) with several dramatic illustrations of trophic cascades where recovering predator populations influence herbivores that in turn can affect vegetation (Ripple and Beschta 2006, Beyer et al. 2007, Frank 2008). Prey need not be killed for predators to have an effect—"landscapes of fear" can alter habitat use patterns and nutrition even without the predators actually killing the prey (Christianson and Creel 2008). In other instances, seasonal differences in predation can alter relative abundances of species in herbivore communities (Lingle et al. 2008). Changes in the seasonal distribution and relative abundance of herbivores may, in turn, have a profound effect on the perceptions that people have on the impacts that predators are having on prey species.

Wolves

On the policy front, certainly the biggest news relates to the attempts by the U.S. Fish and Wildlife Service (FWS) to delist wolves in the Northern Rocky Mountains, and in the western Great Lakes states. To do this, these two subpopulations of wolves had to be identified as a distinct population segment (DPS). The Northern Rocky Mountain wolf DPS (see Figure 1) was delisted on March 28, 2008. Immediately Wyoming began killing wolves and, within three months, more than 100 had been taken within the terms of the delisting agreement.

On July 18, 2008, the Federal District Court in Missoula, Montana issued a preliminary injunction against the FWS based on a lawsuit by 12 parties led by Defenders of Wildlife, the Natural Resources Defense Council, Sierra Club, and the Humane Society of the United States. The main legal argument was developed in an affidavit by Robert K. Wayne, a geneticist from UCLA, claiming that the FWS acted arbitrarily because there was no evidence of genetic exchange among three subpopulations in the Northern Rocky Mountains. The concern was that without dispersal among subpopulations wolves would suffer inbreeding depression and an increased risk of extinction (Vonholdt et al. 2008).

A federal judge in Missoula agreed with the genetic exchange argument and in his brief explained that he also felt that the FWS was arbitrary and capricious in approving the Wyoming Wolf Management Plan that failed to commit to a continued population of 15 breeding pairs of wolves. His preliminary injunction also makes it clear that the aggressive control of wolves implemented in Wyoming subsequent to delisting influenced his opinion. On October 14, 2008, the District Court remanded the Delisting Rule to the FWS.

FWS disagreed with the ruling based on genetic exchange, and provided an affidavit from L. Scott Mills from the University of Montana taking issue with Robert K. Wayne's affidavit. After the Delisting Rule was remanded to FWS, a revision to the Delisting Rule was prepared that expanded the data and arguments on wolf genetics. Indeed, genetic diversity of the NRM population is as high as that in the Canadian populations that were the source for the introductions in 1995 and 1996. Also, there are extensive data on movements of wolves based on radiotelemetry showing that dispersal movements average 60 miles (97 km) with some dispersal events in excess of 373 miles (600 km). Documented movements of wolves between Canada, Idaho, and Montana ensure that wolves in the NRM are part of a population of some 12,000 wolves in western Canada. Further, Idaho and Montana agreed to sign a Genetic Memorandum of Understanding that the states will work with the FWS to ensure genetic connectivity among subpopulations of wolves within the NRM distinct population segment. Genetic diversity will be monitored and if natural gene flow is insufficient, the states agree to participate in deliberate translocations of wolves to maintain genetic diversity within the NRM

subpopulation. The FWS concludes that the NRM will never be threatened by low genetic diversity, genetic drift, or inbreeding.

On April 2, 2009, the FWS published a new Delisting Rule in the *Federal Register* (74:15123-15188) that will return of management to the states of Idaho and Montana on May 4, 2009. Because Wyoming failed to provide a satisfactory management plan, Wyoming was omitted from the Delisting Rule and the Endangered Species Act will continue to protect wolves in Wyoming. Idaho has made its intentions clear to have a hunt for wolves subsequent to delisting, and the Defenders of Wildlife have made their intentions clear to file suit for an injunction against the new Delisting Rule.

In parallel court action, the Humane Society of the United States filed suit against the FWS attempting to block the delisting of wolves in the Western Great Lakes states. In this law suit, the Human Society argued that the FWS inappropriately carved the distinct population segment (DPS) from the original distribution for purpose of delisting (Figure 2). In this instance, however, the U. S. District Court agreed with the FWS noting that the Endangered Species Act was vague on the issue of DPSs. Nevertheless, he remanded the Delisting Rule to the FWS for a revision that will explain the rationale behind the DPS designation and how this was consistent with the Endangered Species Act.

Although not a direct consideration in the legal delisting challenge, another genetic analysis claimed that wolves in the upper Midwest 100 years ago were genetically different from 69 percent of the population today (Leonard and Wayne 2007). From this result, they concluded that wolves should not be delisted in the Western Great Lakes DPS. Mech (2009) has challenged this conclusion because the sampling of individuals for genetic analysis by Leonard and Wayne (2007) was not representative of the population. Mech insists that a population of 4,100 wolves distributed over 42,471 square miles (110,000 $km^{2)}$ of Minnesota, Wisconsin and Michigan constitutes a recovered population, thereby supporting the delisting decision by the FWS.

On the same day that the NRM delisting rule was published in the *Federal Register*, April 2, 2009, the FWS also published a new Delisting Rule for the Western Great Lakes DPS, reasserting their decision to delist wolves. These delisting decisions supported by Secretary of Interior Ken Salazar make a bold statement that science will drive natural resource decisions by the Obama administration. Whether science can prevail on decisions regarding the management of wolves remains to be seen.

Wolves in the NRM and the Western Great Lakes have continued to thrive and to increase in abundance. As of today (April 2009), the FWS estimates that the NRM population exceeds 2,100 wolves within the DPS as per Figure 1. In addition to this range the population continues to expand into other western states, e.g., a radiocollared wolf was found dead in NW Colorado in late March 2009. The wolf population in northern Minnesota appears to have reached saturation density with a relatively constant population of about 3,000 wolves over the past decade. Wolf numbers continue to increase in Wisconsin and Michigan with approximately 1,000 individuals currently and a projected population of about 1,700 (Hammill 2007).

Wolf populations are expanding in other parts of North America as well. Wolf populations in several Canadian provinces were reduced substantially by poisoning, aerial gunning, and trapping during the 1950s and ‘60s. Although a few wolf-control programs continue, e.g., to protect declining populations of woodland caribou (*Rangifer tarandus caribou*) in Alberta and British Columbia and an experimental program in Alaska (Boertje et al. 2009) designed to increase abundance of moose (*Alces alces*) and caribou, most wolves are managed as a game species throughout most of Canada and Alaska. Although wolves are subjected to harvest by hunting and trapping, generally hunters and trappers are unable to remove more than the annual surplus from wolf populations (Boitani 2003). Wolf recovery has been remarkably successful in North America; now it’s a matter of deciding how best to manage these populations.

Cougars

Reduced persecution and increased prey abundance have resulted in increased cougar abundance and distribution in North America, as has been true for wolves. In October 2008, a cougar shot in Saskatoon had a radiocollar showing it had originated in the Black Hills of South Dakota, 597 miles (960 km) from its final location. This was the second longest known dispersal of a cougar; the furthest–a 663-mile (1,067 km) stretch from South Dakota to Oklahoma–occurred in 2004.

Farther east in Canada, cougars have made appearances in Manitoba, Ontario, Quebec, andas far east as New Brunswick. In the USA, cougars have been documented in all Midwestern states with populations becoming established in Missouri and Arkansas (http://www.cougarnet.org). Whether most of these cougars are residents or transients is unknown, but it is clear that these elusive predators are re-occurring in areas where they have not been seen for more than100 years.

The Cypress Hills of southeastern Alberta and southwestern Saskatchewan host the most eastern confirmed breeding population of cougars in Canada. Although occasional sightings have occurred throughout the last 20 years, tracks and sightings have increased significantly within the past 5 years (Bacon and Boyce 2009). Indeed, the cougars in the Cypress Hills appear to have a population density as high as any in North America.

Conclusions

As highlighted by many of the papers in Predator-Prey Management symposium published in the 72nd *Transactions*, expanding populations of large carnivores continue to challenge wildlife managers. Yet, it is partly the success of wildlife management to restore large mammal populations throughout North America that has created a prey base that can support populations of wolves and cougars (Hammill 2007). Accommodations must be made for hunted prey species populations to be able to sustain predation as well as hunting (Milner et al. 2007). To achieve sound harvest policies, careful population monitoring will be required to ensure that we are able to coexist with wolves, cougars, and other large predators. Maintaining public and financial support for population monitoring is sometimes a challenge, but in this era of climate change we have yet another justification for collecting sound data with which to make wildlife management decisions. It will be equally important to improve our communications efforts with all segments of the human population so that the decisions made by wildlife managers are understood and supported by the public. Doing so should help improve the scientific basis of the decision-making process and reduce the involvement of courts in making these decisions.

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